Growing SMEs

The sensitivity of investment and employment to the cost of debt financing*

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This version: September 9, 2020

Abstract

This paper uses variation in the access to a credit certification program in Portugal to estimate the sensitivity of small and medium sized firms (SMEs)´ investment and employment to the cost of debt financing. The program offers a credit certification as well as subsidized bank loans through a credit guarantee scheme provided by the Portuguese government. The program design allows for a multidimensional regression discontinuity methodology to estimate the impact of the program on firms' access to credit, as well as its real effects over a decade. When comparing firms around cutoff points, we find that eligible firms increase their borrowing, and borrow at significantly less expensive rates than non-eligible firms. Targeted firms also increase investment and employment when compared to non-certified firms. Last, we document heterogenous effects of the program during the financial crisis and in the post crisis period.

Keywords: Credit Rating, Credit Access, Certification

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1. Introduction

During financial crisis, when supply of credit is limited, firms might become financially constrained, especially small ones (Brown and Earle, 2017, Campello et al. 2010, Carbó-Valverde et al. 2016, Carpenter and Petersen, 2002, DeYoung et al. 2016). Mutual guarantee programs, where governments offer a guarantee, are common stimulus measures to the economy (Bach, 2013, Bartoli et al., 2013, Beck, 2014, Blasio et al. 2018, Columba et al. 2010, D'Ignazio and Menon, 2013, Lelarge et al. 2010, Gonzalez-Uribe and Wang (2020)). Through these programs, governments offer (partial) guarantees on loans granted by financial institutions to small firms, with the purpose of subsidizing the cost of borrowing and alleviating potential financing constraints to promote their growth. Despite the popularity of these type of programs among governments and policy makers (for instance during the 2020 COVID19 pandemic these were again commonly used across countries), the real effects of these programs remain understudied and the existing evidence on its impact is mixed (e.g., France: Lelarge, Sraer, and Thesmar, 2010; Italy: de Blasio et al., 2014, USA: Brown and Early, 2017; D'Acunto, Tate, and Yang, 2017; Chile: Mullins and Toro, 2017). A possible limitation of these programs in its most common set up, has to do with the role of financial institutions for which perverse incentives may arise (Anginer et al. 2014, Arping et al. 2010, Beck et al. 2008, Honohan, 2010). Because of the government guarantee, banks have less 'skin in the game' and might relax borrowing conditions and monitoring efforts. The effectiveness of these programs might thus be compromised because banks allocate subsidized credit to firms of worse credit quality and limited growth prospects.

A targeted stimulus program adopted in Portugal focused on small and medium enterprises (SMEs) with a minimum credit quality, providing them with loan guarantees but also with a credit certification (rating) that is publicly available and visible. Eligible firms have thus access to subsidized bank credit and to a credit rating that may potentially reduce information asymmetries, especially during economic downturns. SMEs are typically opaque, which makes the process of collecting information and establishing a relationship with creditors long and expensive (Beck and

Demirguc-Kunt, 2006). Moreover, unlike large and public firms, these firms do not benefit from the certification mechanism offered by the main credit rating agencies.[1] In this paper we make use of this public policy program - 'SME-Leader Program' - that was introduced in Portugal at the beginning of the great recession in 2008 to study how sensitive is small firms´ investment and employment to the cost of bank debt financing.[2] The unique features of this program, that run for more than 10 years and use several eligibility criteria that change over time, allow for a Multidimensional Regression Discontinuity Design (MRDD) to estimate real effects during the financial crisis, and during the post crisis period. Because the program certifies eligible firms with one of two ratings we also exploit variation around the ratings cut-offs to isolate the impact of an additional credit notch for SMEs. The richness of the data on the population of Portuguese firms make it possible for a detailed analysis of financing conditions and usage of the borrowed funds. Around cutoff points, we find that eligible firms increase their bank lending and have access to cheaper loans than non-certified firms. These funds are used to increase investment and employment, mostly during economic downturns. We then study firm growth that may arise from investment. We find that around the threshold firms eligible to the program have an acceleration of sales growth, cost of sales, as well as exporting sales. In a second part of the paper we examine the rating component of the program. We find modest effects of an extra credit rating notch on growth, that are mostly observed in the post-crisis period.

A relevant feature of the program is that certification and top rating criteria are multiple and change on a yearly basis. Firms submit their financial information and application through a sponsor bank before the criteria are announced and cannot be sure ex-ante about whether they will be part of the program in a given year. The certification is then valid for a year. Because firms have discretion and endogenously choose whether to apply to the program, we estimate the intention to treat effect (ITT), ie., we compare all firms eligible to be in the program with non-eligible firms. The multidimensional criteria design has the advantage of estimating the intention-

[1] Sufi (2009), and Faulkender and Petersen (2006) show there is a credit rating effect for large firms.
[2] In Portuguese the program is called PME-Lider.

to-treat effect using different groups of firms around different cut-off points. This improves on the external validity of unidimensional RDs, which usually rely on a limited and small number of observations around a single cut-off point. In order to define a single running variable based on multiple criteria and thresholds we follow Ferreira, Ferreira and Mariano (2018). We first determine the binding criteria for each firm-year and then standardize the distance to threshold across criteria. For our baseline estimates we make use of Calonico, Cattaneo and Titunik (2014) approach to choose the optimal bandwidth around the cutoff points and order of polynomials for the functional form.

We first document that firms that are eligible to participate in the program have access to significantly lower costs of debt financing and increase their borrowing. This effect is not surprising, as certified firms are offered loans that are guaranteed by the national system of Mutual Guarantee, and firms can shop around multiple sponsor banks to have access to it. However, it could also be the case that, because borrowing costs through the program decrease, firms increase their borrowing from other banks to a level that increases their overall cost of bank financing. When comparing firms around the cutoff point for the program, we find that eligible firms have access to credit that is between 1.8 and 2.6 percentage points cheaper than non-eligible firms. We also document that eligible firms grow their borrowing by more than non-eligible firms during the crisis period, which is consistent with them being credit constrained. This effect is not as pronounced during the post-crisis period. We then test if eligible firms make use of borrowed firms for investment purposes. We find that during the crisis they invest more in fixed capital, working capital as well as hire more employees than non-eligible. Again, these effects are not as pronounced in the period after the crisis.

Overall we also find a positive and persistent impact of this certification program on firm growth and performance. We find some evidence of a positive impact on firm's sales growth one year after the certification, but no persistent effects. Growth in sales is 0.006 percentage points higher for eligible firms when compared to non-eligible around the threshold. We then check whether certified firms increase their exports. We find that firms eligible to the program export

more than non-certified firms around the eligibility treashold. The effect is positive and economically significant. Program eligible firms export up to 0.051 percentage points more when compared to others. Overall our results suggest that this program has a positive impact on firm growth and performance, with real effects in terms of firm investment and employment. Noteworthy, these are mostly present during the crisis period and much less salient in the period post crisis.

The SME-Leader Program attributes two different credit ratings to SMEs (*SME Leader* and *SME Excellence*), which allows to identify the impact of reducing informational frictions through the provision of a public rating. When comparing firms with different levels of rating, in order to evaluate the value of an extra notch in certification, we find significant results on firm growth and performance, suggesting that the overall impact of the program is not limited to the improved access to credit but also due to the certification itself. Nevertheless, the effects arising from access to subsidized credit seems to dominate those arising from decreasing information asymmetries about firm quality during the crisis, as evidence of a credit rating effects is mostly present in the post-crisis period.

Our results can have relevant policy implications. SMEs represent an extremely large part of the European economy: according to the "Annual Report on European SMEs" by the European Union (EU) in 2016 they represented almost all (98%) of non-financial enterprises, two-thirds (66%) of total EU employment and accounted for almost three-fifths (57%) of the value added generated by the non-financial sector. Because of their importance in the economy these firms have been gaining particular attention by researchers and policymakers who recognize the challenges associated to SME credit access. Our research design help us to understand how relevant are financial and informational frictions on hampering firms' access to credit and performance, leading to different outcomes in terms of investment on physical and human capital. This allows policymakers to understand the potential impacts of enacting policies to alleviate financial and informational constraints on SMEs. This can be particularly relevant during financial crisis, or other economic distress events such as the recent COVID19 pandemic.

