Original Article

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Take it to the (public) bank: The efficiency of public bank loans to private firms

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Abstract: Incomplete capital markets and credit constraints for small and medium-sized enterprises (SMEs) are often considered obstacles to economic growth, thus motivating government interventions in capital markets. While such policies are common, it is less clear to what extent these interventions result in firm growth or to which firms interventions should be targeted. Using a unique dataset with information about state bank loans targeting credit-constrained SMEs in Sweden with and without complementary private bank loans, this paper contributes to the literature by studying how these loans affect the targeted firms for several outcome variables. The results suggest that the loans create a one-off increase in investments, with long-term, positive effects for sales and labor productivity but only for firms with 10 or fewer employees. Increased access to capital by firms can therefore produce increases in economic output but only in a specific type of firm. This insight is of key importance in designing policy if the aim is to increase economic growth.

Keywords: Credit constraints, Public policy, State-owned banks, SMEs, CEM, Matching, Credit rationing

JEL Classification: L52, O38, H81, L26, G28

1 Introduction

At least since Schmidt (1951), economists have studied how capital market imperfections affect small and medium-sized enterprises (SMEs) and their access to credit. There are several reasons why capital markets, especially capital markets for SMEs, should not work perfectly. These reasons include asymmetric information between borrowers and lenders, low profitability for small loans, large

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transaction costs in gathering information and moral hazard. These barriers, in turn, lead banks and other financial institutions to resort to rationing credit since the market price is set at a level inconsistent with market clearing. With imperfect financial markets, firms with ideas, projects and innovations with positive net present values cannot realize them because they lack access to sufficient credit to finance these projects. If firms are capital constrained, there might be room for government policies to expand access to capital and hence increase firm and economic growth. If, in contrast, capital markets are somewhat efficient, or governments are inefficient in allocating credit to constrained firms, then public credit risks wasting taxpayer money, either by crowding out private credit (since all worthwhile projects are already fully financed) or by investing in projects that are not worthwhile due to an inability to target good projects. In other words, in inefficient equilibrium, bills are left on the sidewalk since firms have ideas that would generate profits were they implemented, to borrow an expression from development economics (Olson 1996).

Unfortunately, it is quite difficult to directly determine whether public interventions are efficient or not. Governments are often reluctant to allocate credit, grants or similar resources using randomized, controlled trials, rendering ex post evaluation difficult. Further, firms seek the most profitable method of financing, creating selection bias across different categories of creditors. Evaluations therefore must address this endogeneity as well as possible to allow for causal inference (Klette et al. 2000; David et al. 2000). Several studies have also examined publicly traded firms due to better data access for these firms, although small private firms are more likely to be credit constrained (Saunders and Steffen 2011).

The aim of this paper is to estimate the growth effects in firms from public loans to SMEs, using Swedish data. While there is a large body of previous research regarding credit constraints, this paper adds to the literature in several ways. First, it utilizes better data due to a unique dataset of loans from the state-owned bank, Almi, along with registry data on all Swedish firms from which a control group could be obtained. These data include information about whether firms that receive a loan from Almi also received a commercial loan at the same time, the interest rate charged, and the size of the loan. Since Almi charges higher interest rates than other banks to allow for greater risk taking, firms able to obtain sufficiently large commercial bank loans have little incentive to apply for an Almi loan. This fact should ensure that firms that borrow from Almi are genuinely credit constrained since only firms that cannot obtain all of their funding from a commercial bank seek an Almi loan as well. Almi's lending is per se not subsidized since Almi is able to cover its financial costs. It is however subsidized in the sense that Almi is not a profitable firm and is dependent on government funding to cover its non-financial costs. When a firm borrows from both a commercial bank and

Almi, its debt to Almi is subordinated (junior), creating incentives for commercial banks to increase their lending to firms that they would not otherwise lend to due to high risk since they can offload some of their risk to Almi, although at the price of not collecting interest on the part of the loan that they offload.

By combining matching and difference-in-difference regressions on the Almi firms and the matched control group, selection bias is reduced, although not eliminated. If firms that received bank loans from Almi perform better than the matched control group after they have received their loans, then it is reasonable to assume that these loans alleviated credit constraints and that the constraints had negative effects on firm performance.

The results indicate that Almi's loans do create a temporary increase in investments, leading to a larger capital stock. This result spurs long-term sales and labor productivity. The effects are significant and fairly large for sales and smaller for labor productivity. The results for employment are significant and equal to roughly a one-and-a-half more employees. This finding suggests that increasing access to credit does have positive effects for short-term investments, sales and productivity, but the effect on employment is fairly small. The results are significant only for firms with 10 or fewer employees.

2 Credit constraints in SMEs

The body of research regarding capital market failures for SMEs is both large and somewhat inconclusive. There are several plausible reasons why one should expect credit markets to work less than perfectly. First, information about credit markets is asymmetric, and firms that seek credit have more information about the project than their financiers. This asymmetry can lead to market inefficiencies due to adverse selection, with the lender not able to increase the price in accordance with the risk (Akerlof 1970; Stiglitz and Weiss 1981; Stiglitz and Blinder 1983). In these models, a firm faces an upward-sloping marginal cost curve for capital. With perfect competition and symmetric information, the risk-adjusted marginal cost of capital should be constant and equal to the risk-free interest rate in the economy. However, if creditors are able to offer different types of loans to different firms, it can also mitigate the problem (Arnold and Riley 2009). Efficient price discrimination might therefore expand both the scope and efficiency of the market. Another way to model a capital-constrained firm is as a firm that faces a wedge between the cost of internally generated capital and externally generated capital (Fazzari et al. 1988; Hubbard 1998). If capital markets are perfect, and

there are no taxes, there should be no wedge between external and internal capital. With imperfect markets, asymmetric information increases the cost of, e. g., bank loans, but it does not affect the opportunity cost of retaining earnings and hence creates a price difference between the two sources. One argument against this model is that requiring that firms face exactly the same cost for internal and external capital is somewhat unreasonable since even a simple fee to visit a bank creates a wedge between internal and external capital costs (Kaplan and Zingales 1997). Capital-constrained firms must therefore must face a large wedge between internal and external capital relative to non-constrained firms.

Moral hazard is always an issue when lending money to firms with the possibility of going bankrupt. Banks might be able to monitor firms and thereby improve their behavior (Besanko and Kanatas 1993; Cressy and Toivanen 2001), but since screening is costly, it creates large fixed costs and renders especially small loans unprofitable. A lack of competition among banks, with banks having large market power, could increase credit constraints since banks can lower the supply of credit to increase their profits (Ryan et al. 2014).

The asymmetric information narrative assumes that the entrepreneur knows more about his or her project than the lender does, which might not be true since many entrepreneurs are overconfident and might have biased views of their projects (Koellinger et al. 2007). If there is also a risk of moral hazard, then the equilibrium amount of borrowing might actually be too high. This effect is increased if governments subsidize lending, leading to an increase in low-quality entrepreneurs seeking credit (De Meza and Southey 1996; De Meza and Webb 2000; De Meza 2002). Indeed, when access to credit increased in Denmark following mortgage reform, entrepreneurship increased, but the new entrants were of lower quality than the incumbents (Jensen et al. 2014). There is therefore a lack of consensus regarding whether governments should subsidize access to capital for SMEs or not (Parker 2002).

