



WORKING PAPER 2019:01 | Anders Gustafsson | Andreas Stephan

Does the countryside lack cash (funding)?

The impact of public bank loans on firm growth and its dependence on location

INCREASING THE AMOUNT OF CREDIT available via public bank loans to firms, can increase economic growth, but the results might depend on where the firm is located. Currently, there is limited knowledge of where additional credit creates the most economic growth. This study finds larger effects from public bank loans to firms in urban areas compared to rural areas, suggesting that firms in urban areas have a larger growth potential.

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Does the countryside lack funding? The impact of public small business loans on firm growth and its dependence on location

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Abstract

We investigate whether public policies that aim to reduce credit constraints for small and medium-sized enterprises (SMEs) have different impacts on firms located in different types of regions. Using loan data from the state-owned Swedish bank Almi and combining coarsened exact matching with difference-in-difference regressions, we find positive but heterogeneous effects of loans on firm growth. Firms in urban regions are found to be less credit-constrained compared to firms located in other regions. However, the impact from receiving a public loan on firm growth is stronger for SMEs residing in major cities compared to firms in other regions. These results have important implications, suggesting that an evaluation of policies that are targeted to reduce credit constraints should take firm location into account.

Keywords: Credit constraints, Public policy, State-owned banks, SMEs, CEM, Matching, Causal treatment effect evaluation, Regional policy

JEL: L52, O38, H81, L26, G28

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1 Introduction

Among scholars and policymakers, there is a large and growing interest in how firms, and especially small and medium-sized enterprises (SMEs), can obtain sufficient funding. SMEs are generally viewed as vital for economic growth, both for creating new jobs and for innovation (Soete and Stephan, 2004). At the same time, SMEs are presumed to suffer from credit constraints, as they often do not possess sufficient collateral or large cash flows and do not have a long credit history. Furthermore, SMEs do not have access to financial markets to the same extent as larger corporations (Rajan and Zingales, 1998; Aghion et al., 2007). The existence and overall importance of funding constraints for SMEs has been subjected to a great deal of recent research (Brown and Earle, 2017; Howell, 2017; Kaya and Masetti, 2019).

In Sweden, loans from the state-owned bank Almi are supposed to complement loans from commercial banks by lending with less strict requirements on collateral, thereby enabling those firms to have access to debt finance. In most cases, but not always, the firm that borrows from Almi also has a joint commercial loan. Almi charges a higher interest rate than the commercial bank and can therefore be viewed as a provider of the uncollateralized “high risk part” of business loans. The argument for the existence of such support is that commercial banks are reluctant to give loans to SMEs because of the involved high risk and the high fixed costs of providing this financial service for relatively small loan amounts.

The question of whether the credit constraints of firms vary over regions has not received much attention in previous studies. According to textbook models, if credit markets are perfect without frictions, all positive net present value projects will receive funding. However, there are several reasons why access to credit could be more difficult for firms in rural regions compared to those in urban regions. As has been documented in a previous study by Backman and Wallin (2018), for Sweden, the reduction in regional bank offices has reduced the scope for relationship banking, which is hypothesized to have negative effects on the possibility of SMEs obtaining loans.

The contribution of this paper to the literature is twofold. First, it provides evidence on the effects of obtaining a public loan on SME growth. As mentioned above, these public loans are not directly subsidized but entail even higher interest rates compared commercial loans¹. This result is justified by the high risk of these loans with less strict requirements for collateral than a commercial bank and, particularly, since start-ups have high failure rates. Second, we analyze whether those effects – if they exist – depend on the type of region

¹They are however subsidized to the extent that Almi is not a profitable corporation but requires government funding to cover their costs.

where the firm resides. We hypothesize that public bank loans should have stronger effects in remote rural regions where access to local banks is generally more difficult for SMEs than in more densely populated regions. Similarly, firms in urban regions should face reduced constraints, as access to financial services is easier, and firms therefore do not have to rely on a few local banks as much as firms in remote regions have to do.

We use information on loans from the state-owned Swedish bank Almi in combination with registry data on all Swedish firms. Since Almi has 40 offices spread over Sweden and lends to firms that are located in all municipalities, we have sufficient data to estimate the treatment effect depending on the location of the treated firm, something that – to the best of our knowledge – previous studies have not been able to do. Using a combination of matching and difference-in-difference regressions to reduce selection bias, we study how several performance measures of firms are affected by receiving a bank loan, where the region type of the municipality in which the firm is located is assumed to be a moderating effect, modeled by using interaction terms. We also distinguish the effects from public loans on start-ups (new firms) and those on established SMEs (old firms). The former group is expected to be more constrained than the latter.

The econometric findings show that location of firms plays a decisive role both for the likelihood of being credit constrained and for the relationship between bank loans and firm growth. Overall, we find that firms in major cities are less credit-constrained, in the sense that they are less likely to have an Almi loan. However, the effect of receiving a public loan on firm growth despite its high interest rate cost is more significant in urban regions than in less densely populated regions, which might be due to better growth opportunities for firms in major cities compared to firms in other types of regions.

The remainder of this paper is organized as follows. Section 2 summarizes the literature on regional variation of credit constraints. Section 3 provides some background on public loans and the governmental bank Almi. Section 4 describes the empirical strategy, data and results. Section 5 concludes.

2 Regional variation of credit constraints for SMEs

The literature regarding credit constraints for SMEs is both large and heterogeneous. Due to asymmetric information, it is not obvious that credit markets should work perfectly. Therefore, banks and other creditors will ration credit rather than increase the interest rate (Akerlof, 1970; de Meza and Webb, 2000; Stiglitz and Weiss, 1981). Problems related to asymmetric information should be even larger for SMEs than for larger firms, since SMEs often lack collateral or a credit history, which can otherwise reduce the asymmetric informa-

tion problem. SMEs are often dependent on bank loans since they are unable to access bond or equity markets. While studies on venture capital often find significant positive effects on firm growth (Gompers and Lerner, 2001; Kaplan and Stromberg, 2001; Schäfer et al., 2004), only a select number of high-potential firms receive venture capital. Many firms also avoid venture capital since it forces them to relinquish control of the firm (Bornhäll et al., 2016).

Observing funding gaps is difficult since it involves a counterfactual question regarding how firms would develop if they had access to sufficient amounts of capital. Since studies seldom have information on the (expected) profitability of an investment opportunity, it is difficult to know why the firm did not choose to invest. Without knowing if there are profitable opportunities for a firm, it is impossible to know if its lack of investment is due to lack of credit or due to lack of possibilities. Furthermore, it is difficult to know the profitability of an investment opportunity *ex ante*, given that such investment is performed under genuine (Knightian) uncertainty (Knight, 1921).

One way SMEs can increase their access to credit is by building a long-term relationship with their main business bank, called relationship banking, which reduces asymmetric information between the firm and the bank (Berger and Udell, 2002). This increases trust and lowers the asymmetric information that is prevalent in a borrower-lender situation. Since this requires the firm to visit their bank in order to discuss their projects, a firm that is located far away from a bank might have less access to finance than a firm that is located nearby. Not only will transportation costs be higher, but the bank might also have less information regarding the quality of the entrepreneur, the local business opportunities, the regional supply of labor, etc., which in turn suggests that firms in more peripheral regions should be more credit-constrained than those in urban areas. If a local bank has market power, it can use this market power to decrease the amount of lending in order to increase its profits (Canales and Nanda, 2012; Ryan et al., 2014).

A competing hypothesis is that banking markets actually work better in rural areas than in urban regions. In rural regions, it is easier for banks to collect important “soft” information of the quality of the entrepreneur via social networks (Silver, 2001). In cities, entrepreneurs are more anonymous, and it is more difficult for a bank to assess the creditworthiness all of their customers. If this is the case, then firms might have larger funding gaps in urban regions compared to firms in other regions.