Related literature

SMEs have limited access to equity capital markets (Ferrando, Popov and Udell, 2015), so typically their most important source of external finance are bank loans. Government and national financial structures affect credit availability mainly through lending technologies (Berger and Udell, 2006), so several measures have been developed to improve the SMEs' access to finance through bank loans at different levels. Gonzalez-Uribe and Paravisini (2016) study the Seed Enterprise Investment Scheme in the UK, which consists of an exemption on capital gains and income tax relief offered to individual investors in small entrepreneurial firms. They find that this program had positive impact on investment. Aghion, Bergeaud, Cette, Lecat and Maghin (2019) exploit a change in Eurosystem's Additional Credit Claims (ACC) program to perform a differences-in-differences analysis on the supply of credit to firms. They find that firms with easier access to credit (i.e. with higher credit ratings) experience higher productivity growth, but they also find that incumbent firms with easier credit access experience lower exit rates, particularly the least productive firms.

Other lending technologies (for example, factoring) are also available to SMEs but, as Udell (2015) stated, the extent, type, and pricing of SME loans is not correlated with lending technologies. During the global financial crisis, banks were forced to significantly adjust their portfolios in response to negative shocks, implying that SMEs' access to credit was highly constrained (Carbó-Valverde, Rodriguez-Fernandez and Udell, 2016; Ferrando et al., 2015). Moreover, such credit-constrained firms are limited in their ability to grow (Beck and Demirguc-Kunt, 2006). Cressy and Olofsson (1997) claimed that lack of access to both finance and expertise represented the biggest constraint for small and medium companies. Nowadays main streams of policy developments in this area include (i) development of alternative sources of funding and (ii) support of the bank credit flow (Ryan, O'Toole and McCann, 2014). Alternative sources of funding that get significant attention are trade credit (Carbó-Valverde et al., 2016) and venture capital, especially in Europe (Berger and Schaeck, 2011).

Credit-constrained SMEs are additionally limited in their access to finance by the market power of the banks (Carbó- Valverde, Rodriguez-Fernandez and Udell, 2009; Ryan et al., 2014), and vulnerability to information problems (Carbó- Valverde et al., 2009). Competition in the European lending market (Ryan et al., 2016), as well as greater sharing of information (Berger and Udell, 2006), are necessary conditions for successful development of SMEs. According to Hernández-Cánovas and Martínez-Solano (2010) trustful relationships improve access to financing, reducing the borrowing cost.

Information asymmetry may also affect firms' financing, so higher credit ratings imply lower borrowing costs (Tang, 2009). A credit rating may serve as a signal of a firm's quality (Kisgen, 2006) or a benchmark for debt issuing (Boot, Milbourne and Schmeits, 2006). Ratings have been mainly assessed through their impact on firm's bond yields, changes in yields and corporate leverage for large and public firms (Kisgen and Strahan, 2010). It has been documented that firms with higher ratings make more capital investments and grow faster than their lower rating counterparts, who make fewer investments and accumulate more cash (Tang, 2009). Sufi (2009) evaluated the impact of the introduction of credit ratings and stated that, for the rated firms, asset growth and cash acquisition doubled with the presence of the rating.

Information provided to a bank consists of both (hard) quantitative and (soft) qualitative data (Berger and Udell, 2006). Banks' internal credit ratings are perceived as a reasonably reliable measure of the borrower's risk, but Machauer and Weber (1998) did not find evidence that lending terms were changed as a response to changes in ratings.

Our paper contributes to this literature by estimating the causal impact of access to subsidized bank credit on firm growth and performance, as well as documenting the real economic effects in terms of investment and employment. We also estimate the value of an extra notch of rating for SMEs.

The paper proceeds as follows. In Section 2 we describe the program and in Section 3 we describe the data and the empirical strategy adopted. In Section 4 we analyze the impacts of the program on the cost of debt financing, on revenue growth and firm performance, and on real

outcomes (investment and employment). Section 5 summarizes some extensions and robustness exercises and Section 6 concludes the paper.

2. Institutions, Data, and Descriptive Evidence

2.1 The SME-Leader Program

The SME-Leader program was introduced in 2008 with the main objective of ensuring that the best performing SMEs had access to financing during the global financial crisis. The governmental agency in charge of the program, IAPMEI, defines every year a set of eligibility criteria for firms to be classified as SME-Leaders. The criteria are defined with the goal of identifying small firms with more potential for growth and that offer less credit risk to their lending institutions. A firm that gets the title of SME-Leader has access to bank loans from a sponsor bank with a government guarantee, and a certification as SME-Leader, i.e., a 'stamp' that certifies that it passed a hurdle that others did not.

The eligibility criteria are mainly based on past accounting performance. Across all years of the program, these financial criteria included: total assets, number of employees, total sales, net income, EBITDA, net income/assets, net income/equity, equity/assets, EBITDA/assets, EBITDA/sales, debt/EBITDA, sales growth and EBITDA growth. An example of criteria for 2012 and 2013 is provided in Figure 2. A relevant feature of the program is that the criteria have changed on an annual basis, becoming more demanding over time. Thus, a firm that is SME-Leader in a certain year might not necessarily be eligible in the following year.

The program also includes a top rating certification for those SME-Leaders that meet a tighter set of criteria. Those better performing SME obtain the top rating of SME-Excellence that is also attributed on an annual basis. For SME-Excellence firms the formal benefits of access to government guaranties are unchanged (i.e., there are no lower established interest rates for SME-Excellence when compared to SME-Leader). The benefits accrue from having a higher rating, signaling the superior quality of the firm.

To get a certification, the firm must apply through a bank that sponsors its application. The bank has to confirm if the firm fulfills the eligibility criteria, assess its credit quality, and submit the application to the government agency. The criteria are based on accounting data that is reported before the criteria are announced every year, thus making it unfeasible for firms to manipulate their accounts in order to meet the requirements. Applications are typically submitted until the beginning of the 4th quarter of each year and the benefits are valid until the end of the following year.

Besides the financial criteria, the firms must meet a set of more general qualifying criteria that are the same every year. These include being officially classified as an SME firm by IAPMEI (this is solely based on firm size measured by number of employees, revenue and assets), have three consecutive years of complete financial statements, and have no conflicting situations (e.g. late payments) with the Portuguese tax authorities, IAPMEI or the social security.

The main benefits for SME-Leader firms derive from the better borrowing conditions they can have access to. Given that applications are submitted through banks, most firms in the program had access to bank loans before entering the program. Once they enter the program, they gain access to credit lines with partial credit guarantees provided by mutual guarantee societies. This allows firms to borrow at lower rates, with less collateral, and in a more streamlined and standardized process for credit approval.[3] The sponsor banks obtain a smaller margin on these loans, but benefit from significant regulatory capital savings, given the partial guarantees attached to these credit lines.

Besides the benefits in terms of access to bank loans, firms also benefit from the certification. By being part of the program, the firms can publicize on their websites and other communication

[3] The terms and conditions applied vary across credit lines and change throughout the sample period. For illustration purposes, the maximum spread that banks could apply on credit lines granted to SME-Leader firms in 2015 ranged between 2.7 and 3 p.p. over the 6-month Euribor (banks could charge lower spreads). The average spread for new loans under 1 million euros was 3.8 p.p. in the same period. The firms also had to pay a commission for access to the mutual guarantee, which was 0.65% for the most expensive credit lines.

platforms that they are among the best performing small firms in the country, what might offer reputational advantages with their customers and stakeholders. Furthermore, there are other fringe benefits, such as access to training and partnerships with service providers.

Based on the program design we can identify 5 types of firms in a given year (illustrated in Figure 1):

(1) SME-Leader Eligible and Certified: Firms that applied to the program and got rated 'Leader Firm' (the bottom rating)

(2) SME-Excellence Eligible and Certified: Firms that applied to the program and got rated 'Excellence Firm' (the top rating)

(3) SME-Leader Eligible Not Certified: Firms that did not apply to the program but satisfy the criteria to be *'Leader Firm'*

(4) SME-Excellence Eligible Not Certified: Firms that did not apply to the program but satisfy all the criteria to be *'Excellence Firm'*

(5) Non-eligible: firms that are not eligible because they do not satisfy the criteria. We do not have information on applications for these firms, i.e, we do not know whether these applied.

2.2. Data

The government agency responsible for the program (IAPMEI) makes publicly available the list of firms that are certified by the program in each year as well as the criteria to be certified as SME-Leader and SME-Excellence. We collected data on certified firms and program criteria between 2008 and 2018 from IAPMEI. This allows to know if a firm was classified as SME-Leader or SME-Excellence in a given year. There is also information on which bank filed the application of the firm (sponsor bank).