Starting with the work of Jaffee and Modigliani (1969), there have been many empirical studies on the extent of credit rationing. Finding an effective and empirically useful measurement of credit constraints is not simple, despite previous efforts. Following Fazzari et al. (1988), investments and cash flow are used as measures of investment, with firms that have lower cash flows also having lower investments. However, this method was criticized by Kaplan and Zingales (1997), and the ensuing debate has not yielded conclusive results on whether this method is useful (Fazzari et al. 2000; Kaplan and Zingales 2000). Other lines of research have focused on changes in the differences between investments in short-term working capital versus long-term capital (Fazzari and Petersen 1993), whereas other scholars have examined the link between liquid assets and cash flows (Almeida et al. 2004) to find other viable measurements of credit constraints.

Using survey data from ECB:s SAFE-survey that questioned SMEs regarding their credit constraints, several papers have found that firms' access to credit depends on several factors.

There is some uncertainty regarding if women face greater credit constraints than men. Some studies suggests that females face discrimination and therefore pay higher interest rates than male firms (Muravyev et al. 2009; Alesina et al. 2013). This seems in part to be driven by self-selection i. e. that women do not seek bank credit to the same extent as men as they expect to be rejected (Stefani and Vacca 2013; Moro et al. 2017b). However, some paper does not find any evidence for women in particular to be discriminated and e. g. Cavalluzzo and Cavalluzzo (1998) finds no discrimination for white women in the U.S., but do find discrimination for minorities applying for credit.

Younger firms with lower profits, low working capital and high leverage are more likely to perceive themselves to be credit constrained (Ferrando and Mulier 2015); and general macroeconomic conditions matter (Ferrando et al. 2017), with worsening macroeconomic conditions leading to lower profits, especially in new firms (Banerjee 2014). Labor market regulation affects financial decisions, since more heavily regulated labor markets makes it more difficult for firms to adjust their labor costs. Therefore, tighter labor market regulation reduces leverage (Simintzi et al. 2015; Kugler and Pica 2008; Moro et al. 2017a). Indeed, labor market regulation could even have more widespread effect on the financial system, affecting both profits and financial stability (Tridico 2012). Since Sweden have a quite regulated labor market, Swedish firms should be expected to have less leverage then e. g. U.S. firms.

Interestingly, Farre-Mensa and Ljungqvist (2016) found that current measures of credit constraints do not predict real world behavior. They used exogenous tax increases, which increase the benefits of holding debt, to measure how firms that should be constrained based on the prevailing measures react and thereby test the predictive power of these measures. They did not find any connection between the behavior of the firm corresponding to the measures of credit constraints, and the firms that the indicators of capital constraints deem to be constrained increase their debt exactly as much as the non-constrained firms. The probability of identifying credit-constrained firms could contribute to the lack of consensus in the literature.

Governments in most developed nations have various policies to support SME access to capital, perhaps partly due to the results of research on capital market failures. Governments intervene in capital markets via public venture capital, direct loans to firms, credit guarantees and direct subsidies. Since these interventions are seldom allocated randomly, and access to data is often lacking, it is often difficult to evaluate the efficiency of these interventions. Aggregate results using

cross-country data have shown non-existent or negative effects of state-owned banks (Galindo and Micco 2004). A large share of government-owned banks in 1970 were associated with less growth and less financial development in 1995 (La Porta et al. 2002). One explanation for this lack of positive results might be that state-owned banks lend money to firms with political connections or firms located in areas where voters support a certain political party (Sapienza 2004). A recent study found rent seeking in banking networks in Germany, with more rent seeking in public banks than in private (Haselmann et al. 2018). Another recent paper found that guarantees to banks lad them to lend to firms that should not receive credit. This outcome allowed unproductive firms to conduct their operations longer than if they had not received any subsidies and hence decreased Schumpeterian creative destruction, with negative effects for long-term growth (Gropp et al. 2019).

A similar paper to this essay is Brown and Earle (2017), who studied the effects of receiving loans from the Small Business Administration (SBA) in the United States. Using an impressive dataset and a combination of propensity score matching and instrumental variables, they showed that firms that receive SBA loans have an increase in the number of employees compared to the control group. Increasing the number of employees is the main goal of SBA loans, and they showed that the cost of SBA loans, from default losses and administration, is sufficiently low to render them fairly efficient.

3 Government loans to firms in Sweden

The Almi group was formed in 1994 as a result of the transformation of the Swedish Regional Development Funds. The transformation of the Funds was part of a larger political agenda aimed at improving the situation for SMEs in Sweden. In particular, the ruling conservative government had identified a need to complement the market for financial services available to SMEs (Prop. 1993/94:40 1993). Almi Företagspartner AB, the parent company, is wholly state owned. There are currently 16 regional subsidiaries responsible for loans and counseling, with a total of 40 offices across the country. The state holds 51 percent of the shares, and the remaining 49 percent of shares are held by local owners, such as regions (Landsting).

Almi is financed mainly through state funding and allocations from regional owners. In addition, Almi receives funding via state special funds, the Swedish regions, the EU and accumulated profits from its own operations. State-supplied equity in Almi Företagspartner consists of share equity, a reserve fund and a loan

fund. The loan fund, currently valued at 5,482 million SEK, is used to finance loans distributed by regional subsidiaries. It is to be kept intact, in nominal terms, over the long run. In most years, Almi receives sufficient interest rate payments to cover its capital costs but not its wages or facilities. The state grants are therefore mainly used to pay for offices and employees. It would not be possible for Almi to run its current operations without government funding.

A similar system of state banking exists in Germany as the KfW (Kreditanstalt für Wiederaufbau). Part of it, the Mittelstandsbank, lends directly to German SMEs for both expansion and start-ups. In the U.S., the SBA lends directly to firms and provides credit guarantees to commercial banks to increase the loans to small firms.

Almi's two different businesses are lending and counseling.[1] Almi has, unfortunately, not recorded sufficient information regarding its counseling service for it to be properly analyzed.

Almi's role in the capital market is supplementary. Almi offers a variety of loans for different purposes, but the common goal of these loans is to promote innovation and growth in companies unable to obtain full financing elsewhere. Growth is defined as increases in sales, productivity and number of employees. Since Almi has no explicit financial goal (other than maintaining the nominal value of the loan fund), it is able to lend money to projects with higher risk profiles than private lenders would find comfortable. To compensate for this higher risk and to avoid direct competition with private agents, Almi charges interest rates greater than the market average. Almi's loans are aimed at companies with up to 250 employees. Almi is allowed to administer loans without collateral. It does not follow Swedish banking legislation but is currently governed by regulation (2012:827) on state financing through regional development companies (SFS 2012). This legislation allows Almi to take more risks since it is not bound by, e. g., Basel III rules on banking risk.