Many banks have introduced credit scoring to determine the creditworthiness of SMEs. While this might decrease the scope of relationship banking, some studies find that the introduction of credit scoring is associated with an increase in SME lending (Berger, Frame and Miller, 2005; DeYoung et al., 2008). Larger banks seem to be associated with less relationship banking and do not relieve SMEs’ credit constraints as much as smaller banks

do (Stein, 2002; Berger, Miller, Petersen, Rajan and Stein, 2005). Firms that are located far away from a bank office seems to lack credit when general credit conditions are stricter (Granja et al., 2018).

One aspect of relationship banking is that when the firm's major bank fails in dire times, it might be difficult for a firm to switch to a new bank (Greenstone et al., 2014). This creates a lock-in effect, which can amplify a financial downturn but could also ensure that banks keep lending in a downturn (DeYoung et al., 2015). It can also increase the difficulties a firm faces if their local bank office closes.

With regard to identifying the effects of public loans on firm growth, a complication that arises is that urban areas tend to have higher growth rates than less dense regions (Glaeser et al., 1992; Glaeser and Mare, 2001; Stephan, 2011). This result creates a confounding problem since lower firm growth in less dense areas might be due to having funding gaps or due to the lack of growth opportunities. Put differently, the more efficient the credit markets for SMEs are, the less important firm location should be for obtaining loans (Klagge and Martin, 2005; Klagge et al., 2017). If credit markets work perfectly, no project that would generate a positive expected risk-adjusted return would go unfunded regardless of firm location. The less efficient the credits markets are, and the larger the frictions created by asymmetric information, the more important the spatial component may become. An investigation of the regional effects of public bank loans can therefore be viewed as an indirect test of the efficiency of the capital markets. If there is no evidence of regional differences in the effects of public bank loans on firm growth, this could be an indication that the credit markets are somewhat efficient and that local knowledge cannot be too important for credit allocation. The exact extent of geographical importance in finance is debated, with, e.g., Petersen and Rajan (2002) arguing that it is of limited importance, while, e.g., Klagge and Martin (2005) argue that it is of great importance. A firm that is located far away from a bank headquarters, but close to a branch, might still have less access to credit than a firm that is located closer to the bank's headquarters (Zhao and Jones-Evans, 2017).

Using a theoretical model, (Hainz and Hakenes, 2012) show that subsidies through banks entail higher social welfare than granting direct subsidies to firms. However, government ownership of banks might be associated with several political risks, possibly reducing the effectiveness in reducing credit constraints. When governments are responsible for loan decisions, it becomes tempting to allocate credit based not on market decisions but on political grounds, as suggested by studies in both developed and developing countries, as well as cross-sectional studies (La Porta et al., 2002; Carvalho, 2014; Haselmann et al., 2018).

3 Public support for debt financing of SMEs in Sweden

Like most other OECD countries, Sweden has an extensive, but somewhat fragmented, system to promote SMEs and reduce their lack of credit (OECD, 2016). This involves both direct grants to firms, governmental venture capital and direct bank loans via Almi. Almi's goal is to complement the commercial bank market by lending directly to SMEs. Most of the time, but not always, the firm that borrows from Almi also has a joint commercial loan (the share of commercial to Almi loans is plotted in Figure 10). Almi charges a higher interest rate than commercial banks but does not require collateral to the same extent. Almi can therefore be viewed as a provider of high-risk business loans.

While several other countries have publicly sponsored bank loans, in most countries, these are credit guarantees to private banks rather than public banks per se. For example, in the U.S., the Small Business Administration guarantees loans to private banks (Brown and Earle, 2017), and in Germany, Kreditanstalt für Wiederaufbau (KfW) fulfills a similar role (Lehmann et al., 2004). Likewise, in the UK, the Small Firms Loan Guarantee Scheme promotes access to debt finance for small credit-constrained firms (Cowling, 2010). Almi instead takes a more direct approach. With 40 offices spread over the country, Almi provides both loans in conjunction with private banks and by themselves. They also provide guidance to firms who may or may not have also received a loan².

The spatial distribution of Almi branches across all Swedish regions is not a coincidence but instead an important part of its mission to ensure that all regions in Sweden have access to funding. This ensures that one can analyze Almi's lending for firms located in different types of regions since there are firms in both urban and rural areas that receive Almi loans. Almi uses the same rules for allocating loans regardless of firm location, which ensures that firms that are assessed to be eligible for public loans should be similar across locations. However, since more firms are located in major cities, more loans are granted to firms in major cities and firms located close to major cities overall (the distribution of loans per region is plotted in Figure 12).

²For a longer discussion on the structure and general efficiency of Almi, see, e.g., ITPS (2002) and Gustafsson (2018).

4 Empirical strategy, data, and results

Matching the data from Almi provided by Growth Analysis³ with registry employer-employee data from Statistics Sweden (SCB) creates a panel of all firms in Sweden⁴. This panel covers Almi loans for the years 2000-2010⁵ and firm register data for the years 1997-2013. This means that a firm that receives its loan in the year 2000 can be observed 3 years prior to the loan and 13 years afterward. A firm that receives its loan in 2010 can be observed for 3 years over the posttreatment period. Most of the firms are not listed on any stock exchange, which increases the likelihood that they are facing funding constraints (Saunders and Steffen, 2011). The summary statistics for the firms can be found in Table 1-3.

To investigate regional differences in the effects of public loans, we apply a classification developed by the The Swedish Agency for Economic and Regional Growth (SAERG), which defines region types that encompasses all of Sweden’s 290 municipalities into 6 different types. The main criterion of classification is spatial density, and all municipalities are categorized into different types ranging from “Major Cities” to “Countryside municipalities very far away from major city”, with a descending density order. For a full description of the methodology, see Table 18 in the Appendix.

Table 1: Summary statistics

	Observations	Mean	Median	Std. Dev.	Min	Max
Loan from Almi = 0						
No. of employees	2072677	8.7	4	16.8	2	251
Labor cost per emp.	2072677	226	216	140	0	69862
Share high skilled	1942569	23	6	31.4	0	100
Gross investments	2072677	817	38	12769	0	4622739
Net sales	2072677	11153	2868	51501	0	16570062
Capital stock	2072152	25586	2064	638508	0	163182912
Labor productivity	2072677	440	370	1330	-90794	965135
Loan from Almi = 1						
No. of employees	138899	6.3	2	13.6	0	236
Labor cost per emp.	97220	215	213	133	0	9908
Share high skilled	101402	27	11	34.7	0	100
Gross investments	138899	409	18	1820	0	121438
Net sales	138899	7031	1514	20055	0	814600
Capital stock	138697	5982	1532	18501	0	1414773
Labor productivity	97220	365	349	577	-120621	27656

Notes: Summary statistics for firms with and without Almi loans. All variables in 1000-kronor, inflation adjusted. Firm-year observations.

³Formally, The Swedish Agency for Growth Policy Analysis, which is an agency that evaluates and analyses Swedish growth policy.

⁴Firms with industry codes related to agriculture or governmental services are dropped.

⁵Almi underwent a major restructuring of the internal organization in 2011, which resulted in no data being available for that year. Later data are not available at the time of writing.