We merge this data with detailed accounting data on the firms, using their unique fiscal identification number. The Portuguese Central Balance Sheet database covers all non-financial firms operating in Portugal. The data is sourced from *Informação Empresarial Simplificada* (IES), a joint project of the Ministry of Finance, Ministry of Justice, Statistics Portugal and Banco de Portugal. The aim of this project is to integrate most of the information that all Portuguese firms have to report for legal, fiscal and statistical purposes. Banco de Portugal revises the data to enhance its analytical content for economic and statistical purposes (this revised version of the data is the Central Balance Sheet database). We collect this data from 2007 to 2018.

We are thus able to identify all firms that are eligible for the program and each specific rating in each year and the ones that are actually certified. The granular and detailed information in the dataset also allows for an accurate characterization of firms' financial ratios.

Last, we are able to merge this information with the Central Credit Register dataset, owned and managed by Banco de Portugal. This includes monthly information on all loans outstanding in Portugal, granted by resident credit institutions. The reporting threshold is among the smallest in the world (50 euros). This virtually universal coverage is key for the analysis of SME financing. Indeed, most credit registers worldwide typically have higher reporting thresholds, sometimes excluding smaller firms from the analysis. The information contained in the Credit Register allows to know if the firm is borrowing from banks other than the one which has submitted the application for the program. The dataset has information on the total outstanding bank loans of each firm and on the status of each loan (for instance, if it has become overdue or if it was renegotiated). There is also information on unused credit lines, loan products, maturity and collateral.

2.3. Sample and summary statistics

Our main sample comprises 427,493 firm-years from 2007-2018. Table 1 shows summary statistics for all firms in our sample, both participating in the programme and also non-eligible ones. Large firms (non-SME) are excluded from the sample. We also exclude firms in tourism

sector that have their own loan guarantee programme, as well as financial firms, government own firms and micro firms (less than 5 workers). The average firm in our sample has 29 employees and average sales of 3.2 million euros. Table 2 shows the number of certified firms and the number of firms eligible for Leader and Excellence certification on a given year. The program started in 2008 only with one type of certification and then it added a second certification in 2009. The number of certified companies has increased over time, which is possibly associated with greater awareness of the program. The number of eligible and non-certified firms overall decreases over time as the program criteria become tighter and again more visible. After 2012 average compliance rate is at 63%, and for the years before at 25%.

Table A1 in appendix shows the summary statistics for 5 main sub-samples of firms: Leader, Excellence, Leader -eligible and Excellence Eligible firms. Overall Leader and Excellence firms are larger and better performing. This is not surprising as these firms are selected into the program based on accounting performance and size.

3. Methodology

In order to estimate the impact of credit guaranties and credit certification we exploit the discontinuity threshold between firms that are eligible to the program and non-eligible firms. While we observe the firms that are certified and the ones that are not in a given year, we do not have information on applications and therefore we cannot account for selection into the program. For this reason, we estimate an intention to treat (ITT) effect, i.e., we compare eligible firms with non-eligible firms around different cut-off points, defined by the different eligibility criteria. The list and summary statistics for these criteria is presented in Table 1.

In order to estimate the impact of an additional credit rating notch we exploit the discontinuity between the top-rated firms (Excellence Eligible and Certified Firms) and the bottom rated firms (Leader Eligible and Certified Firms). All these firms were selected into the program, and around the cutoff arguably differ only on the attributed rating classification.

We use a multidimensional regression discontinuity design to estimate the intention to treat effect of the program and the average treatment effect of being certified with the top rating. The

underlying assumption to be able to establish causality is that the assignment of firms close enough to the threshold is as good as random. Therefore, the analysis is restricted to a set of firms that lie around the threshold: to estimate the effect of certification and access to credit we compare firms that got eligible to the SME-Leader program but only met the criteria by a small margin, with the firms that were not eligible to get the certification because by a small margin. The 'just below the threshold' firms are used as counterfactual for firms that are 'just above the threshold" (the intended to treat firms). Likewise, to estimate the isolated top rating effect we compare firms that got the SME-Excellence certification just by a small margin with the SME-Leader certified firms that did not get the top rating (Excellence) just by a small margin.

In a one-dimensional regression discontinuity design, the bandwidth definition and distance to threshold is determined by a single criterion. In a multidimensional we have multiple criteria and multiple thresholds are therefore we need to define a single running variable and threshold. We will define the distance to threshold of a given firm in a given year using the criterion that is the most binding. As an example, to be eligible to the program as SME-Leader in a given year a firm must have: positive net income, positive EBITDA (earnings before interest taxes depreciation and amortization) in two consecutive years, and equity-to-assets ratio greater or equal to 30%. Therefore, a firm is considered to be close to be eligible based on the most binding criteria. We follow the approach of Ferreira, Ferreira and Mariano (2018) to define the binding distance to threshold across criteria. We first calculate the distance to threshold for all criteria. Then we standardize these differences to make them comparable across criteria. Then we define as binding criteria the one that has the furthest distance to threshold. Then we aggregate the standardized distances to threshold across criteria to define the RD running variable (standardized distance to threashold). The econometrics literature on regression discontinuity design provides detailed guidance on the choice of optimal bandwidth (Imbens and Kalyanaraman, 2012); the choice of local polynomial order to include in the regression (Pei, Card, Lee, and Weber, 2018); and the

inclusion of covariates (Frölich and Huber, 2018). We follow Calonico, Cattaneo and Titunik (2014a) for the choice of optimal bandwidth and order of polynomial.[4]

Formally, we will estimate the following model:

$$y_{it} = \beta v_{it} + \sum_{p=1}^{P} [\gamma_{p0} + \gamma_{p1} v_{it}] D^p + \varepsilon_{it} \quad (1)$$

where y_{it} is a firm outcome (eg., interest rate of new loans), v_{it} is an indicator variable that takes the value of 1 if a firm is eligible to be SME-leader in year t (i.e., v_{it} =1 if D_{it} >=0), and $\sum^{P} [\gamma_{p0} + \gamma_{p1} v_{it}]^{p}$ is a polynomial of order P of the distance to threshold, the coefficients γ_{p0} and γ_{p1} can differ on the left- and right-hand sides of the threshold.

An example of program criteria for years 2012 and 2013 are shown in Figure 2.

A possible concern with the validity of this method is that firms manipulate their financial statements to meet the program criteria. The design of the program makes it harder for manipulation for the following reasons: 1) the program eligibility criteria for a given year are always based on the financial statements of the previous year and only announced after firms submitted their financial reports to the authorities; 2) the program criteria change on a yearly basis; 3) not only thresholds but performance indicators change overtime, which makes it difficult to firms to predict the requirements. Note as well that in Portugal all firms, irrespective of size, must submit detailed financial statements (balance sheet, income statement and cash flow statement) to the authorities in a timely manner, otherwise they pay a penalty. This also reduces incentives for manipulation.

[4] We use the Stata package rdrobust described in Calonico, Cattaneo and Titunik (2017)

4. Results

By gaining the certification, all firms benefit from guarantees provided by the mutual guarantee system. This means that banks can offer these firms better loan terms and conditions, as the risk associated with these exposures is now much smaller (thus also entailing savings in terms of banks' risk-weighted assets). The first step in our empirical evaluation of the program is thus to examine the changes on the cost of debt financing in order to confirm that firms indeed have access to cheaper cost of bank financing. Finding that firms indeed access to less expensive bank loans does not necessarily mean these firms are credit constrained. In order to evaluate if firms increase their borrowing at these rates, or simply replace existing debt with new loans because they are less expensive we also look at changes in bank loans, and potential usage of new funds. We perform this analysis during the crisis period as well as in the period post crisis as we conjecture that firms might be mostly constrained during the crisis.

4.1 Cost of debt financing and changes in bank loans

We find that firms that are eligible to participate in the program have access to significantly lower cost of debt financing during the crisis. Table 3 Panel A shows the results using financial conditions variables constructed using data from firm financial statements. When comparing firms around the cutoff point for the program during the crisis period, we find that eligible firms have access to bank credit that is 2.6 percentage points cheaper than non-eligible firms (column 1). In columns (2)-(3) we show that this effect is persistent over time. We also find similar negative and significant coefficient when we measure the financing costs one year after the certification and two years after the certification. These results despite unsurprising suggests that the program is being effectively implemented. In columns (1) to (3) of Panel B we repeat this analysis for the period post crisis (20014-2018) and find similar results, in the specifications with one year and two years lags. These results despite unsurprising suggests that the program is being effectively implemented.