It is common, but not necessary, for Almi to approve loans in collaboration with private actors, e. g., commercial banks. During the 2000–2010 period, the overwhelming majority of loans were given to firms in combination with commercial banks. In this respect, Almi can be regarded as a provider of "second mortgages" for firms with less expensive loans from commercial banks. The most common procedure when a firm has a loan from both Almi and a commercial bank, according to private discussions with senior Almi executives, is that a firm first

1 Since 2013, Almi has also offered venture capital investment. Since this essay covers loans only until 2010, venture capital investments do not affect the analysis.

approaches its commercial bank and is partly rejected. The commercial bank demands that the firm contacts Almi to, from their perspective, offload sufficient risk to Almi to make the loan worthwhile.

It is this distinction between firms that receive only Almi loans and those that receive Almi loans in conjunction with commercial bank loans that makes it possible to study both the intensive and extensive margins of credit rationing. By dividing loans from Almi from loans from commercial banks, the money that the firm has committed to the project and the loans from Almi, one can calculate the share of the Almi loan in the entire project. This amount is equal to one if the firm has money only from Almi and is close to zero if the loan from Almi is small relative to other sources of finance. A histogram of the distribution of this variable is plotted in Figure 1. The most common arrangement is that the firm has 50 percent Almi funding and 50 percent internal and/or commercial bank funding. Some firms, less than 10 percent, have only Almi funding. It is, however, uncommon for firms to have a large proportion of Almi loans relative to commercial loans, with only a few firms having an Almi share greater than 0.8 but less than 1. There are no specific reasons for the 50 percent Almi/50 percent commercial loan other than common practice.

In a 2002 evaluation, the authors noted that Almi's operations resemble the venture capital market rather than the bank loan market. Almi's loans are often combined with counseling and strict repayment schedules – features commonly found in venture capital investments (ITPS 2002). In a survey conducted by Almi in 2000, as many as 56 percent of all Almi clients responded that they could, in fact, have raised capital elsewhere. The most important source of financing was bank loans, and the second-most important source was internal funds. One should, however, bear in mind that self-perceived access to capital is often positively biased; therefore, this figure could be upward biased. In a 1998 survey, companies reported that the most important capital source was retained earnings and not loans (ITPS 2002). Growth-inhibiting factors were mainly employment law and taxes, coupled with business cycle factors, such as competition and interest rates. The main reason for taking on new partners was knowledge needs rather than capital needs, according to this survey.

The most common reason, according to discussions with a senior Almi official, for a firm to turn to Almi to borrow is that it has been partly rejected by a commercial bank. After applying for a loan of a certain size, the commercial bank suggests that it cannot lend the requested amount and recommends that the firm contact Almi. The firm then negotiates with Almi and receives a loan that is partly from its bank and partly from Almi. For the empirical analysis, this fact should ensure that firms that borrow from Almi are genuinely credit constrained.

This procedure is also interesting from a theoretical perspective since it might be the case that the commercial bank is offloading risk to Almi. Since Almi has less strict requirements for collateral than commercial banks and takes a junior debt position, its part of the loan is riskier. While this outcome is intentional, Almi takes on greater risk than the commercial banks, creating a moral hazard. A commercial bank that is willing to issue a loan but would prefer to reduce its risk can tell the firm owner that he or she needs co-financing from Almi, although the bank would have been willing to lend if Almi did not exist. In this case, the commercial bank has reduced its risk, although it also reduces its profits due to fewer interest payments. In the end, Almi's existence reduces commercial banks' risk without increasing aggregate lending. The risk is now indirectly borne by the taxpayers, who guarantee Almi's creditworthiness.

4 Data and empirical approach

Data on Almi loans are collected by Growth Analysis.[2] These data are matched with registry data on firms from Statistics Sweden (SCB), using a unique firm code that ensures a perfect overlap. The dataset on Almi loans contains information on whether – and if so, how much – external funding was obtained from another bank when firms obtained their Almi loans. Unfortunately there are no such data on any other commercial loans since banks are reluctant to release this information. Hence, it is impossible to know the types of loans that the control group firms have. It is also impossible to know whether firms that receive Almi loans also have older commercial bank loans. However, there is information about total debt for the control group, which is a decent proxy.

As mentioned above, since Almi both lends to firms in combination with private banks and issues loans to firms without complements, it should be possible to measure the intensive and extensive margins of the capital constraints. Loans to firms without a complementing private loan should be on the extensive margin of the credit supply curve, whereas firms with a private bank loan should be on the intensive margin. Since there are fewer firms that receive loans only from Almi, the results for these firms should be carefully interpreted.

Firms with fewer than 2 employees that do not receive an Almi loan are omitted to avoid noise from actors, e. g., self-employed journalists, who do not have

2 Growth Analysis, formally the Swedish Agency for Growth Policy Analysis, is a government agency responsible for the analysis and evaluation of Swedish growth policies.

growth ambitions and are not relevant as a control group.[3] While firms that receive Almi loans often are extremely small, they have borrowed money with the intent to grow the firms, which should ensure that these firms have growth ambitions even if they only have 0 or 1 employee. The registry data on firms cover 1997–2013, and the data on Almi lending cover 2000–2010. The extra-registry data observations are useful for estimating the effects on firms that received their loans in 2010 because they allow for three more years pre- and postevaluation.

4.1 Summary statistics

Summary statistics for Almis loans is provieded in Table 1, the statistics for firms financed by Almi and all other Swedish firms are shown in Table 2. Firms that receive financing from Almi are, in general, quite small but not extremely small.[4] The median loan is 370.000 Swedish kronor, around 37.000 €. All variables have been inflation adjusted using consumer price index from the Swedish Riksbank. Additional information of Almi's loan is show in Figures 1–3.

Table 1: Summary statistics for Almi's loans.

	Observations	Mean	Median	Std. Dev.	Min	Max
Loan decision from Almi	11465	755	370	1280	4	28404
Internal loan funding	11465	570	102	1851	0	82429
External loan funding	11465	1479	343	4268	0	127937
Interest rate on Almi loan	11465	7.3	8	1.72	0	14.1
Share of Almi/total funding	11465	.46	0	.252	.01	1
Observations	11465					

Notes: Summary statistics for Almi loans. All variables in 1000 kronor, inflation adjusted. Internal loan funding is the part of the total project for which the firms borrows for that is provided by the firm. External loan funding is the part provided by the commercial bank. The share is calculated as Almi's part divided by the sum of Almi's loan, the internal and external funding.

3 A substantial number of firms do not have growth ambitions and these entrepreneurs instead value non-monetary rewards, such as being their own boss, as the main benefit of running their firms (Hurst and Pugsley 2011).

4 A few firms had more than 250 employees in the original dataset. Since Almi's policy is to not lend to firms with more than 250 employees, and this finding might be due to a merger or acquisition, these firms were omitted, eliminating 45 of more than 140 000 observations.

Table 2: Summary statistics.

	Observations	Mean	Median	Std. Dev.	Min	Max
No loan from Almi						
No. of employees	2072677	8.7	4	16.8	2	251
Labor cost per emp.	2072677	226	216	140	0	69862
Share of highly 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
Firm age	1945285	7.1	5	6.89	0	27
Loan from Almi						
No. of employees	95632	7.7	2	15.6	0	236
Labor cost per emp.	69739	221	218	136	0	9908
Share of highly skilled	72097	27	12	33.9	0	100
Gross investments	95632	507	29	2063	0	121438
Net sales	95632	8814	1995	23316	0	814599
Capital stock	95526	7340	1980	21097	0	1414773
Labor productivity	69739	379	360	445	−15175	27656
Firm age	72252	5.6	3	6.11	0	27
Observations	2168309					

Notes: Summary statistics for firms with and without Almi loans. All variables in 1000 kronor, inflation adjusted. Firm-year observations. Data on firm age extend to only 1983, which is why firm age is never greater than 27 years.