Table 2: Summary statistics for older firms

	Observations	Mean	Median	Std. Dev.	Min	Max
No. of employees	95632	7.7	2	15.6	0	236
Labor cost per emp.	69739	221	218	136	0	9908
Share high skilled	72097	27	12	33.9	0	100
Gross investments	95632	507	29	2063	0	121438
Net sales	95632	8814	1995	23316	0	814600
Capital stock	95526	7340	1980	21097	0	1414773
Labor productivity	69739	379	360	445	-15175	27656

Notes: Summary statistics for old firms with Almi loans. All variables in 1000-kronor, inflation adjusted. Firm-year observations

Table 3: Summary statistics for newly created firms

	Observations	Mean	Median	Std. Dev.	Min	Max
No. of employees	43329	3.1	1	6.5	0	179
Labor cost per emp.	27515	201	198	124	0	7051
Share high skilled	29347	27	2	36.6	0	100
Gross investments	43329	192	2	1076	0	105443
Net sales	43329	3091	946	8190	0	234505
Capital stock	43233	2978	958	10079	0	697478
Labor productivity	27515	330	320	821	-120621	14319

Notes: Summary statistics for new firms with Almi loans. All variables in 1000-kronor, inflation adjusted. Firm-year observations

4.1 The regional variation of credit constraints

We start by running simple probit regressions on the selection of firms into Almi lending. As Almi loans are expensive for borrowers, we assume that only firms that cannot obtain funding from an alternative source will seek an Almi loan. This assumption enables us to identify which firm types are most constrained⁶. Additionally, from this approach, we can obtain estimates on how financial constraints vary between various firm locations. The regression results in Table 4 show that firms with Almi loans are characterized by high debt levels, low labor productivity and a low capital stock, which is plausible given the assumption that firms that seek Almi loans are more financially constrained. Compared to firms located in major cities, the probability of borrowing from Almi is significantly higher in all other locations. This result implies that firms outside of cities are more credit-constrained. Most constrained are firms in regions far away from major cities.

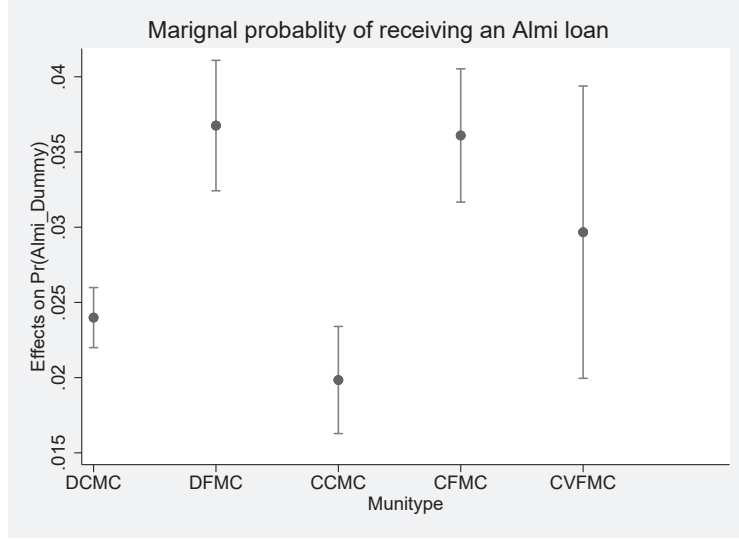
⁶A caveat is that firms in urban areas might have less knowledge about Almi and might therefore not apply for their loans for that reason.

Table 4: Marginal effects on probability of taking an Almi loan

	Old Firms	Old Firms	New Firms
Capital stock (log)	-0.022*** (0.00056)		
Labor productivity (log)		-0.013*** (0.00035)	-0.0061*** (0.00021)
Total debt (log)	0.028*** (0.00061)	0.012*** (0.00029)	0.0045*** (0.00016)
No. of employees (log)	-0.020*** (0.0013)	-0.020*** (0.0013)	-0.027*** (0.00086)
No. of employees squared (log)	0.0036*** (0.00026)	0.0026*** (0.00027)	0.0038*** (0.00016)
Share high skilled	0.00022*** (0.000012)	0.00018*** (0.000012)	0.000063*** (0.0000068)
DCMC	0.013*** (0.00089)	0.013*** (0.00089)	0.0094*** (0.00053)
DFMC	0.019*** (0.0019)	0.018*** (0.0019)	0.015*** (0.0012)
CCMC	0.011*** (0.0015)	0.011*** (0.0015)	0.0043*** (0.00082)
CFMC	0.023*** (0.0020)	0.022*** (0.0019)	0.0092*** (0.0010)
CVFMC	0.019*** (0.0044)	0.018*** (0.0042)	0.0071*** (0.0022)
Observations	2000843	1966737	1621995

Notes: Standard errors in parentheses. Dependent DV = 1 if the firm will ever borrow from Almi. Region types: MC= major city (ref cat), DCMC = dense muni close to major city, DFMC = dense muni far away from MC, CCMC = countryside muni close to MC, CFMC = countryside muni far away from MC, CVFMC = countryside muni very far away from MC. Cluster robust s.e. at firm level. Time, industry and regional fixed effects included. $p < 0.1$, ** $p < 0.05$, and *** $p < 0.01$.

Figure 1: Marginal probability of being credit constraint depending on location



Notes: Marginal effects calculated from the regression in Table 4, reference category: major cities.

4.2 Matching approach

The methodology in this paper consists of using matching and difference-in-difference regressions to control for endogeneity, a well-known method for analyzing SME-financing effects (Saunders and Steffen, 2011; Brown and Earle, 2017) that has also been used in other research (Heckman et al., 1997, 1998; Ho et al., 2007). Unlike most papers that simply control for and eliminate the region-type effects, this paper follows Tingvall and Videnord (2018) in analyzing the treatment effects conditional on firm location and regional characteristics.

Firms that receive a loan from Almi are matched to similar firms that did not receive a loan using coarsened exact matching (CEM) (Iacus et al., 2011, 2012). CEM has been recently proposed as a matching method that uses all the moment conditions of a variable and then coarsens the variable into bins. Firms are then matched on these bins for all the chosen variables. Bin sizes can be set either manually or by using the default algorithm (Blackwell et al., 2009). When matching on categorical variables such as industry code, exact matching is used instead of coarsening the variable to ensure that the treated firms are as similar as possible to the control group. Due to the large sample size, we use a one-to-one matching, meaning that each firm is assigned one similar firm as a control.

It is advisable to match firms the year before they receive their treatment, but since there are firms that receive their loan during the first observation year, this approach is not possible for all firms. We therefore split the treated group into two subgroups: one with firms that receive their bank loan during the first observation year and one with firms that had at least

one observation year before they received their loan. Start-ups are matched the same year that they receive their loan, and old firms are defined as those that existed at least one year before they obtain a loan. While this approach is not optimal, it is the only way to perform a matching if there are not sufficient pretreatment observations. Since approximately half the sample is from newly started firms, the approach outlined above allows us to include these firms in the analysis as well. However, we provide results separately from those for the old firms as a precaution.

Old firms receiving a loan from Almi are matched with nontreated firms based on their number of employees, their debt to capital stock, sales growth and the one-digit industry code and municipality type. Newly started firms are matched on the same variables except sales growth since this variable by definition does not exist for them. The results from the matching show a decrease in the mean imbalance value, meaning that the control group has become more similar to the treated group after matching. Full matching statistics are available in the Appendix in Tables 6-13.

4.3 Difference-in-Difference approach

We run the following regression for all outcome variables:

$$Y_{it} = \alpha_0 + \beta X'_{it} + \theta_i \cdot \eta_i + \delta_i + \gamma_i + \tau_t + \epsilon_{it} \quad (1)$$

where α_0 is the constant, X'_{it} is the vector of control variables described in Table 5; θ_{it} is the posttreatment dummy interacted with the municipality type, η_i ; δ_i are firm fixed effects; τ_t denote year dummies; γ_i denote industry dummies; and ϵ_{it} denotes an error term. The firm-specific fixed effects account for all systematic time-invariant differences between the control and the treatment group.