We then look at the acceleration of changes in bank loans. Columns (4)-(6) show the results. We find that firms that are eligible to the program increase their borrowing growth rate when compared to non-eligible ones during the first years of the program. The estimated coefficient for contemporaneous variables is at 0.08, which represents 0.15 of a standard deviation of 0.55. The effect persists for one year. The estimated coefficients are smaller for the period post 2013 at 0.02 for the contemporaneous effect, and 0.026 and 0.027 for the one year and two year lags.

We then look at the weight of short-term debt on the total existing debt of the firm. Columns (7)-(9) show the results. Overall we find that the weight of short term debt in the balance sheet of eligible firms increases when compared to non-eligible. This effect is observed beyond the year of certification but mostly observed before 2014.

Table 4 shows the results using loan flow data. Columns (1)-(3) show the impact of the program on the cost of new loans. Overall find consistent results with the ones presented in Table 3. The costs of debt for eligible firms is 0.02 percentage points lower than for non-eligible firms during the period 2008-2013. When using new loans data we do not find an effect during the period beyond 2014, as shown in panel B. As for the maturity of new loans we also find that eligible firms have lower loans maturity. Results are shown in columns (4)-(6). This effect is persistent over time and present during the whole sample period.

We then look at new banking relationships. The program available through multiple banks and therefore firms might start new bank relationships are a result of the program. Columns (7)-(9) show that the number of relationships increase for eligible firms. The coefficient is at 0.9, which suggests that the program is responsible for a new relationship for eligible firms. This effect is persistent and observed in both sample periods.

Last we look at collateral requirement. Columns (10)-(12) show the results. We find that collateral requirement is greater for eligible firms than non-eligible firms. This is not surprising because all the loans through the program have a government guarantee, which makes them being classified by the bank and in the data as collateralized.

Overall these results suggest that firms eligible to the program benefit from lower costs of debt

financing and make use of the program to increase bank loans, as opposed to simply substituting existing ones at a lower cost. We interpret these results as evidence that good small firms face credit constraints, especially during periods of financial crisis.

4.2 Investment

In the previous section we show that eligible firms increase their borrowing more than non-eligible firms, which points to the existence of credit constraints for these firms. Firms that are credit constrained may differ from unconstrained ones in their usage of newly borrowed funds. We test whether eligible firms grow their investment by more than non-eligible firms.

Table 5 shows the results for investment in fixed capital (columns (1)-(3)) and working capital columns (4)-(6). We find a positive effect of the program on firm investment. Certified firms invest 5.9 percentage point more than non-eligible firms during the crisis. This is a large effect of 60% more investment evaluated at the mean during the year of the award that, however, is not very persistent over time. In fact, one year after the award investment is significantly lower for eligible firms at -0.035, which partially offsets the initial impact. We find a modest and persistent effect on capital expenditures between 0.003 and 0.005 in the post-crisis period.

In columns (4)-(6) we show the results for investment in working capital. We find that eligible firms increase their investment in working capital by more than non-eligible firms. The estimated intention to treat coefficient is 0.053 which is a 50% increase evaluated at the mean of 0.10. This effect is persistent for one period and more pronounced during the crisis period. Panel B shows the results for the post-crisis, where the coefficient is at 0.018 for the first year of the program, not significant one year after, and again at 0.015 two years after certification.

These results suggest that eligible firms increase their investment by more than non-eligible firms, and that these effects are more pronounced during the financial crisis. The persistence of the effects may also be explained by firms being certified for several years in a row.

Table 6 shows the results for investment in human capital. Columns (1) to (3) show that eligible firms increase their growth in employees when compared to non-eligible firms by an extra 0.004

during the period of the crisis (in Panel A), as well as during the period post crisis by 0.005 (in Panel B). This effect is persistent for one year after award. Columns (4)-(6) show the effects for the growth rate in wages. Wages in eligible firms grow by 0.003 more during the crisis period than for non-eligible firms (Panel A). This effect if persistent for one year, but not significant during the period post-crisis, as shown in Panel B.

Overall we find evidence that credit constrained firms make use of newly borrowed funds through the program to invest in fixed capital, working capital as well as hire new employees.

4.3. Growth: impact on revenue, costs and profits

Table 7 presents evidence on total revenues, exports, costs and profits.

Columns (1)-(3) of show that eligible firms grow their sales by more than non-eligible firms, one year after the year of certification during the period of the economic crisis. This effect is not persistent for another year, and not present in the period post crisis as shown in Panel B. Columns (4)-(6) show similar test for growth in costs. We also find an increase in the growth rate of costs one year after the year of reference during the period of the crisis, with similar magnitude to the one for total revenues. This effect is not persistent. Interestingly, during the post crisis period we find that costs of eligible firms grow by less than the costs of non-eligible firms.

We then look at exports. During the economic crisis of 2008-2013 several Portuguese firms have increased their exports. We test whether exports grew by more for eligible firms during this period. Columns (7)-(9) of Panel A show these results. We find that Eligible firms increased their growth in exports by 0.051 more than non-eligible firms. This occurs with a one-year lag and is persistent for one year. This is reasonable having into account that firms might have to invest or adapt themselves to increase exports. Panel B shows these effects in the period post crisis. We do no find significant effects in the first two periods and we do find a negative and significant effect with a two year lag.

Last, we focus on profits. Columns (10)-(12) show the results. The impact on profits is positive at 0.007 and persistent for one year during the crises period for eligible firms, as shown in Panel

A, but negative and persistent during the post crisis period, as shown in Panel B.

These results seem consistent with the notion that good small firms can be credit constrained during economic crisis and that by alleviating these constraints these firms can then invest and grow their production. We don't find this to be necessarily true during good times.

4.4. The impact of an extra credit rating notch

We now move to test the impact of the certification as *Excellence* firm. Table 8 shows the results. We first focus on financing conditions. Columns (1) and (2) show that there are no significant differences in cost of financing around the threshold between *Leader* and *Excellence* firms. This is the case for both the period pre-crisis and post crisis in panels A and B respectively. When we compare the increase in new loans (Columns (3)-(4)), we find that Excellence firms increase their borrowing by less than Leader firms. It is possible that having a better credit rating makes these firms less credit constrained in the first place, or able to access other sources of credit such as trade credit for instance.

Columns (5)-(6) show the differences between *Excellence* and *Leader* firms for debt maturity. Panel A shows them during the crisis and Panel B during the post-crisis period. While during the crisis we observe no differences, in the post crisis period we find lower debt maturity for Excellence firms.

In columns (7)-(12) we examine the impact of the extra rating notch on firm growth. We focus on sales growth, exports growth and profits. During the crisis period we only find significant effects on exports. *Excellence* firms increase their exports by 0.15 more than Leader firm in the year of the certification. The effect is still positive at 0.077 with a one-year lag but not significant. Interestingly the effect of an extra credit certification notch seems to be more salient in the period after the crisis as shown in Panel B. We find a positive effect on sales growth of 0.023 in the year of the award that is persistent at 0.015 one year after (columns (7) and (8)). We also find a positive effect on exports growth with a 1-year lag of 0.059 on column (10). Last, we find a positive impact of having the top rating on profits. Ebitda for *Excellence* firms around the threshold is 0.024 larger

than for Leader firms also close to the threshold.

We conclude that most of the impact of credit certification program during the crisis period is associated to the relaxation of financial constraints through the access to less expensive bank loans and less so to the attributed credit rating. Interestingly we do find an impact on growth and profits associated to having the top credit rating during expansion periods.

4.5. Firm fixed effects estimates.

In this section we present firm fixed effects regressions to estimate the intention to treat effects. Results are shown in Table 9. Because in firm fixed effects estimates we exploit within firm variation, i.e., firms that become eligible/illegible to the program we use the full sample period not to limit this variation. All variables are contemporaneous to the award. The regressions include year dummies as well as firm-level covariates: size, age, leverage and profitability. In column 1 we show the result for financing costs estimated using data from financial statements. We find a negative and significant coefficient at -0.002, which is of smaller magnitude than the RDD estimate. In column (2) we show the impact on bank loans growth, which increase by 0.072. This result is also consistent with the RD estimate.

In columns (3)-(4) we estimate the impact on investment. While we do not find an effect on CAPX we do find a positive effect on working capital investment of 0.018.

Last, columns (5) and (6) show the results for growth in revenue and exports. We find a positive impact on eligible firms of 0.011 on sales growth and 0.027 on export growth.