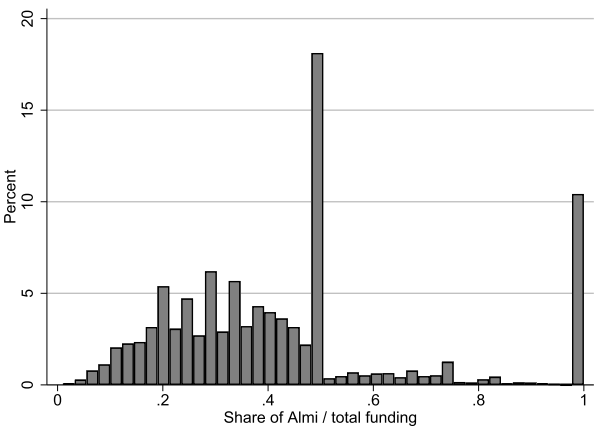

Figure 1: Almi's share of total project loans.

The loan from Almi divided by the loan size of the commercial loan and the Almi loan. A share equal to 1 means that the firm borrows from only Almi.

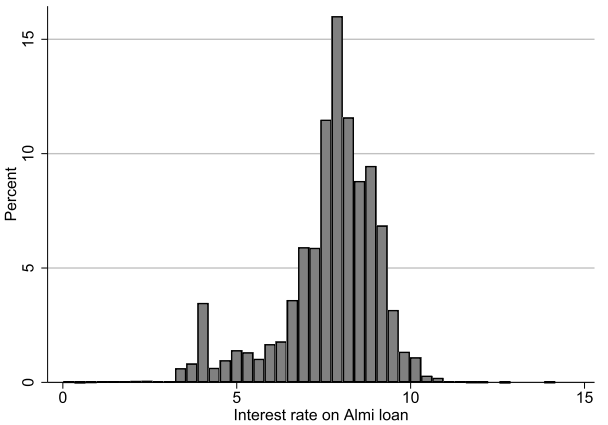

Figure 2: Distribution of Almi's interest rates.

Almi's interest rates for all loans in percentages, nominal interest rate.

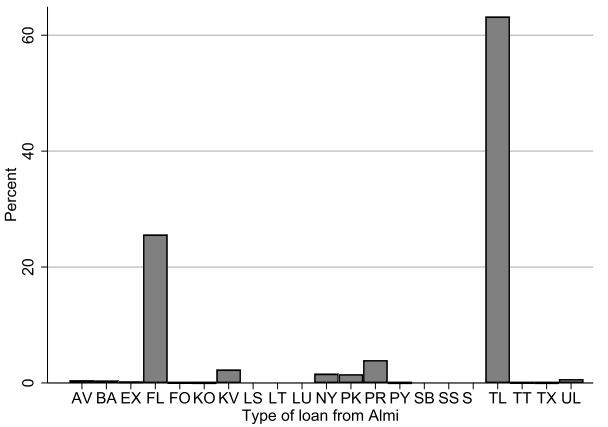

Figure 3: Distribution of Almi's different loan types.

Almi grants different loans for different purposes. The most common loan is Tillväxtlån, coded "TL", which translates to "Growth Loan".

4.2 Selection into Almi

Before analyzing the effects of receiving a loan from Almi on firms, we perform a selection analysis to understand which firms receive Almi loans. By running probit regressions on a dummy for being an Almi-supported firm, it

is possible to study the types of firms that self-select into seeking and receiving an Almi loan. The results in Table 3 suggest that being a firm with a small amount of capital, a high amount of debt and low productivity increases the likelihood of becoming an Almi-financed firm the next year. These factor all should render a firm more credit constrained. In particular, a small amount of capital relative to debt and low productivity should be factors that make it more difficult for a firm to receive commercial loans and hence push them toward Almi.

Table 3: Who borrows from Almi.

	Probit	**Probit**
Capital stock (log)	−0.48***	
	(0.0085)	
Total debt (log)	0.41***	0.15***
	(0.0089)	(0.0042)
No. of employees	0.00067	−0.011***
	(0.00079)	(0.00077)
No. of employees squared	−0.0000079	0.000032***
	(0.0000051)	(0.0000046)
Share of highly skilled	0.0032***	0.0024***
	(0.00017)	(0.00018)
Labor productivity (log)		−0.23***
		(0.0053)
Constant	−2.14***	−2.39***
	(0.38)	(0.37)
Observations	1692475	1655808
Pseudo R^2	0.103	0.086

Standard errors in parentheses. *p < 0.1, **p < 0.05, ***p < 0.01.
Dependent variable: Dummy indicating whether the firm will ever borrow from Almi. All explanatory variables values are lagged one year. Cluster robust s. e. at the firm level. Industry-time and regional fixed effects. Labor productivity is defined as the value added per employee.

4.3 Matching methods for causal analysis

Since firms self-select into borrowing from Almi, the sample is, by definition, not random. Further, there are no data on firms that apply for loans from Almi and

are rejected.[5] The control group therefore includes both firms that have access to other forms of financing and firms that were rejected by Almi. While firms that borrow from Almi are credit constrained, they might be less credit constrained than firms that were not even able to secure a partial bank loan. Due to the ambiguous theoretical nature of selection bias, it is important to attempt to correct for this bias and not simply rely on the regression result being an upper or lower limit.

Previous research has often used matching to reduce selection bias. Matching techniques offer a number of benefits by reducing heterogeneity between the treated and control groups when the treatment is not randomly distributed (Ho et al. 2007; Imbens 2015). Specifically, propensity score matching (PSM) has often been used in previous work on credit constraints to reduce bias from a non-matched control group when using difference-in-difference regressions (Oh et al. 2009; Ferrando and Mulier 2015; Ferrando et al. 2017; Brown and Earle 2017; Gropp et al. 2019). A more recent matching method is coarsened exact matching (CEM), which uses more moment conditions when creating the control group than other matching methods (Iacus et al. 2012). Additionally, it does not require the balancing property that must hold for PSM.[6] CEM works by coarsening each matching variable into different bins, either by manually defining the bins or by means of a pre-set algorithm. The treated group is then matched to a control in the same bin for each variable based on the moment conditions for the selected variables. This process reduces observed heterogeneity in both the coefficient and the moment conditions since the treated and control cases are now more similar for each matched variable. Since CEM is matched on observable variables, there is still a risk that non-observable differences affect the results. Due to the large number of observations, one-to-one matching is used, indicating that each firm that receives an Almi loan is a matched to a similar firm.