Based on the marginal effects and plotting the results in Figures 2-9, we find that the treatment effect varies with the municipality type where the treated firm is located⁷

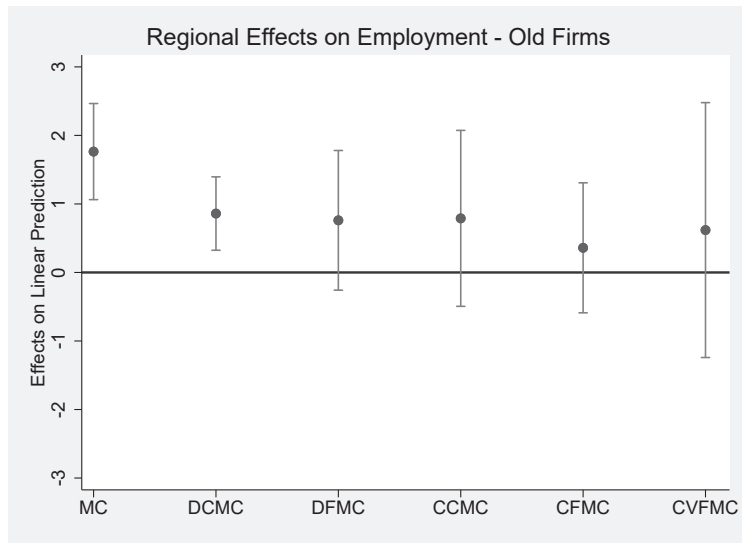
⁷A disadvantage of this method is that time-varying treatment effects are more difficult to obtain, given the limitations of sample size. For this reason, instead of using dummy variables for each year after the firm has received a loan, a single posttreatment dummy is used. While this appears to be a somewhat restrictive assumption to estimate the average effect over the posttreatment period (see Gustafsson et al., 2016, for an alternative approach), it is a necessary assumption due to the regional focus of this study and to keep the analysis tractable. For a discussion on the importance of time-varying treatment effects, see, for instance, Dettmann et al. (2018).

Table 5: Control variables

Variable	Description
Number of employees	
Number of employees squared	
Amount of public (Almi) loan	In real SEK
Size of external finance	In real SEK
Size of own finance	In real SEK
Ratio of public loan to other finance	public loan / (public +external+own funding)
Share of employees with tertiary education	Tertiary/ primary+secondary+tertiary
Industry codes	One digit NACE-code
Municipality type	6 different types of municipalities

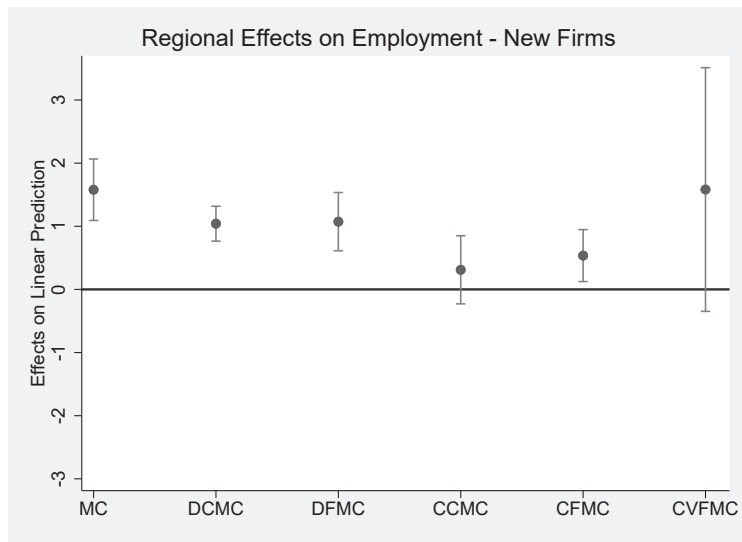
To avoid posttreatment bias, we use a minimum number of control variables in the regressions (King, 2010). For example, controlling for the firms' capital stock in the post-treatment analysis might be problematic since one of the goals of the loan is to increase the capital stock. Therefore, we only control for the share of high-skilled employees, the number of employees, and the number of employees squared in addition to the posttreatment dummies.

Figure 2: Effect of Almi loan on number of employees for old firms interacted with region type



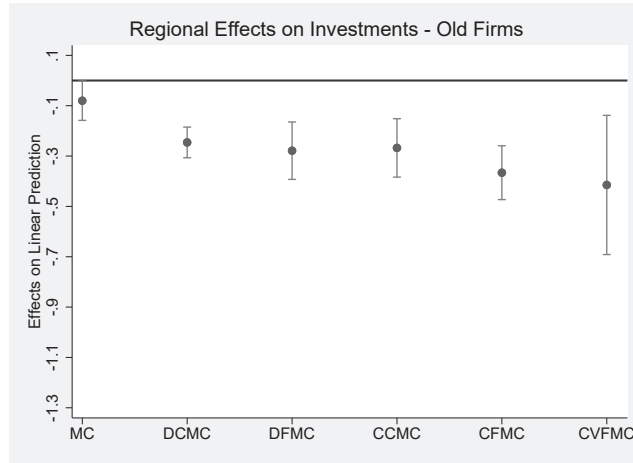
Notes: Marginal effects from fixed effects regression using matched sample. Points show regression results with 95% confidence intervals. Scale of Y-axis identical for both new and old firms. MC= major city (ref cat), DCMC = dense muni close to major city, DFMC = dense muni far away from MC, CCMC = countryside muni close to MC, CFMC = countryside muni far away from MC, CVFMC = countryside muni very far away from MC.

Figure 3: Effects of Almi loan on number of employees for new firms interacted with region type



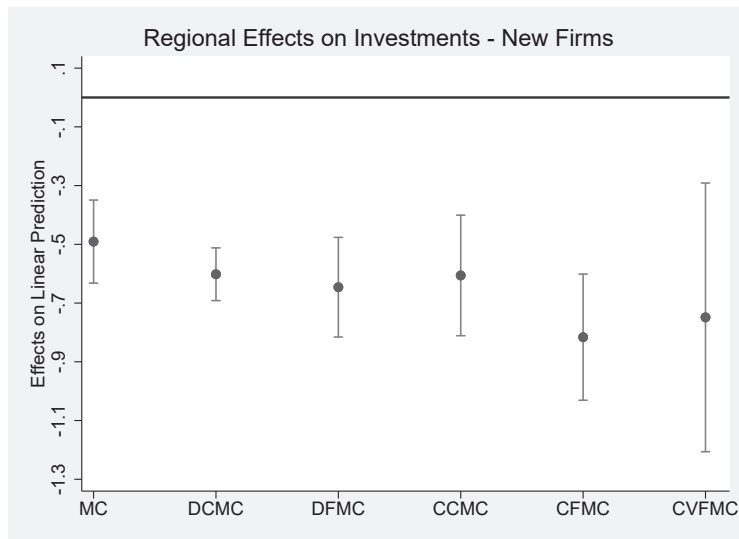
Notes: See Figure 2

Figure 4: Effects of Almi loan on investments for old firms interacted with region type



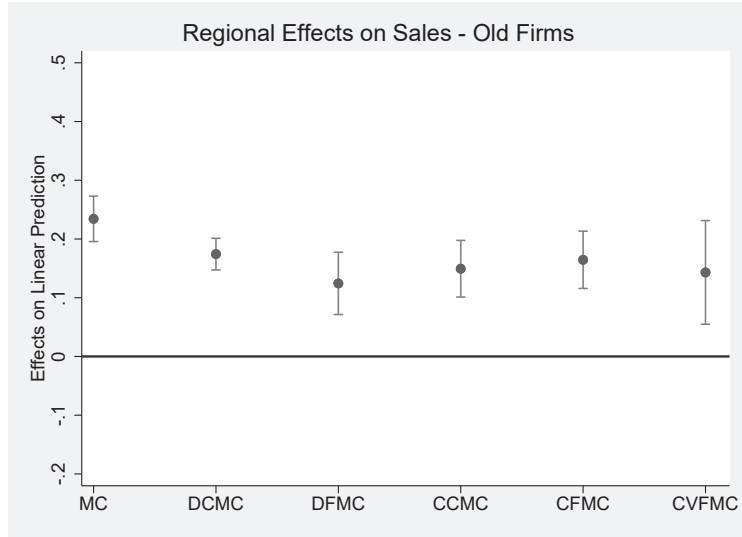
Notes: See Figure 2

Figure 5: Effects of Almi loan on investment for new firms interacted with region type