These fixed effects estimates are overall consistent with the results obtained with the RDD.

4.6.RD Graphs and Robustness

In this section we provide some visual representation of the RD estimates using a fixed bandwidth across all outcomes of -0.25 to 0.25 as well as a 3 order polynomial. Figure 3 shows these results. Consistent with the previous estimates we find a negative effect on interest rate of new loans of approximately 0.03. The impact on new loans is also consistent with previous

estimates. There is a clear increase in the growth of loans above the eligibility cut-off.

As for investment we do find a positive effect on capex of approximately 0.07, as well as a positive effect on working capital investment. The impact on total revenue and exports is also positive, which is consistent with previous estimates.

5. Conclusion

This paper tests financial constraints for good small firms using a credit certification program in Portugal that targets firms with a minimum credit quality. We use regression discontinuity design to establish a causal effect between access to finance through the program and firm-level outcomes. The unique features of this certification program allows for a quasi-experimental design that elicits the causal effects of this intervention.

The program design also permits a clean measurement the effects of credit certification for small firms. The importance of ratings is well established for large and listed companies but not for private firms, for which it can potentially be more important given higher frictions for these companies when it comes to access external financing.

The Portuguese firm-level data is very rich, which allows a very thorough and detailed analysis of the channels through which the relation of credit constraints can impact growth. We find that the program of certification has a positive impact on firm growth and performance. The real economic effects are also meaningful. Certified firms show more investing and hire more workers as a result of this program. These effects are more pronounced during the crisis. These results can have relevant policy implication as they show that government programs promoting access to credit during economic downturns can help firms overcome financial constraints.

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Table 1: Summary statistics

	Mean	Std. Dev.	Min	Median	Max	Obs
Panel A: Criteria						
Assets (000)	4,407	52,200	1	1,073	9,230,000	427,493
Employees	29	32	6	17	249	427,493
Sales (000)	3,160	7,081	10	1,118	409,000	427,493
Net income (000)	95	3,947	-462,000	13	959,000	427,493
Ebitda (000)	290	4,081	-317,000	72	962,000	427,493
Net income-to-assets	0.02	0.08	-0.21	0.02	0.17	427,493
Net income-to-equity	0.11	0.28	-0.54	0.07	0.83	427,493
Equity-to-assets	0.32	0.26	-0.23	0.31	0.79	427,493
Ebitda-to-assets	0.08	0.10	-0.14	0.08	0.29	427,493
Ebitda-to-sales	0.07	0.10	-0.16	0.07	0.28	427,493
Debt-to-ebitda	2.92	4.68	-5.72	1.80	15.17	361,340
Sales growth	0.07	0.28	-0.37	0.03	0.84	427,493
Ebitda growth	0.52	338.62	-17,452.62	-0.06	208,339.10	427,477
Panel B: Debt and cost of debt:						
~~Bank financing costs~~	~~0.32~~	~~0.64~~	~~0.00~~	~~0.06~~	~~2.59~~	~~278,405~~
Δ Log(Bank loans)	0.06	0.55	-0.99	-0.01	1.40	301,086
Short term debt (%)	0.52	0.39	0.00	0.48	1.00	347,397
Interest rate (new loans)	0.08	0.06	0.02	0.06	0.24	160,177
Loan maturity	4.70	1.42	2.20	4.55	7.36	122,464
Number of bank relationships	3.68	2.63	1.00	3.00	26.00	354,113
Collateral (0/1)	0.78	0.41	0.00	1.00	1.00	160,177
Panel C: Other firm variables						
Capex-to-assets	0.10	0.21	0.00	0.00	0.74	413,072
Δ Log(Working Capital)	0.10	0.41	-0.70	0.05	1.08	210,208
Δ Log(Employees)	0.01	0.14	-0.27	0.00	0.32	380,247
Δ Log(Wages)	0.02	0.13	-0.24	0.02	0.29	380,245
Δ Log(Sales)	0.01	0.22	-0.48	0.02	0.45	380,298
Δ Log(Costs)	0.02	0.22	-0.45	0.02	0.46	377,981
Δ Log(Exports)	0.04	0.84	-1.79	0.04	1.90	153,190

Note: This table shows the summary statistics for the full sample of firms. Leverage is defined as equity over assets. Bank financing costs are defined as total interest expense during year *t* divided by average total bank loans in years *t-1* and *t*. Short-term debt is reported as percentage of total debt. Interest rate on new loans, loan maturity and collateral are computed with information available only from mid-2012 onwards.

Table 2: Certification awards per year

Year	Leader	Leader eligible non-rated	Excellence	Excellence eligible non-rated	Non-eligible	Take up	Obs
2008	2,612	12,889	0	0	24,599	16.9%	40,100
2009	4,443	18,241	324	2,619	12,980	18.6%	38,607
2010	4,992	17,090	932	1,552	13,394	24.1%	37,960
2011	4,768	7,948	1,238	1,490	20,771	38.9%	36,215
2012	6,201	5,488	1,091	924	19,413	53.2%	33,117
2013	5,276	2,588	913	486	22,273	66.8%	31,536
2014	5,422	3,428	1,562	788	20,547	62.4%	31,747
2015	5,080	3,493	1,277	1,198	21,943	57.5%	32,991
2016	4,615	2,545	1,471	341	25,098	67.8%	34,070
2017	4,489	2,614	1,459	434	26,179	66.1%	35,175
2018	4,819	3,121	1,766	578	25,653	64.0%	35,937
Obs	52,717	79,445	12,033	10,410	232,850	41.9%	427,493

Note: This table shows the number of awards of "Leader" and "Excellence" certifications in each year of the program. It also shows the number of firms in each year that meet the criterion for "Leader" certification and are not certified ("Leader eligible non-rated"), and the number of firms in each year that meet the criterion for "Excellence" certification and are not certified ("Excellence eligible non-rated"). All firms not included in these four categories are classified as non-eligible. Take up corresponds to the percentage of firms that are eligible to the program and are certified.

Table 3: Bank financing costs and bank loans (balance sheet data)

Intention to treat (ITT) – RD regressions

	Bank financing costs			ΔLog(Bank loans)			Short-term debt (%)		
	T	T+1	T+2	T	T+1	T+2	T	T+1	T+2
Panel A: Period 2008-2013									
Eligible	-0.026***	-0.047***	-0.027***	0.083***	0.079***	-0.029***	0.018***	-0.003	0.037***
	[-3.499]	[-6.122]	[-3.120]	[8.056]	[9.704]	[-2.781]	[3.233]	[-0.593]	[6.738]
Obs	162,869	141,950	125,708	139,814	128,095	118,320	146,412	134,559	126,892
Bandw.	0.202	0.212	0.195	0.084	0.173	0.108	0.169	0.279	0.197
Panel B: Period 2014-2018									
Eligible	0.005	-0.055***	-0.047***	0.020*	0.027**	0.026*	0.017*	-0.001	0.009
	[0.510]	[-3.671]	[-2.919]	[1.769]	[2.205]	[1.773]	[1.845]	[-0.144]	[0.899]
Obs	85,789	59,067	36,688	109,104	78,628	53,955	110,614	80,328	55,887
Bandw.	0.0937	0.0664	0.0783	0.0640	0.0733	0.0728	0.0436	0.0515	0.0695

Note: This table shows intention to treat estimates for the impact of firm certification as Leader/Excellence on the cost of debt financing (columns (1)-(3)), growth in bank loans (columns (4)-(6)) and proportion of short-term debt on total debt using financial statements data (columns (7)-(9)). Bank financing costs are defined as total interest expense during year *t* divided by average total bank loans in years *t-1* and *t*. Panel A reports results for the period 2008-2013 and Panel B reports results for the period 2014-2018. All regressions include a polynomial order of 2. Columns (1), (4), and (7) show estimates where the dependent variable is observed at the year of award, columns (2), (5), and (8) one year after the award and columns (3), (6), and (9), two years after the award.