The literature on credit constraints is not coherent when it comes to the choice of the dependent variable that should be estimated. Some papers used growth in productivity, sales, employment or productivity, whereas others used survival rates (Hyytinen and Toivanen 2005; Kang and Heshmati 2008). It could be argued

5 This in turn means that rejected firms will be included in the control group, since they are impossible to distinguish from firms that never applied for a loan. However, since the control group consists of all firms in the Swedish economy, the likelihood that the matching algorithm will pick a rejected firms as a control firm in the empirical analysis should be minimal. Still, it is possible that there is some bias introduced in the analysis, which should lead to the results being overestimated, since the rejected firms should be of lower quality than the treated firms. Unfortunately, nothing can be done to solve this problem, given the limitations of the data.

6 For a discussion of other drawbacks of PSM compared to CEM, see King and Nielsen (2019).

that an increase in capital makes it possible for firms to substitute labor for capital and that employment should therefore not be an interesting outcome variable. However, since Almi is a state-owned bank intended to complement capital markets to increase firm growth, it is relevant to focus on real rather than financial variables, such as profit. Based on Almi's objective and previous research, four different outcomes that capture different aspects of firm growth are analyzed. The difference-in-difference regression is run to estimate the effects on net sales, gross investments, labor productivity and number of employees, and these dependent variables are therefore used in the matching.

Firms are matched on the dependent variable that will be analyzed, the trend of the dependent variable (average growth during the last two years), the debt-to-capital ratio (log debt divided by log capital), the firm industry-year code (one-digit NACE code grouped by year) and the regional code (NUTS2).[7] All firms are matched the year before they received their loans.

The coefficients are chosen to create as relevant a control group as possible. Matching on the dependent variable the year before the firm receives a loan, as well as the trend of this variable, should ensure that the treated firms are as similar to the control group as possible in the relevant variable. The two-year average trend is to remove any "one-hit wonder" effect that sometimes exists among firms (Daunfeldt and Halvarsson 2015). The trend variable is also useful since younger firms initially tend to grow more rapidly than more mature firms (Audretsch 1995; Coad 2009; Coad et al. 2018). While even longer trends could be relevant, it reduces the number of observations to a large extent for each firm. With this trade-off in mind, a two-year trend is used.

Firms with collateral to pledge have a greater likelihood of obtaining a loan than firms without collateral (Bester 1985, 1987), motivating the usage of the debt-to-capital stock as a parameter. It is also important to match on debt ratios because we cannot use debt as a control variable in the regressions since a loan, by definition, will affect the total debt of a firm. To include debt would therefore create post-treatment bias that might affect the results (Iacus et al. 2012). The industry-year code is important since previous research has found different effects depending on whether firms are in an industry that is more dependent on external finance (Rajan and Zingales 1998; Hyytinen and Toivanen 2005; Heider and Ljungqvist 2015). By grouping industries with the current year, any industry-specific business cycle effect should also be mitigated. Regional codes aim to capture differences among Sweden's urban areas and more sparsely populated areas.

7 NUTS, formally Nomenclature des Unités Territoriales Statistiques, is an EU-constructed definition of different regions. The NUTS2 coding divides Sweden into eight different regions.

The default algorithm is used to create the bin sizes. Because it is inappropriate to coarsen discrete variables, an exact matching method is used when matching on the industry and region code to avoid mixing continuous and discrete variables, indicating that the control and treated groups must have exactly the same NACE-year and NUTS codes to be matched.

The difference between the treated and control groups can be measured with an imbalance score. The lower that the score is, the more that the two groups overlap in terms of the variables that are measured. An imbalance score of 0 indicates perfect overlap, and an imbalance score of 1 indicates no overlap. The default algorithm for creating bins is used, except for the industry-year and region code (Blackwell et al. 2009). With four different outcome variables, it means that four different matching processes are performed, with four corresponding imbalance checks. All matching results show a decrease in all imbalance measurements, indicating that the matching was successful in creating an appropriate control group. The kernel density for the control and treated groups for each matching variable show a close similarity between the control and treatment groups after matching, which should decrease the bias in the difference-in-difference regressions.[8]

4.4 Empirical estimation

We estimate the following regression model

$$Y_{it} = \alpha_0 + \beta X'_{it} + \sum_{-5}^{8} \theta_{it} + \delta_i + \tau_t + \epsilon_{it} \quad (1)$$

where α_0 is a constant, X'_{it} is the vector of control variables described in Table 4, θ_{it} are the pre- and posttreatment dummies, δ_i are firm fixed effects, τ_t are industry-year dummies, and ϵ_{it} is an error term. The firm fixed effects account for all systematic time-indifferent differences between the control and treatment groups. θ_{it} are dummy variables equal to 1 for each 5 years before the firm receives its loan, during this year and the subsequent 8 years, allowing for a more nuanced view of the pre- and posttreatment effects from the loan than when using only a single posttreatment dummy, as is common in many other difference-in-difference regressions.

The control variables in X'_{it} are described in Table 4. The motivation for using the number of employees rather than the log of employees is the inclusion of firms with zero or one employee that receive Almi loans. The number of em-

8 All tables and figures are available upon request.

ployees and employees squared are needed to address both gains from scale and any non-linear effects. The amount of capital per employee must be controlled for because it affects the firms' production possibilities and their ability to borrow money. More capital increases the chances of a bank loan since capital can often be used as collateral. The share of highly skilled employees should control for the type of firm, e. g., if the firm produces more complex or simpler products and addresses the quality of employees.

The control variables are identical for all regressions except one: the numbers of employees and employees squared are, for obvious reasons, not included when the number of employees is estimated. Firm age has been shown to be of importance regarding firms' access to credit and is therefore controlled for (Hyytinen and Pajarinen 2008; Ferrando and Mulier 2015). To capture any heterogeneity that was not reduced by matching, industry-year and regional codes are included as dummy variables. In the regressions, two-digit industry-year codes are used, to allow for a more detailed control. Finally, a number of variables related to the Almi loan are used to control for heterogeneity in the type of firm that receives a loan. A higher interest rate should correspond to a riskier firm and possibly worse outcomes due to higher capital costs. A lower share of Almi financing to either internal or external financing should be positive since it indicates that the firm was able to raise more capital without resorting to Almi. The industry-year dummies should eliminate any business cycle effects.

Table 4: Control variables.

Variable	Description
Number of employees	
Number of employees squared	
Share of employees with tertiary education	Tertiary/primary+secondary+tertiary
Size of Almi loan	In real SEK
Size of external finance	In real SEK
Size of own finance	In real SEK
Ratio of Almi loan to other finance	Almi loan/Almi+External+Own
Industry-year codes	Two-digit NACE code grouped by year
Regional codes	NUTS2 regions

The most interesting variable in Equation 1 is θ_{it}, which measures the treatment effect on the treated firms on a year-to-year basis. Since the effect might be increasing or diminishing, it is safer to use one dummy for each posttreatment year than only one dummy that measures the average treatment effect. If the treatment effect is constant over time, using a single dummy is more efficient than using one

per year. However, since it is difficult to predict the time-varying effects of a loan, it is more prudent to use several dummies. It is interesting to see how firms behaved before they received a loan, so dummies for the five years before they received their first payment are included. This inclusion also ensures that it is possible to determine whether there is a common trend between the control and treatment groups before the treatment.