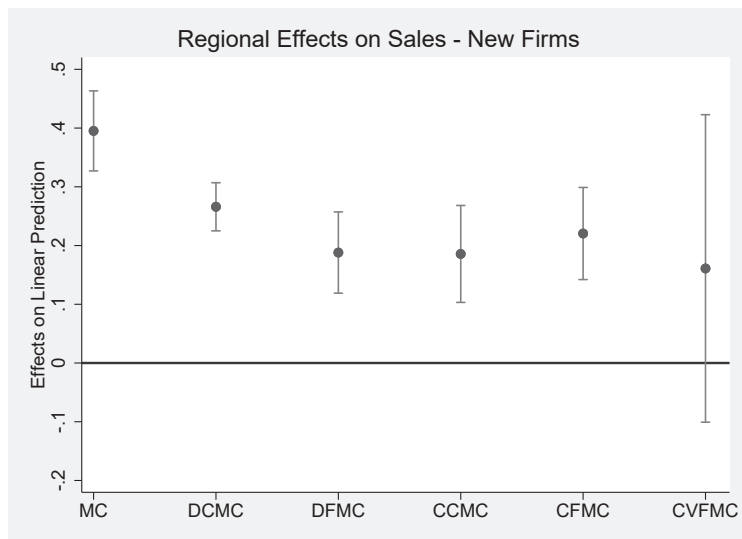
Notes: See Figure 2

Figure 6: Effects of Almi loan on net sales for old firms interacted with region type



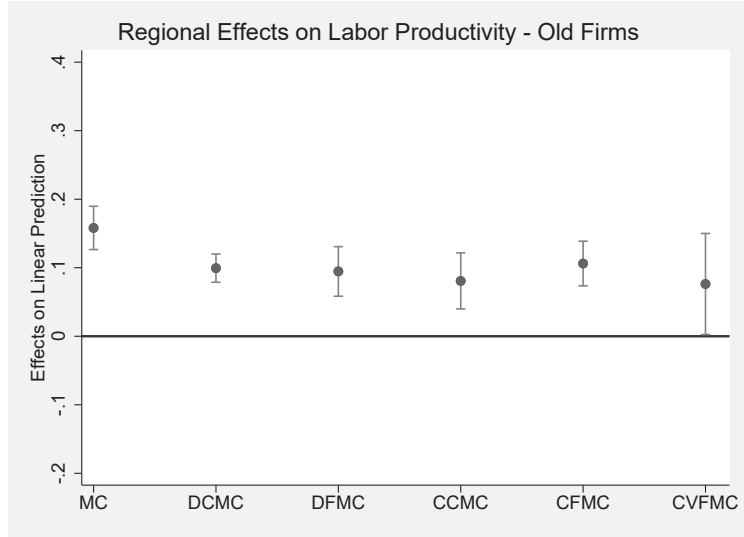
Notes: See Figure 2

Figure 7: Effects of Almi loan on net sales for new firms interacted with region type



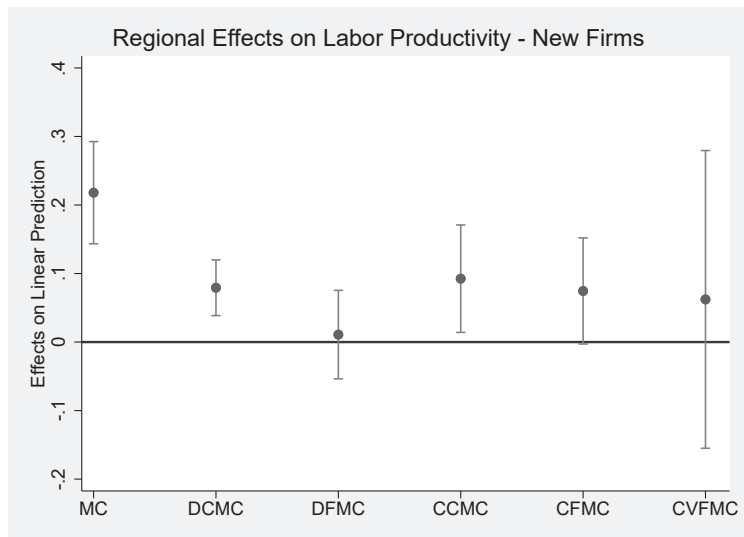
Notes: See Figure 2

Figure 8: Effects of Almi loan on labor productivity for old firms interacted with region type



Notes: See Figure 2

Figure 9: Effects of Almi loan on labor productivity for new firms interacted with region type



Notes: See Figure 2

The results from both plots of the marginal effects in Figures 2-9 and the regression results in Tables 14-17 show that the effects of public loans on employment are greater in major cities than in other regions. Note that the posttreatment dummy represents the effect of the treatment effect on firms in major cities. In fact, these effects from Almi loans are only positive and significant in major cities and in municipalities located close to major cities. This result holds for both new and old firms. On average, new firms with Almi loans located in major cities employ 1.6 additional employees than the control group. Old firms with Almi loans located in major cities employ 1.8 employees more than old firms without Almi loans. As with the table results for the posttreatment dummy, the interaction effects show the difference of the treatment effect in the respective region relative to the treatment effect in major cities. These results are in line with the results from the urban economics literature, which conjectures that cities play an important role in economic growth. One explanation is that firms in major cities (or close to them) have generally better growth opportunities. Thus, once these firms obtain the needed funds, they can generate more growth from this funding due to a higher capability (Hottenrott and Peters, 2012; Schäfer et al., 2017). The results are in contrast to those from the regional credit constraints literature predicting mostly positive effects for remote regions. Since firms in peripheral regions far away from a major city are more credit-constrained, as shown by the estimation results in Table 4, it could be expected that the effect of an Almi loan should be greater, and not smaller, in these remote regions. Since the results *do* differ between the regions, this contradicts the theories that suggest that with perfect credit markets there should be no regional differences.

One explanation of the results could be due to the fact that Almi intentionally lends to firms in all parts of Sweden. If Almi were to maximize returns on investments, according to our results, they should mainly invest in firms located in major cities because that will also reduce the risk of loan defaults. If Almi wants to ensure that it lends to firms in all areas, it might be willing to lend to firms with somewhat lower potential in order to ensure that its activities cover all regions. If this is the case, this would explain the larger effects in major cities.

However, for other outcome variables, the emerging regional pattern is less clear. In terms of investments (see Table 16), treated firms (those that receive a public loan) on average reduce their investment irrespective of their location. This is a counterintuitive finding, as an Almi loan should enable firms to undertake investments that might have been postponed due to funding gaps. The result is most likely caused by the lack of the investments years after the the initial investment (Gustafsson, 2018). However, this negative impact is less pronounced in large cities compared to rural regions. The less firms are financially constrained, the more likely it is they can invest using other funding sources, even in years

after the Almi loan. Thus, this result also supports the view that firms in major cities are less credit-constrained than firms located in more remote regions.

Most positive is the effect from an Almi loan on sales growth (see Table 15). In all region types, firms expand their sales after receiving the loan. The effect is again strongest in major cities and generally larger for new firms compared to older ones. The same holds also for productivity (Table 17). Old firms in major cities increase productivity by 16% on average, while new firms in the same location increase their productivity by 22% after having obtained a public loan.

4.4 Robustness checks

A number of robustness tests are performed to investigate whether the results are robust to variation in methodology. First, the results might depend on the size of firms. We therefore rerun the regressions for firms with more than 10 employees as well as for firms with 10 or fewer employees. The results remain similar, with positive effects in major cities and significantly lower results in every other municipality type. To ensure the results are not affected by outliers, we Winsorize the data at a 1 percent level and rerun the regressions. Once again, the results remain similar.

We switch value added per worker as a measurement of productivity to the total factor productivity measurement that has been suggested by Levinsohn and Petrin (2003); Petrin et al. (2004) as well as the one suggested by Wooldridge (2009); again, the results remain similar.

Some firms only receive a loan from Almi and not a complimentary commercial bank loan. Excluding those firms, the results remain positive, although with a lower coefficient in major cities and lower in all other municipalities.