Table 4

Impact on other financing conditions (loan flow data)

Intention to treat (ITT) – RD regressions

	Interest rate (new loans)			Loan maturity			Number of bank relationships			Collateral (0/1)		
	T	T+1	T+2	T	T+1	T+2	T	T+1	T+2	T	T+1	T+2
Panel A: Period 2012-2013												
Eligible	-0.020***	-0.021***	-0.018***	-0.333***	-0.202***	-0.015	0.878***	0.946***	0.961***	0.099***	0.096***	0.077***
	[-8.818]	[-10.849]	[-15.435]	[-4.912]	[-3.897]	[-0.438]	[22.048]	[21.080]	[19.853]	[6.952]	[11.723]	[0.570]
Obs	36,192	51.04	65.804	26,835	36,192	87,577	166,240	36,192	26,835	36,192	51,040	65,804
Bandw.	0.067	0.058	0.188	0.061	0.063	0.147	0.0917	0.0882	0.0848	0.09	0.087	0.197
Panel B: Period 2014-2018												
Eligible	0.001	-0.001	-0.004***	-0.265***	-0.179***	-0.153**	0.953***	1.046***	1.054***	0.051***	0.043***	0.061***
	[0.570]	[-0.998]	[-2.705]	[-4.867]	[-3.145]	[-2.506]	[11.723]	[11.839]	[11.399]	[4.381]	[3.805]	[4.356]
Obs	87,223	63.772	65.804	68,416	50,179	34,272	87,577	60,427	37,979	87,223	63,772	44,095
Bandw.	0.0476	0.038	0.053	0.0313	0.0370	0.0476	0.029	0.0326	0.0458	0.09	0.087	0.197

Note: This table shows intention to treat estimates for the impact of firm certification as Leader/Excellence on loan interest rates (columns (1)-(3)), loan maturity (columns (4)-(6), number of bank relationships (columns (7)-(9)), and collateral (columns (10)-(12)). Interest rate on new loans, loan maturity and collateral are computed with information available only from mid-2012 onwards. Panel A reports results for the period 2008-2013 and Panel B reports results for the period 2014-2018. All regressions include polynomial order of 2. Columns (1), (4), (7), and (10) show estimates where the dependent variable is observed at the year of award, columns (2), (5), (8), and (11) one year after the award and columns (3), (6), (9), and (12) two years after the award.

Table 5

Fixed capital and working capital investment

Intention to treat (ITT) – RD regressions

	CAPEX			Δ Log(Working Capital)		
	T	T+1	T+2	T	T+1	T+2
Panel B: Period 2008-2013						
Eligible	0.059***	-0.035***	0.006***	0.053***	0.072***	-0.046***
	[19.620]	[-12.419]	[10.296]	[5.546]	[10.053]	[-5.794]
Observations	180,173	157,183	142,061	83,357	88,287	92,495
Bandwidth	0.089	0.072	0.150	0.066	0.139	0.134
Panel B: Period 2014-2018						
Eligible	0.003***	0.004***	0.005***	0.018**	0.008	0.015*
	[3.501]	[4.608]	[4.970]	[2.361]	[1.264]	[1.893]
Observations	119,707	88,415	62,581	95,335	69,296	47,858
Bandwidth	0.0532	0.0693	0.081	0.052	0.085	0.079

Note: This table shows intention to treat estimates for the impact of firm certification as Leader/Excellence on CAPEX (columns (1)-(3)) and growth in working capital (columns (4)-(6)). Capex is defined as capital expenditure over total assets. Panel A reports results for the period 2008-2013 and Panel B reports results for the period 2014-2018. All regressions include polynomial order of 2. Columns (1) and (4) show estimates where the dependent variable is observed at the year of award, columns (2) and (5) one year after the award and columns (3) and (6) two years after the award.

Table 6
Employment and wages
Intention to treat (ITT) – RD regressions

	Δ Log(employees)			Δ Log(Wages)		
	T	T+1	T+2	T	T+1	T+2
Panel B: Period 2008-2013						
Eligible	0.004**	0.010***	-0.008***	0.003*	0.003**	-0.003*
	[2.444]	[6.053]	[-4.501]	[1.691]	[1.999]	[-1.895]
Observations	180,180	157,183	139,855	180,178	157,183	139,855
Bandwidth	0.201	0.243	0.243	0.054	0.058	0.065
Panel B: Period 2014-2018						
Eligible	0.005**	0.007**	0.004	-0.003	-0.002	-0.001
	[1.963]	[2.566]	[1.379]	[-1.267]	[-1.020]	[-0.573]
Observations	119,707	88,415	61,946	119,707	88,415	61,946
Bandwidth	0.055	0.076	0.057	0.042	0.046	0.051

Note: This table shows intention to treat estimates for the impact of firm certification as Leader/Excellence on employment growth (columns (1)-(3)) and wage growth (columns (4)-(6)). Panel A reports results for the period 2008-2013 and Panel B reports results for the period 2014-2018. All regressions include polynomial order of 2. Columns (1) and (4) show estimates where the dependent variable is observed at the year of award, columns (2) and (5) one year after the award and columns (3) and (6) two years after the award.

Table 7
Growth
Intention to treat (ITT) – RD regressions

	Δ Log(Sales)			Δ Log(Costs)			Δ Log(Exports)			Ebitda		
	T	T+1	T+2	T	T+1	T+2	T	T+1	T+2	T	T+1	T+2
Panel A: Period 2008-2013												
Eligible	0.001	0.006**	-0.020***	-0.001	0.009***	-0.019***	-0.004	0.051***	0.050***	0.007***	0.005***	-0.002
	[0.495]	[2.216]	[-5.789]	[-0.488]	[3.441]	[-5.717]	[-0.262]	[3.237]	[2.961]	[4.464]	[3.308]	[-1.585]
Observations	157,183	139,855	179,193	156,257	138,957	138,957	66,401	62,294	59,181	180,180	157,183	142,061
Bandwidth	0.252	0.264	0.120	0.201	0.223	0.139	0.300	0.344	0.297	0.086	0.144	0.191
Panel B: Period 2014-2018												
Eligible dummy	0.000	0.000	-0.014***	-0.006*	-0.002	-0.013***	0.024	0.017	-0.071**	-0.009***	-0.004*	-0.005*
	[0.109]	[0.029]	[-2.968]	[-1.821]	[-0.509]	[-2.794]	[1.297]	[0.720]	[-2.406]	[-3.839]	[-1.647]	[-1.743]
Observations	119,707	88,415	61,953	118,770	87,691	61,429	56,328	42,224	29,771	119,707	88,415	62,581
Bandwidth	0.083	0.061	0.074	0.074	0.087	0.06	0.081	0.072	0.077	0.029	0.034	0.036

Note: This table shows intention to treat estimates for the impact of firm certification as Leader/Excellence on sales growth (columns (1)-(3)), cost growth (columns (4)-(6)), exports growth (columns (7)-(9)), and Ebitda (columns (10)-(12)). Panel A reports results for the period 2008-2013 and Panel B reports results for the period 2014-2018. All regressions include a polynomial order of 2. Columns (1), (4), (7), and (10) show estimates where the dependent variable is observed at the year of award, columns (2), (5), (8), and (11) one year after the award and columns (3), (6), (9), and (12) two years after the award.

Table 8

Credit certification

Average Treatment Effect on the Treated- RD Regressions

	Financing						Growth					
	Bank financing costs		Δ Log(Bank loans)		Short-term debt (%)		Δ Log(Sales)		Δ Log(Exports)		Ebitda	
	T	T+1	T	T+1	T	T+1	T	T+1	T	T+1	T	T+1
Panel B: Period 2009-2013												
Excellence	-0.026	-0.014	-0.081**	-0.090***	0.01	0.003	0.009	-0.014	0.149*	0.077	0.006	0.001
	[-1.023]	[-0.431]	[-2.015]	[-2.704]	[0.418]	[0.116]	[0.784]	[-1.269]	[1.819]	[1.185]	[1.069]	[0.091]
Obs	23,416	22,374	22,128	21,614	22,691	22,035	23,906	22,935	14,227	14,352	23,906	22,935
Bandwidth	0.285	0.208	0.221	0.282	0.232	0.216	0.280	0.277	0.157	0.245	0.151	0.148
Panel B: Period 2009-2018												
Excellence	-0.002	0.014	0.010	0.003	-0.030***	-0.017*	0.023***	0.015***	-0.011	0.059**	0.024***	0.021***
	[-0.212]	[1.163]	[0.751]	[0.230]	[-3.074]	[-1.885]	[5.171]	[2.955]	[-0.589]	[2.546]	[12.703]	[10.036]
Obs	45,809	39,164	48,988	42,801	49,796	43,532	52,321	45,676	32,663	29,235	52,321	45,676
Bandwidth	0.274	0.314	0.320	0.315	0.152	0.33	0.108	0.125	0.300	0.215	0.114	0.166

Note: This table shows regression discontinuity estimates for the differential impact of firm certification as Excellence when compared to Leader on bank financing costs (columns (1)-(2)), loan growth (columns (3)-(4)), short-term debt (columns (5)-(6)), sales growth (columns (7)-(8)), exports growth (columns (9)-(10)), and Ebitda (columns (11)-(12)). Bank financing costs are defined as total interest expense during year *t* divided by average total bank loans in years *t-1* and *t.* Panel A reports results for the period 2008-2013 and Panel B reports results for the period 2014-2018. All regressions include a polynomial order of

2. Columns (1), (3), (5), (7), (9), and (11) show estimates where the dependent variable is observed at the year of award, columns (2), (4), (6), (8), (10), and (12) one year after the award.