In Figures 4–7 below, the firms receive their loans on the sixth dummy, and the following eight dummies show the posttreatment effects. The choice of eight years for the posttreatment period and five for the pretreatment period is slightly ad hoc. Since the panel for Almi loans ends in 2010, and that for the registry data ends in 2013, firms that received their loans in 2010 have only three years of posttreatment observation. A longer posttreatment analysis leaves fewer observations and thus leads to larger standard errors. Similarly, a firm started in 2005 and granted is loan in 2006 will have only one pretreatment observation. Nevertheless, eight years should be more than sufficient given the average product development life cycle (Kamran 2014; Griffin 2002). Indeed, eight years might be too long a time frame since there are so many factors that can affect firms over such a long time (Mian and Sufi 2012). The results for the later treatment years should therefore be carefully considered.

It is quite common that firms that are granted a loan receive it in several payouts, creating difficulties for the posttreatment analysis. The treatment dummy is coded for the first payout for two reasons. Since the dataset is based on yearly observations, it is possible that the payouts are close, i. e., one in December and one in January, in which case they will appear to be one year apart without any practical difference. Second, when a firm has been granted a loan and knows when the money will be disbursed, it seems reasonable to assume that the firm is able to adjust its behavior.

4.5 Regression results

To illustrate how the treatment effect evolves over time, the treatment effect dummies, θ_{it}, from the matched regressions are plotted in Figures 4–7. The timing is normalized so that the loan is received by the firm in year 0, and the pretreatment years are coded as –1, –2, and so on. Posttreatment years are similarly coded as 1, 2, and so on. The previous observations show whether there is any effect on the firms before they receive their loans to ensure that there is a common trend before treatment. A different trend might exist if firms have rational expectations regarding their future needs for financing and are able to change their behaviors beforehand.

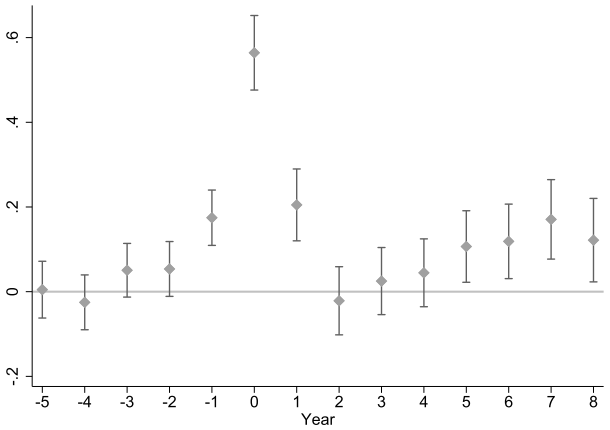

Figure 4: Effects on investment of an Almi loan.

Regressions results for the difference between firms receiving Almi loans and the matched control group over time. The treated firms receive their loans in year 0. Points show regression results with 95 percent confidence intervals.

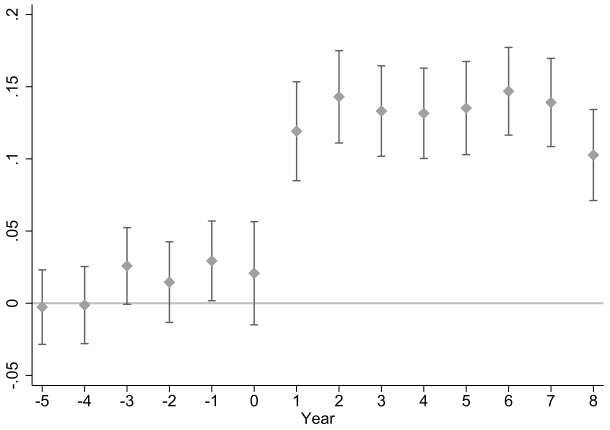

Figure 5: Effects on net sales of an Almi loan.

Regressions results for the difference between firms receiving Almi loans and the matched control group over time. The treated firms receive their loans in year 0. Points show regression results with 95 percent confidence intervals.

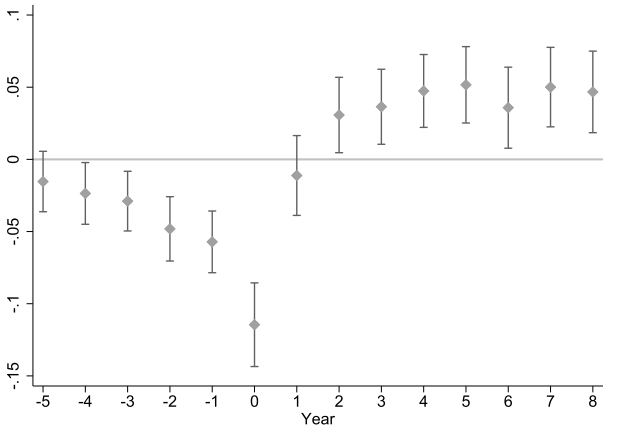

Figure 6: Effects on labor productivity of an Almi loan.

Regressions results for the difference between firms receiving Almi loans and the matched control group over time. The treated firms receive their loans in year 0. Points show regression results with 95 percent confidence intervals.

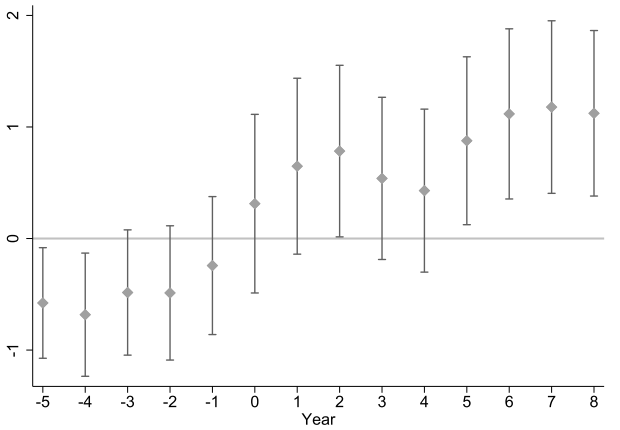

Figure 7: Effects on no. of employees of an Almi loan.

Regressions results for the difference between firms receiving Almi loans and the matched control group over time. The treated firms receive their loans in year 0. Points show regression results with 95 percent confidence intervals.

In all regressions, standard errors are clustered at the firm level to ensure that the results are not biased by firm-level correlations in the standard errors. The results do not change if one uses heteroskedasticity-robust standard errors instead.

The effect on investment is shown in Figure 4, which shows a drastic increase in investment when firms receive their loans or in the previous year, followed by a subsequent decrease and a minor increase after 5 years. The increase is consistent with the aim of the loan to finance the purchase of machinery or similar investments. Once the firm has invested, it must pay off its loan, use its new investments, and so on, which could explain the rapid decrease in investment in subsequent years. The loan did contribute to a permanent increase in the firms' capital stock due to the one-off investment and a small increase in investments roughly 5 years after the loan.

The results in Figure 5 show a large increase in sales that is both statistically and economically significant at approximately 15 percent higher sales. Labor productivity also increases after firms receive their loans, as shown in Figure 6. The posttreatment increase is statistically significant, with a point estimate 5 percent higher than in the control group. The effects on the number of employees, shown in Figure 7, show an upward trend that is significant only in the final years, equal to roughly one more employee.