This study does not consider regional spillovers from firms with loans on other firms that did not receive a public loan. A recent US study does not find spillover effects from SBA lending (Lee, 2018), suggesting that these might be limited in size.

We also do not study how receiving a public loan affects the survival of firms, despite the fact that this question is of major interest in the context of public loan. The main reason for this neglect is that data quality does not allow for studying firm exit since we do not know the reason for the exit (e.g., did the firm exit due to voluntary closure or a bankruptcy?).

In conclusion, in none of the performed robustness tests did the treatment effect vary by type of region in a way that is in line with the theories that suggest urban areas are more constrained or that regional characteristics do not matter. Those regression tables are available from the authors upon request.

5 Discussion

This paper provides evidence that firms in major cities are less credit-constrained than firms located in other regions. This finding is based on the argument that only firms with credit constraints will refer to Almi for obtaining an expensive public loan instead of using other funding sources. As firms located in major cities are less likely to use Almi loans, we can infer from this that they have access to other financial sources. Most constrained firms are firms located in regions far away from major cities, but not necessarily in the very remote regions where, presumably, the number of firms with credit demands is very low.

The treatment effect regressions show that the real effects from receiving a public loan on firm growth are stronger in major cities than in other types of regions. One interpretation of this finding is that firms in major cities have on average higher innovation capabilities and also better growth opportunities than firms in other locations. Thus, when credit constraints are relaxed, these firms experience higher growth in terms of sales, productivity, and employment on average. The results also show that the impact from obtaining a public loan on the growth of new firms is in general somewhat higher compared to the impact on the growth of old firms, with the exception of employment growth. Old firms located in major cities receiving a public loan do have, in the following periods, 1.76 more employees on average than the control group that does not have a public loan. In addition, the results also show that the effect from Almi loans on employment growth is not significant for firms outside of urban areas. Similarly, new firms in major cities have 40% higher sales, while in the same location, old firms experience 23% higher sales. Similarly, the productivity growth is highest, with 22% for new firms and 16% for old firms in major cities. These loans do, however, have a positive impact on the performance of targeted firms even in more remote regions.

From the public policy perspective, this suggests that government policy that aims to reduce credit constraints will have larger benefits for firms in urban areas. However, because public loans have overall a positive effect on sales growth and the productivity of new and old firms, even in remote regions, they can be used as an instrument in aiding declining regions, despite the smaller effects compared to major cities, particularly if the social urgency is great (Austin et al., 2018). While the benefits of loans for firms in urban areas are larger, from an equity consideration, supporting firms in remote regions might be warranted. When evaluating such policies from a cost-benefit perspective, dead-weight losses from taxation should be included in the analysis as well, which could be large in some countries (Innes, 1991; Lundberg, 2017).

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A Additional statistics

A.1 Matching statistics

Table 6: Matching summary for newly created firms sales, investment and productivity

Number of strata		3401	
Number of matched strata		347	
	Control Group	Treated	
All	2072677	8049	
Matched	8048	8048	
Unmatched	2064629	1	

Table 7: Matching summary for older firms on sales, investment and productivity

Number of strata		9736	
Number of matched strata		1048	
	Control Group	Treated	
All	2072677	8123	
Matched	8092	8092	
Unmatched	2064585	32	

Table 8: Matching summary for newly created firms on labor

Number of strata	24162	
Number of matched strata	1668	
	Control Group	Treated
All	2072677	8049
Matched	6967	6967
Unmatched	2065710	1082

Table 9: Matching summary for older firms on labor

Number of strata	54131	
Number of matched strata	2785	
	Control Group	Treated
All	2072677	8123
Matched	7335	7335
Unmatched	2065342	788

Table 10: Matching results for sales, investment and productivity for new firms

Unmatched newly created firms							
Variable	L1	Mean	Min	25%	50%	75%	Max
No. employees	.5883	-6.8129	-2	-2	-3	-6	-157
Log of debt to capital	.21763	.27857	4.0811	.25395	.12105	.12609	-3.0269
Industry code	.09739	-.10873	0	0	0	-1	0
Municipality type	.17275	.24719	0	1	0	1	0
Multivariate L1	.81750094						
Matched to newly created firms							
Variable	L1	Mean	Min	25%	50%	75%	Max
No. employees	.60574	-2.4942	-2	-2	-2	-3	10
Log of debt to capital	.10027	.01966	.309	.00147	-.01104	.03472	.
Industry code	0	0	0	0	0	0	0
Municipality type	0	0	0	0	0	0	0
Multivariate L1	.72316103						

Table 11: Matching results for sales, investment and productivity for older firms

Unmatched older firms							
Variable	L1	Mean	Min	25%	50%	75%	Max
No. employees	.43952	-2.2237	-2	-2	-2	-1	-74
Log of debt to capital	.18931	.17181	2.3	23949	.17576	.09553	-3.0335
Sales growth	.22412	.02142	4.5328	.03137	-.00147	.0347	-4.3752
Industry code	.15207	-.28953	0	-1	0	0	0
Municipality type	.10906	.21912	0	0	0	1	0
Multivariate L1	.97403335						
Matched to older firms							
Variable	L1	Mean	Min	25%	50%	75%	Max
No. employees	.46033	-1.3223	-2	-2	-2	0	-2
Log of debt to capital	.11493	.04533	-.68576	.04799	.09132	.0423	.
Sales growth	.1242	.00381	-.27631	.04312	-.00083	-.00202	.03208
Industry code	0	0	0	0	0	0	0
Municipality type	0	0	0	0	0	0	0
Multivariate L1	.84503213						

Table 12: Matching results for labor for new firms

Unmatched							
Variable	L1	Mean	Min	25%	50%	75%	Max
Log of wage per employee	.23604	-.28232	2.4278	-.30118	-.16861	-.17971	-1.4946
Log of value added	.37051	-1.0044	.73736	-.69021	-.761	-1.2101	-4.5155
Log of debt to capital	.23704	.20244	7.1629	.24569	.07539	.04354	-6.4428
Industry code	.11247	-.21024	0	0	0	-1	0
Municipality type	.19339	.29392	0	1	0	1	0
Multivariate L1	.98819845						
Matched to newly created firms							
Variable	L1	Mean	Min	25%	50%	75%	Max
Log of wage per employee	.05038	.00632	0	.01367	.00401	.	.
Log of value added	.07277	-.03194	-.10651	-.09791	-.07594	-.04395	.
Log of debt to capital	.10679	.00123	.21468	-.01578	-.04517	.00839	.
Industry code	0	0	0	0	0	0	0
Municipality type	0	0	0	0	0	0	0
Multivariate L1	.78053682						

Table 13: Matching results for labor for older firms

Unmatched							
Variable	L1	Mean	Min	25%	50%	75%	Max
Log of wage per employee	.09746	-.09918	1.3941	-.05557	-.02764	-.04473	-2.6073
Log of value added	.16341	-.16968	1.146	-.26569	-.00747	.14209	-3.3304
Log of debt to capital	.24193	.23859	4.6277	.32991	.20917	.09356	-6.4822
Sales growth	.14341	.06021	6.0732	.01413	.0015	.07009	-4.8084
Industry code	.17628	-.51235	0	-2	0	-1	0
Municipality type	.12455	.27751	0	0	0	1	0
Multivariate L1	.99781786						
Matched older firms							
Variable	L1	Mean	Min	25%	50%	75%	Max
Log of wage per employee	.03422	.00081	-.00317	.00824	-.00132	.	.
Log of value added	.03872	-.0063	.10028	-.09809	.01592	-.02424	.
Log of debt to capital	.0923	.03676	-.68576	.04014	.06956	.02702	.
Sales growth	.08221	.01672	-.53416	.04183	0	.01871	.13649
Industry code	0	0	0	0	0	0	0
Region code	0	0	0	0	0	0	0
Multivariate L1	.93960464						

B Regression results

Tables 14-17 show the results from the main regressions are displayed. Based these estimations marginal effects are calculated and margins plots are created.