Table 9

Financing, Investment and Growth

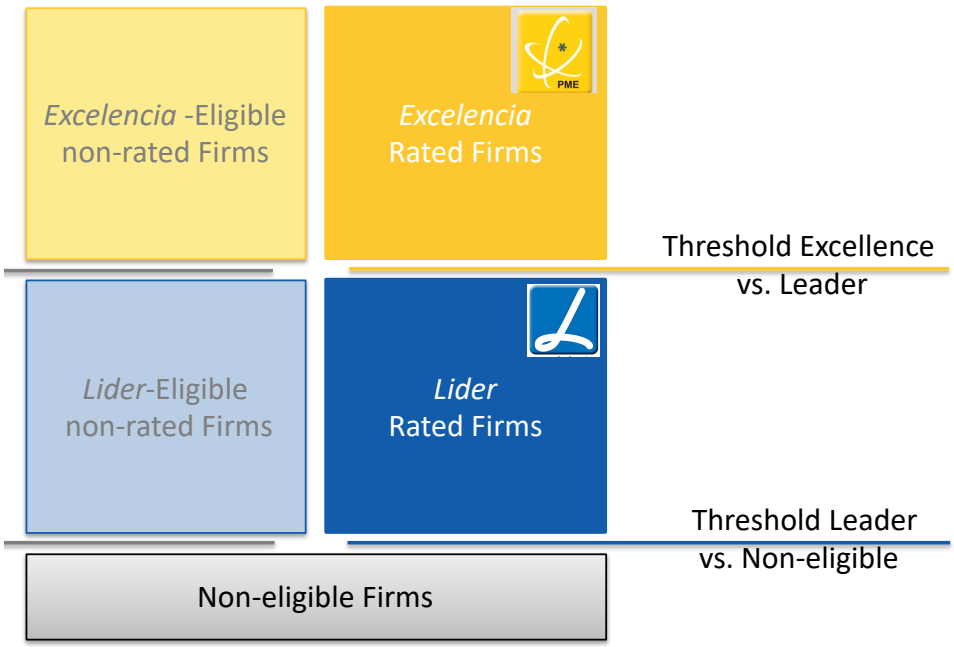
Intention to treat - Firm fixed effects regressions

	Financing		Investment		Growth	
	Bank financing costs	Δ Log(Bank loans)	CAPEX	Δ Log(Working Capital)	Δ Log(Sales)	Δ Log(Exports)
Panel B: Period 2008-2018						
Eligible	-0.002***	0.072***	-0.000	0.018***	0.011***	0.027***
	[-6.222]	[24.249]	[-0.894]	[7.927]	[10.892]	[4.247]
Observations	144,233	275,567	341,260	201,344	341,268	140,673
R-squared	0.143	0.087	0.693	0.219	0.113	0.019

Note: This table shows firm fixed effects estimates for the effect of being eligible to the program on bank financing costs (columns (1)), loan growth (columns (2)), capex(column (3)), working capital growth (column (4), sales growth (columns (5), and exports growth (columns (6). Bank financing costs are defined as total interest expense during year *t* divided by average total bank loans in years *t-1* and *t.* All regressions include year dummies and the following covariates: firm size, firm leverage, profitability and firm age.

Figure 1

Firm categories



Note: This figure illustrates the 5 categories of firms in our sample, as well as the cut-offs between different categories.