The diff-in-diff methodology is based on the control and treated groups having parallel trends before the treatment (Angrist and Pischke 2008) In all regressions except for productivity, there are no significant pretreatment trend differences between the treated and control groups due to the matching and control variables, strengthening the argument that the subsequent effect is due to the loans and not to some other factor (Heider and Ljungqvist 2015). In the case of productivity, firms that borrow from Almi show declining labor productivity before they borrow from Almi. While textbook econometrics suggest that the pretreatment trends should be identical, the declining labor productivity is in line with the theoretical predictions of the behavior of credit-constrained firms. Firms with declining labor productivity will find it more difficult to obtain sufficient credit and are therefore forced to accept expensive Almi loans to ensure that they can invest and break the downward spiral.

Examining the control variables in Table 5, there is a great deal of variation. The interest rate on Almi loans is negative for all regressions except sales. It is interesting that the interest rate is negative for the regressions on employment. A high cost of capital should, ceteris paribus, increase investment in labor to substitute away from (expensive) capital. Firms that obtain loans with high interest rates from Almi might be so risky and credit constrained that they cannot afford to increase labor despite high capital costs. This high risk might explain the positive effects on sales. The share of highly skilled workers is positive for produc-

Table 5: Regressions with matched control group.

	Sales	Investments	Employment	Productivity
Pretreatment year 5	−0.0027	0.0048	−0.58**	−0.015
	(0.013)	(0.034)	(0.25)	(0.011)
Pretreatment year 4	−0.0013	−0.025	−0.68**	−0.024**
	(0.014)	(0.033)	(0.28)	(0.011)
Pretreatment year 3	0.026*	0.051	−0.48*	−0.029***
	(0.014)	(0.032)	(0.29)	(0.011)
Pretreatment year 2	0.015	0.054	−0.49	−0.048***
	(0.014)	(0.033)	(0.31)	(0.011)
Pretreatment year 1	0.029**	0.17***	−0.24	−0.057***
	(0.014)	(0.033)	(0.32)	(0.011)
First loan injection	0.021	0.56***	0.31	−0.11***
	(0.018)	(0.045)	(0.41)	(0.015)
Posttreatment year 1	0.12***	0.20***	0.65	−0.011
	(0.017)	(0.043)	(0.40)	(0.014)
Posttreatment year 2	0.14***	−0.021	0.78**	0.031**
	(0.016)	(0.041)	(0.39)	(0.013)
Posttreatment year 3	0.13***	0.025	0.54	0.036***
	(0.016)	(0.040)	(0.37)	(0.013)
Posttreatment year 4	0.13***	0.045	0.43	0.047***
	(0.016)	(0.041)	(0.37)	(0.013)
Posttreatment year 5	0.14***	0.11**	0.88**	0.052***
	(0.016)	(0.043)	(0.38)	(0.013)
Posttreatment year 6	0.15***	0.12***	1.12***	0.036**
	(0.015)	(0.045)	(0.39)	(0.014)
Posttreatment year 7	0.14***	0.17***	1.18***	0.050***
	(0.016)	(0.048)	(0.39)	(0.014)
Posttreatment year 8	0.10***	0.12**	1.12***	0.047***
	(0.016)	(0.050)	(0.38)	(0.014)
No. of employees	0.068***	0.047***		−0.0045***
	(0.0017)	(0.0016)		(0.00058)
No. of employees squared	−0.00028***	−0.00018***		0.000013***
	(0.000015)	(0.000011)		(0.0000028)
Share of highly skilled	−0.0011***	−0.00052	−0.010***	0.00054***
	(0.00023)	(0.00043)	(0.0034)	(0.00019)
Internal loan funding (log)	−0.00033	0.024***	0.022	−0.0029
	(0.0023)	(0.0055)	(0.050)	(0.0018)

Table 5: (continued)

	Sales	Investments	Employment	Productivity
External loan funding (log)	0.0057**	0.037***	0.28***	0.0073***
	(0.0027)	(0.0065)	(0.051)	(0.0024)
Interest rate on Almi loan	0.0087**	−0.019**	−0.24***	−0.00049
	(0.0035)	(0.0086)	(0.064)	(0.0032)
Share of Almi/total funding	−0.069**	−0.26***	0.46	−0.031
	(0.032)	(0.083)	(0.66)	(0.030)
Firm age	0.0023**	−0.020***	0.11***	0.0039***
	(0.0010)	(0.0020)	(0.027)	(0.00071)
Constant	7.94***	3.45***	11.9**	6.40***
	(0.087)	(0.48)	(5.57)	(0.070)
Observations	123662	99767	89685	120323
Number of firms	13054	13539	8036	13189
R^2	0.343	0.066	0.086	0.047

Standard errors in parentheses. *p < 0.1, **p < 0.05, ***p < 0.01.
Dependent variables: log sales, investments, employment and productivity. Cluster robust s. e. at firm level. Firm, industry-time and regional fixed effects.

tivity, which is what could be expected from human capital theory, and especially strong since sales are significantly negative. Firm age is positive for all regressions except investments, suggesting that younger firms have greater needs for investments than more mature firm. Older firms, in turn, have more employees, greater sales and higher productivity.

Comparing the results from the matched control-treatment group in Table 5 with the unmatched results in Table 6, the results differ in several dimensions. Almi firms have a negative sales trend before their loans compared to the average Swedish firm, rather than the matched control group. Employment and productivity also have larger, more significant, negative pretreatment trends. Examining the posttreatment effects, they are similar in terms of investments and sales but slightly lower for employment and productivity. The differences are, however, quite small, most likely due to the firm-specific effects that remove unobserved firm heterogeneity.

Considering the overall effects, Almi's lending seems to boost a one-off investment in physical capital. This investment translates into higher sales and labor productivity but shows less effect when it comes to increasing employment. This outcome is consistent with the theoretical prediction regarding credit-constrained firms, but it is not entirely in line with Almi's goal of increasing employment in the targeted firms.

Table 6: Regressions without matched control group.