The coefficient “Post treatment dummy” shows the average post treatment result for the firms located in Major Cities, since that municipality type is the baseline type.

Table 14: Effect of receiving a public loan on firms' employment

Dependent variable: Employment	Full Sample	Matched New Firms	Matched Old Firms
Post treatment dummy	1.86*** (0.28)	1.58*** (0.25)	1.76*** (0.36)
DCMC × Post treatment dummy	-0.88*** (0.33)	-0.54* (0.28)	-0.90** (0.44)
DFMC × Post treatment dummy	-1.26*** (0.48)	-0.51 (0.34)	-1.00 (0.63)
CCMC × Post treatment dummy	-1.11** (0.54)	-1.27*** (0.37)	-0.97 (0.75)
CFMC × Post treatment dummy	-1.12** (0.47)	-1.04*** (0.32)	-1.40** (0.59)
CVFMC × Post treatment dummy	-0.76 (0.89)	0.0029 (1.02)	-1.15 (1.01)
Share high skilled	-0.010*** (0.00087)	-0.0037 (0.0029)	-0.015*** (0.0038)
Internal loan funding (log)	-0.017 (0.033)	-0.12 (0.075)	0.022 (0.043)
External loan funding (log)	0.23*** (0.035)	0.085 (0.10)	0.28*** (0.042)
Interest rate on Almi loan	-0.15*** (0.036)	-0.084 (0.062)	-0.20*** (0.051)
Share of Almi / total funding	0.52* (0.29)	-0.11 (0.54)	0.52 (0.44)
Constant	6.98** (2.79)	5.72* (3.00)	9.98*** (0.95)
Observations	2043971	68896	120445

Notes: Standard errors in parentheses. Cluster robust s.e. at firm level. Firm fixed effects. * p<0.1, ** p<0.05, *** p<0.01. ref categ. MC= Major City, DCMC = Dense muni Close to Major City, DFMC = Dense muni far away from MC, CCMC=Country side muni close to MC, CFMC = Country side muni far away from MC, CVFMC = Country side muni very far away from MC.

Table 15: Effect of receiving a public loan on firm sales

	Full Sample	Matched New Firms	Matched Old Firms
Post treatment dummy	0.30*** (0.017)	0.40*** (0.035)	0.23*** (0.020)
DCMC × Post treatment dummy	-0.077*** (0.020)	-0.13*** (0.039)	-0.060** (0.024)
DFMC × Post treatment dummy	-0.13*** (0.028)	-0.21*** (0.049)	-0.11*** (0.033)
CCMC × Post treatment dummy	-0.12*** (0.027)	-0.21*** (0.056)	-0.085*** (0.031)
CFMC × Post treatment dummy	-0.090*** (0.027)	-0.17*** (0.053)	-0.070** (0.031)
CVFMC × Post treatment dummy	-0.14*** (0.047)	-0.23* (0.14)	-0.091* (0.049)
No. employees	0.063*** (0.00041)	0.11*** (0.0061)	0.071*** (0.0017)
No. employees squared	-0.00024*** (0.0000030)	-0.00076*** (0.00011)	-0.00029*** (0.000015)
Share high skilled	-0.00033*** (0.000054)	-0.00048** (0.00020)	-0.0012*** (0.00023)
Internal loan funding (log)	-0.0070*** (0.0020)	-0.013** (0.0054)	-0.00027 (0.0023)
External loan funding (log)	0.0065*** (0.0023)	0.013** (0.0054)	0.0059** (0.0027)
Interest rate on Almi loan	0.0066** (0.0027)	-0.00060 (0.0046)	0.0078** (0.0034)
Share of Almi / total funding	-0.081*** (0.025)	-0.095* (0.052)	-0.059* (0.031)
Constant	7.54*** (0.14)	7.44*** (0.056)	8.01*** (0.16)
Observations	2039772	100373	141076

Notes: Standard errors in parentheses. Cluster robust s.e. at firm level. Firm fixed effects included. * p<0.1, ** p<0.05, *** p<0.01. ref categ. MC= Major City, DCMC = Dense muni Close to Major City, DFMC = Dense muni far away from MC, CCMC=Country side muni close to MC, CFMC = Country side muni far away from MC, CVFMC = Country side muni very far away from MC.

Table 16: Effect of receiving a public loan on firms' investment

	Full Sample	Matched New Firms	Matched Old Firms
Post treatment dummy	-0.014 (0.034)	-0.49*** (0.072)	-0.080** (0.040)
DCMC × Post treatment dummy	-0.20*** (0.042)	-0.11 (0.082)	-0.17*** (0.048)
DFMC × Post treatment dummy	-0.23*** (0.058)	-0.16 (0.11)	-0.20*** (0.069)
CCMC × Post treatment dummy	-0.20*** (0.061)	-0.12 (0.13)	-0.19*** (0.070)
CFMC × Post treatment dummy	-0.32*** (0.059)	-0.33** (0.13)	-0.29*** (0.066)
CVFMC × Post treatment dummy	-0.34*** (0.13)	-0.26 (0.24)	-0.33** (0.15)
No. employees	0.040*** (0.00046)	0.076*** (0.0048)	0.049*** (0.0016)
No. employees squared	-0.00014*** (0.0000027)	-0.00051*** (0.000072)	-0.00018*** (0.000012)
Share high skilled	-0.00054*** (0.00012)	-0.0017*** (0.00052)	-0.00087* (0.00045)
Internal loan funding (log)	0.028*** (0.0049)	0.035** (0.015)	0.026*** (0.0054)
External loan funding (log)	0.054*** (0.0056)	0.066*** (0.014)	0.045*** (0.0064)
Interest rate on Almi loan	-0.022*** (0.0067)	-0.057*** (0.012)	-0.0059 (0.0081)
Share of Almi / total funding	-0.014 (0.068)	0.11 (0.15)	-0.11 (0.081)
Constant	4.97*** (0.19)	4.54*** (0.24)	5.91*** (0.99)
Observations	1388105	64204	101201

Notes: Standard errors in parentheses. Cluster robust s.e. at firm level. Firm fixed effects. * p<0.1, ** p<0.05, *** p<0.01. ref categ. MC= Major City, DCMC = Dense muni Close to Major City, DFMC = Dense muni far away from MC, CCMC=Country side muni close to MC, CFMC = Country side muni far away from MC, CVFMC = Country side muni very far away from MC.

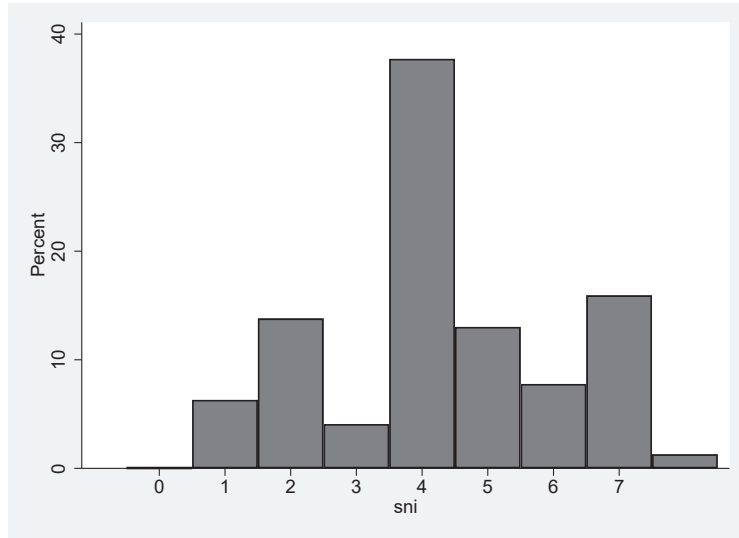
Table 17: Effect of receiving a public loan on firms' productivity