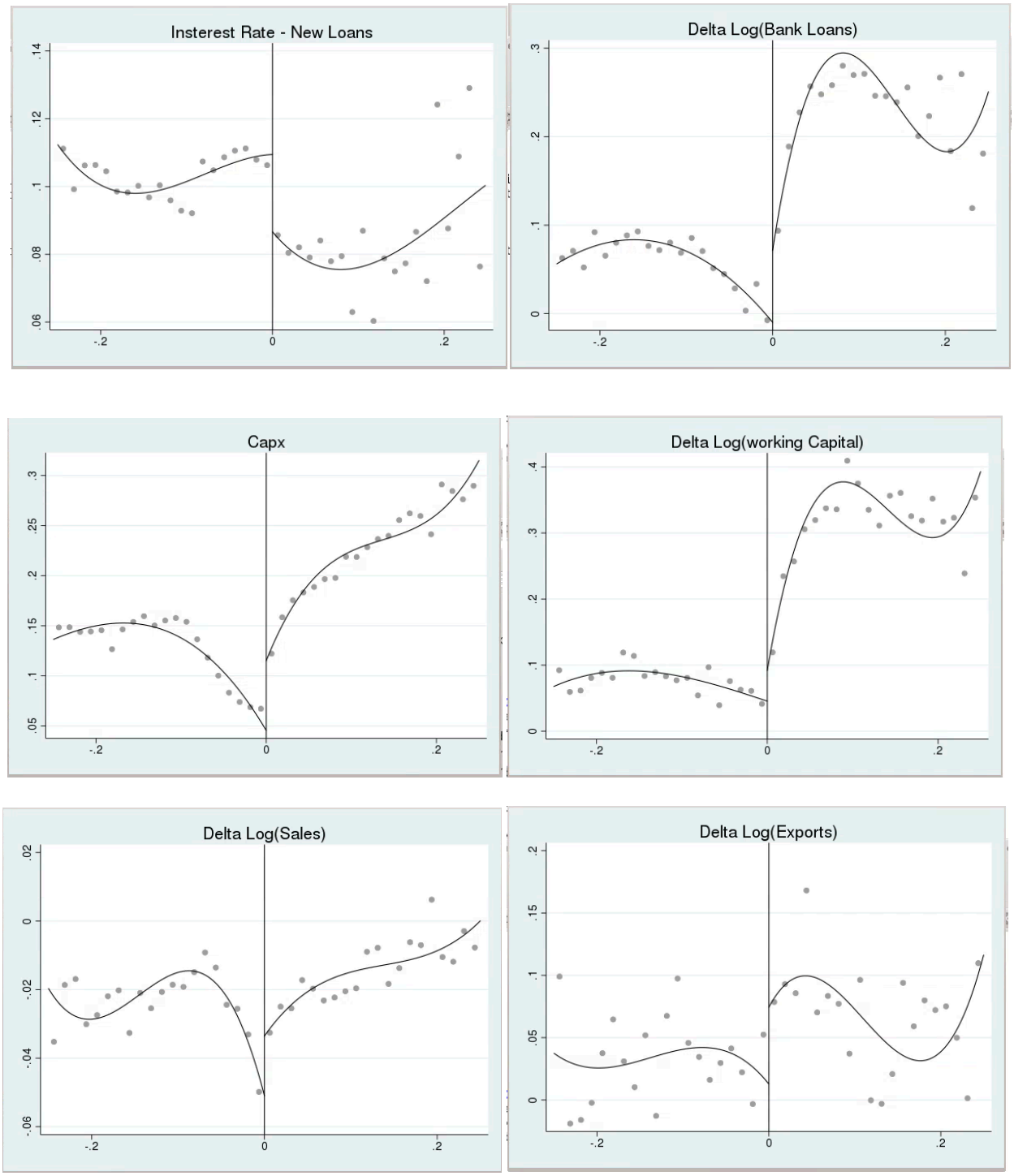
Figure 2

Program Criteria

PME Líder 2012		PME Excelência 2012
Soft criteria	a) SME certified (online application) b) 3 complete financial years (2009, 2010, 2011) c) top 3 ratings with the sponsor bank - standardoized by Sistema Nacional de Garantia Mútua (ratings AAA, AA e A). d) Regular situation with Tax authorities, social security, IAPMEI/ TurismodePortugal	
Financials criteria	1.Net Income > 0 2. Positive EBITDA growth* OR Positive sales growth 3.Equity/Assets>=20% 4.Sales>= 500 000 euros in 2011 5. Number of employees >= 5	1. Top 2 ratings in Sistema de Garantia Mútua (AAA e AA) in 2011 2. meet 4 out of the folowing criteria: a) to d) a) Equity/Assets>= 35% (30%) b) Dales growth >= 5% from 2010 to 2011 (-5%) c) Net income/Equity>=10% (8%) d) Net income/Assets >= 3% Relaxed expost: **1 out of 3 criteria a), b), c)** can be relaxed to above levels in red
PME Líder 2013		**PME Excelência 2013**
Soft criteria	a) SME certified (online application) b) 3 complete financial years (2010, 2011, 2012) c) top 3 ratings with the sponsor bank - standardoized by Sistema Nacional de Garantia Mútua (ratings AAA, AA e A). d) Regular situation with Tax authorities, social security, IAPMEI/ TurismodePortugal	
Financials criteria	1.Net Income > 0 Or Positive EBITDA growth, with positive ebitda in two consecutive years (2011 2012) OR Positive sales growth in two consecutive years (2011 and 2012) 3.Equity/Assets>=25% 4.Sales>= 750 000 euros in 2011 5. Number of employees >= 10	1. Top 2 ratings in Sistema de Garantia Mútua (AAA e AA) in 2011 2. meet 4 out of the folowing criteria: a) to d) a) Equity/Assets>= 35% (30%) b) Dales growth >= 5% from 2010 to 2011 (-5%) c) Net income/Equity>=10% (8%) d) Net income/Assets >= 3% Relaxed expost: **1 out of 3 criteria a), b), c)** can be relaxed to above levels in red

Note: This figure shows the criteria to be eligible to the program as Leader firm and Excellence firm in 2012 and 2013.

Figure 3. RD Plots



Note: This figure shows RD plots for firm-level outcomes. The bandwidth is fixed at -0.25 to +0.25 for all variables. The order of the polynomial used is 3.

Appendix

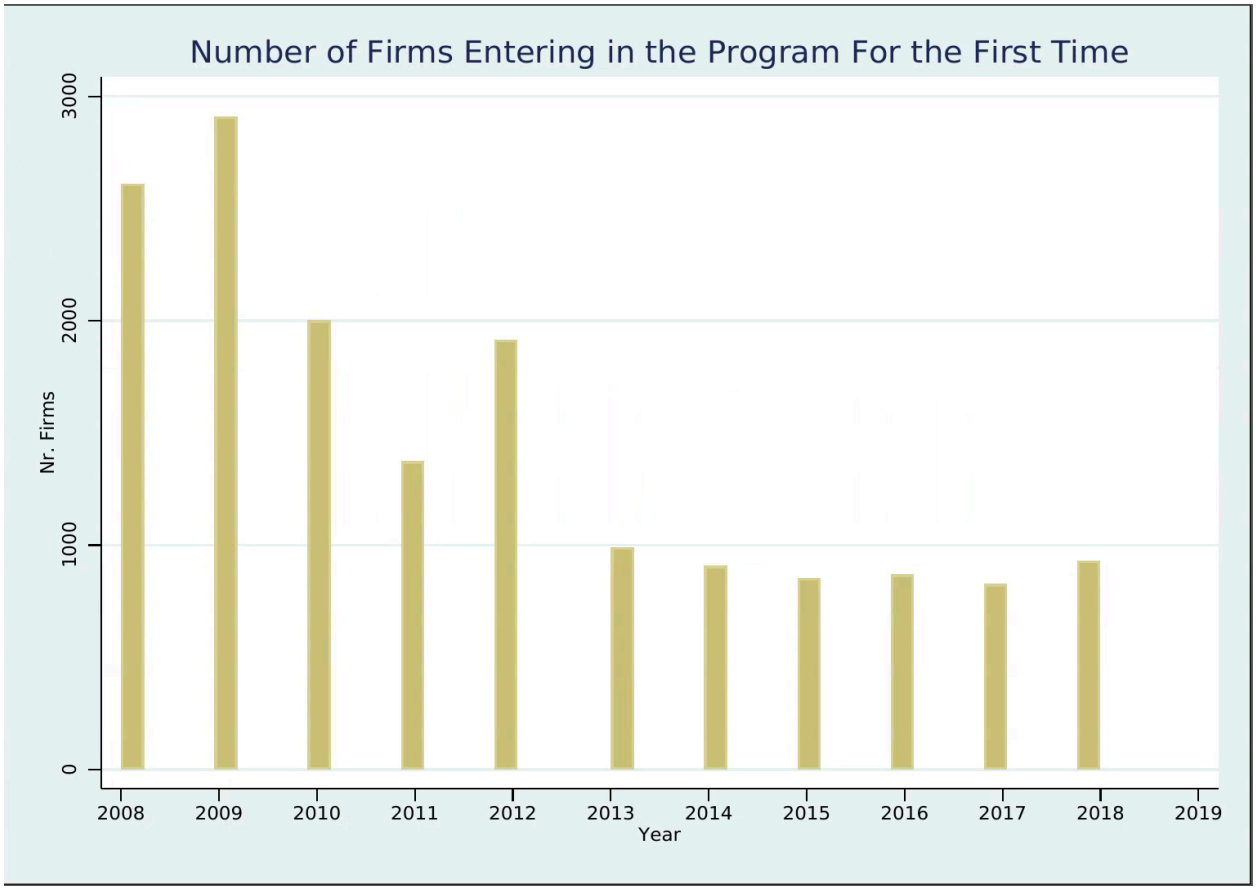
Table A1. Summary Statistics by Firm Category

	Leader	Leader eligible	Excellence	Excellence eligible	Non-eligible
Panel A: Criteria					
Assets	4,543,207	3,337,189	4,716,284	3,507,112	5,588,838
Employees	39.38	31.92	42.85	34.64	28.24
Sales	4,966,029	3,590,035	5,525,464	4,253,886	3,031,093
Net income	149,075	167,720	408,126	386,910	57,182
Ebitda	399,754.90	375,836.20	714,560.40	649,569.70	264,305.70
Net income-to-assets	0.03	0.04	0.08	0.08	0.00
Net income-to-equity	0.07	0.09	0.14	0.18	0.09
Leverage	0.46	0.44	0.57	0.55	0.25
Ebitda-to-assets	0.09	0.11	0.15	0.17	0.06
Ebitda-to-sales	0.09	0.10	0.13	0.13	0.05
Debt-to-ebitda	3.34	2.50	1.65	1.19	3.23
Sales growth	0.04	0.01	0.05	0.01	0.03
Ebitda growth	0.07	-0.05	0.06	-0.10	0.78
Panel B: Debt and cost of debt:					
Bank financing costs	0.20	0.29	0.21	0.25	0.36
Δ Log(Bank loans)	0.05	0.13	0.03	0.12	0.01
Short term debt (%)	0.45	0.56	0.40	0.54	0.49
Interest rate (new loans)	0.06	0.07	0.05	0.07	0.09
Loan maturity	4.59	4.96	5.05	5.04	4.58
Number of bank relationships	5.17	3.55	4.04	2.97	3.70
Collateral (0/1)	0.87	0.75	0.80	0.71	0.79
Panel C: Other firm variables					
Capex-to-assets	0.04	0.17	0.03	0.11	0.07
Δ Log(Working Capital)	0.09	0.17	0.13	0.19	0.05
Δ Log(employees)	0.02	0.01	0.04	0.03	0.00
Δ Log(Wages)	0.02	0.02	0.02	0.02	0.02
Δ Log(Sales)	0.01	-0.02	0.03	-0.02	0.00
Δ Log(Costs)	0.02	0.00	0.04	0.01	0.00

Δ Log(Exports)	0.05	0.02	0.08	0.01	0.02

Note: This table shows the summary statistics for subsamples of firms. Besides Leader and Excellence firms, the table also reports summary statistics for firms that meet the criterion for "Leader" certification and are not certified ("Leader eligible"), and firms that meet the criterion for "Excellence" certification and are not certified ("Excellence eligible"). All firms not included in these four categories are classified as non-eligible. Leverage is defined as equity over assets. Bank financing costs are defined as total interest expense during year *t* divided by average total bank loans in years *t-1* and *t*. Short-term debt is reported as percentage of total debt. Interest rate on new loans, loan maturity and collateral are computed with information available only from mid-2012 onwards.

Figure A1. First-time certified firms



Note: This figure shows the number of firms certified as *Leader/Excellence*