	Full Sample	Matched New Firms	Matched Old Firms
Post treatment dummy	0.16*** (0.014)	0.22*** (0.038)	0.16*** (0.016)
DCMC × Post treatment dummy	-0.065*** (0.016)	-0.14*** (0.042)	-0.059*** (0.018)
DFMC × Post treatment dummy	-0.075*** (0.021)	-0.21*** (0.049)	-0.063*** (0.024)
CCMC × Post treatment dummy	-0.070*** (0.023)	-0.13** (0.054)	-0.077*** (0.026)
CFMC × Post treatment dummy	-0.055*** (0.021)	-0.14*** (0.055)	-0.052** (0.022)
CVFMC × Post treatment dummy	-0.087** (0.037)	-0.16 (0.12)	-0.082** (0.040)
No. employees	-0.0066*** (0.00018)	-0.010*** (0.0013)	-0.0064*** (0.00063)
No. employees squared	0.000021*** (0.00000089)	0.000053*** (0.000016)	0.000021*** (0.0000034)
Share high skilled	0.00033*** (0.000045)	0.00022 (0.00019)	0.00017 (0.00018)
Internal loan funding (log)	-0.0067*** (0.0017)	-0.025*** (0.0058)	-0.0035* (0.0018)
External loan funding (log)	0.0061*** (0.0020)	0.012** (0.0050)	0.0059** (0.0024)
Interest rate on Almi loan	-0.0024 (0.0025)	0.0037 (0.0048)	-0.0043 (0.0031)
Share of Almi / total funding	-0.084*** (0.024)	-0.12** (0.052)	-0.068** (0.029)
Constant	5.62*** (0.084)	5.71*** (0.098)	6.04*** (0.17)
Observations	1992868	93570	131484

Notes: Standard errors in parentheses. Cluster robust s.e. at firm level. Firm fixed effects. * p<0.1, ** p<0.05, *** p<0.01. ref categ. MC= Major City, DCMC = Dense muni Close to Major City, DFMC = Dense muni far away from MC, CCMC=Country side muni close to MC, CFMC = Country side muni far away from MC, CVFMC = Country side muni very far away from MC.

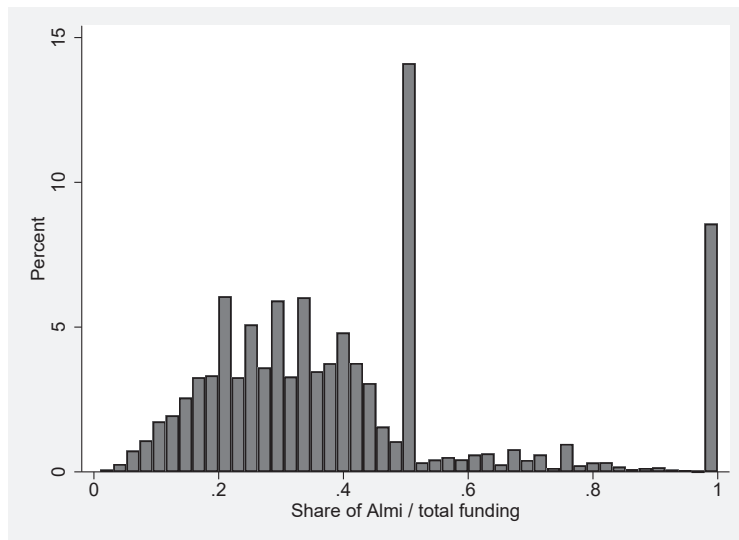
B.1 Various statistics

Figure 10: Distribution of Almi's financed industries



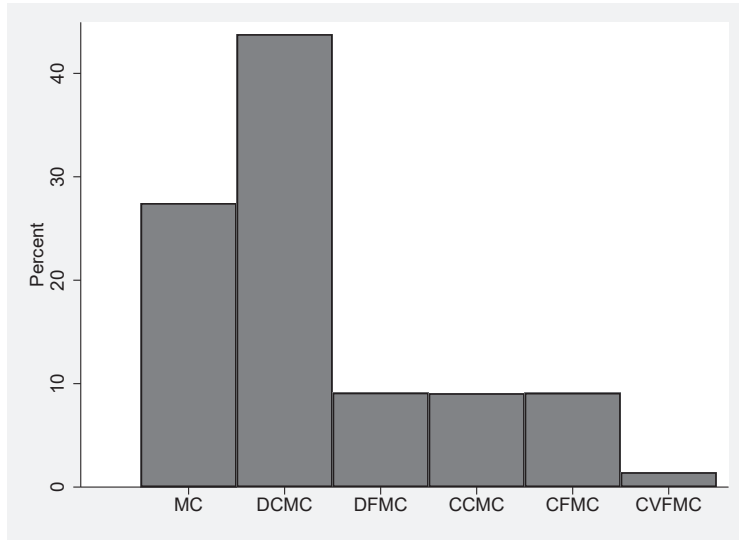
Notes: The distribution of firms who receives an Almi loan among Swedish industry codes.

Figure 11: Almi's share of total project loans



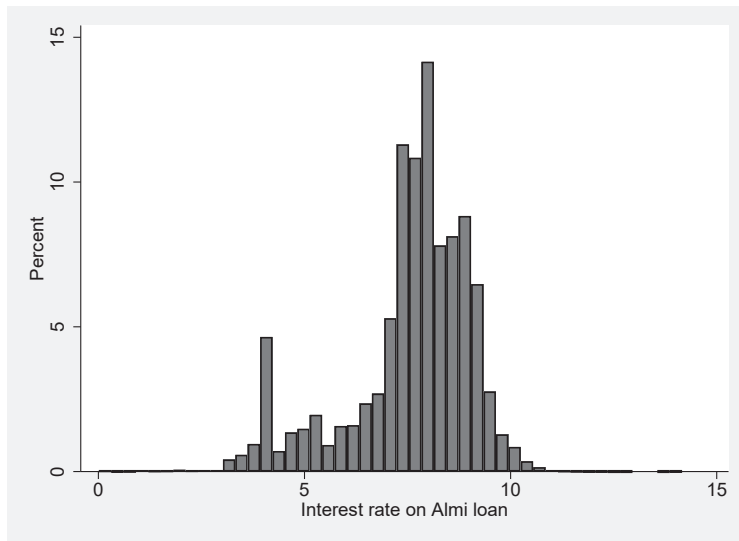
Notes: XY

Figure 12: Distribution of Almi's regional lending by municipality type



Notes: Percentage of loans to each regional type.

Figure 13: Distribution of Almi's interest rates



C Regional statistics

Table 18: SAREG definition of municipality types

Municipality type	Criteria
Major City, MC	Municipalities where less than 20 % of the population live in rural areas and which together with nearby municipalities have a population of at least 500 000 inhabitants.
Dense muni. Close to Major City, DCMC	Other municipalities where less than 50% of the population live in rural areas and <i>where at least half of the population</i> have less than 45 minutes by car to a dense area with at least 50 000 inhabitants.
Dense muni. Far away from Major City, DFMC	Other municipalities where less than 50% of the population live in rural areas and <i>where less than half of the population</i> have less than 45 minutes by car to a dense area with at least 50 000 inhabitants.
Country side muni. Close to Major City, CCMC	Municipalities with at least 50% in rural areas and where <i>at least half of the population</i> have more than 45 minutes by car to a dense area with at least 50 000 inhabitants.
Country side muni. Far away from Major City, CFMC	Municipalities with at least 50% in rural areas and <i>more than half the population</i> have more than 45 minutes by car to a dense area with at least 50 000 inhabitants.
Country side muni. Very Far away from Major City, CVFMC	Municipalities where the entire population lives in rural areas and have at least 90 minutes by car to an dense area with at least 50 000 inhabitants.

Growth Analysis is an agency that evaluates and analyses Swedish growth policy. We provide the government and other stakeholders in the growth policy process with an advanced knowledge base and recommendations to streamline and develop the state's work to promote sustainable growth and business development.

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