	Sales	Investments	Employment	Productivity
Pretreatment year 5	−0.066***	−0.036	−0.66***	−0.035***
	(0.013)	(0.032)	(0.19)	(0.010)
Pretreatment year 4	−0.063***	−0.053*	−0.67***	−0.044***
	(0.013)	(0.031)	(0.21)	(0.010)
Pretreatment year 3	−0.068***	0.00035	−0.53***	−0.060***
	(0.013)	(0.030)	(0.20)	(0.010)
Pretreatment year 2	−0.053***	0.018	−0.35*	−0.066***
	(0.013)	(0.030)	(0.21)	(0.011)
Pretreatment year 1	−0.061***	0.13***	−0.17	−0.083***
	(0.014)	(0.030)	(0.21)	(0.010)
First loan injection	−0.072***	0.63***	0.010	−0.12***
	(0.015)	(0.036)	(0.25)	(0.013)
Posttreatment year 1	0.097***	0.31***	0.59**	−0.040***
	(0.014)	(0.035)	(0.25)	(0.012)
Posttreatment year 2	0.16***	−0.054	0.81***	0.038***
	(0.014)	(0.033)	(0.24)	(0.011)
Posttreatment year 3	0.17***	0.0095	0.78***	0.054***
	(0.013)	(0.032)	(0.23)	(0.011)
Posttreatment year 4	0.17***	0.048	0.72***	0.056***
	(0.013)	(0.032)	(0.22)	(0.010)
Posttreatment year 5	0.17***	0.11***	0.97***	0.054***
	(0.013)	(0.033)	(0.21)	(0.010)
Posttreatment year 6	0.18***	0.12***	1.03***	0.041***
	(0.012)	(0.035)	(0.21)	(0.011)
Posttreatment year 7	0.17***	0.14***	1.03***	0.056***
	(0.012)	(0.037)	(0.21)	(0.010)
Posttreatment year 8	0.15***	0.14***	1.08***	0.050***
	(0.012)	(0.039)	(0.21)	(0.011)
No. of employees	0.063***	0.040***		−0.0070***
	(0.00041)	(0.00046)		(0.00018)
No. of employees squared	−0.00024***	−0.00014***		0.000023***
	(0.0000030)	(0.0000027)		(0.00000089)
Share of highly skilled	−0.00022***	−0.00049***	−0.0088***	0.00039***
	(0.000054)	(0.00012)	(0.00085)	(0.000045)
Internal loan funding (log)	−0.0063***	0.026***	−0.015	−0.0057***
	(0.0020)	(0.0049)	(0.032)	(0.0017)

Table 6: (continued)

	Sales	Investments	Employment	Productivity
External loan funding (log)	0.0053**	0.038***	0.21***	0.0075***
	(0.0023)	(0.0055)	(0.034)	(0.0020)
Interest rate on Almi loan	0.0073***	−0.028***	−0.15***	−0.00062
	(0.0027)	(0.0067)	(0.034)	(0.0025)
Share of Almi / total funding	−0.055**	−0.28***	0.53*	−0.039
	(0.026)	(0.068)	(0.31)	(0.024)
Firm age	0.0018***	−0.016***	0.094***	0.0035***
	(0.00025)	(0.00056)	(0.0063)	(0.00018)
Constant	7.52***	4.86***	4.91	5.53***
	(0.17)	(0.32)	(3.25)	(0.16)
Observations	2039772	1388105	2043971	1992868
Number of firms	335936 285593	336505	329714	
R^2	0.271	0.034	0.031	0.036

Standard errors in parentheses. *p < 0.1, **p < 0.05, ***p < 0.01.
Dependent variables: Log sales, investments, employment and productivity. Cluster robust s. e. at firm level. Firm, industry-time and regional fixed effects.

4.6 Robustness checks

To ensure that the results do not depend on the current choice of variables or sample size, a number of robustness tests are performed.[9] To begin, the total treatment effect is measured by replacing the yearly treatment dummies with a single post-treatment dummy that captures the total treatment effect. The matched coefficient for sales is 0.15; for employment, it is 1.69; for investments, it is 0.18; and for labor productivity, it is 0.11, with all results significant at $p < 0.01$. Comparing these results to the results in Table 5, it seems reasonable to suggest that the average effect for investments is slightly misleading. Firms that borrow from Almi make a one-off, large, investment in physical assets that translates into a larger capital stock. The total effect for employment is also larger than the yearly average, suggesting that Almi's loans do in fact trigger some employment growth equal to approximately one-and-a-half more employees in the treated firms.

Value added per employee is an estimate of labor productivity. If one instead wants to measure total factor productivity, methods such as those suggested by Levinsohn and Petrin (2003); Petrin et al. (2004) and Wooldridge (2009) can be

9 All regression tables are available on request.

used. The productivity regressions are therefore re-estimated after switching the dependent variable from labor productivity to total factor productivity. The results are insignificant or weakly positive, suggesting that Almi loans increase labor productivity (most likely due to increased net sales) but do not have as large an effect on total factor productivity despite the increase in the firms' capital stock.

Different types of loans could have different effects due to the design of the loan but especially due to selection. According to Figure 3, the most common loan type is "Growth Loans". These loans are also the highest risk loans, specifically aimed at firms with greater credit constrains. Re-running the regressions for all outcome variables and splitting the sample between firms that received Growth Loans from all other types of loans show that the positive effects come from not receiving Growth Loans. Firms that received Growth Loans show negative, but insignificant, posttreatment results. When these firms are removed, the results for all other firms are slightly higher than those shown in Table 5, suggesting that the Growth Loan goes to too risky firms, without sufficient ability to invest the money productively.

Given the existence of adjustment costs of employment in the form of hiring and firing costs, a static OLS specification might not be suitable in the Swedish context since the labor protection laws are relatively strict, and employers are cautious regarding hiring new workers.[10] Instead, a lagged dependent variable approach with either OLS or a GMM estimator is prudent for addressing strong persistence and autocorrelation over time (Roodman 2009). The results from the lagged dependent variable models show weakly significant and negative effects on employment, either when estimating with one posttreatment dummy or yearly, which differ from the results shown in Figure 7. Considering both methods, this outcome suggests that the employment effect from the loans is likely to be small or non-existent. This seems to be in line with previous research that finds that rigid labor market laws reduces leverage and makes firm reluctant to increase their labor force, since this makes it more difficult for the firm to quickly adjust to changing market conditions.

Different sized firms might affect the results as well since smaller firms might have less access to credit than larger firms. Larger firms might have longer credit histories, better collateral and stronger administrative capabilities than smaller firms. To investigate whether the effects are different for slightly larger firms, the regressions are re-run for firms with 10 or more employees and for firms with 10 or fewer employees. For larger firms, the investment pattern remains the same as the

10 For a detailed analysis of Swedish employment protection and its effects, see, e. g., Bjuggren (2018) and Bornhäll et al. (2017).

main result, but the positive results on productivity and sales disappear. Among firms with 10 or fewer employees, the long-term results are positive for sales, productivity and employment. This finding suggests that the positive results found in the main regressions above were driven by the smallest firms in the sample. These firms should also be the most affected by credit market failures, and it is reasonable that they therefore benefit the most from Almi loans.

Most firms that borrow from Almi also borrow from commercial banks, as previously described. To attempt to separate the extensive margin from the intensive margin, regressions are run using firms that borrow exclusively from Almi. This measure is imperfect since these firms are different from the average Almi borrower and are a fairly small sub-group. Still, it is an interesting sample, especially since these firms might be more credit constrained than other firms. Only sales remains positive, with productivity now becoming non-significant, suggesting that it is more efficient to increase access to credit on the intensive, rather than the extensive, margin.

5 Conclusions

This paper aimed to study the effects of increasing SMEs' access to credit via public bank loans to firms. The results indicate that firms with low productivity and large amounts of debt choose expensive Almi loans along with commercial loans. To reduce selection bias when estimating the treatment effect, a matching and difference-in-difference approach was used. While this approach does not entirely eliminate the bias, the matching results show that the control group is similar to the treatment group. The results are also robust to several different parameters and estimation methods.

The effects shows a substantial increase in investments for the year in which the firm receives its loan and afterward, followed by increases in sales and productivity for firms with 10 or fewer employees. This finding seems reasonable given the theoretical view that small firms are more credit rationed than other firms, and the added capital allows them to increase their sales and productivity. It could also be the case that larger firms are in such a dire situation that the loans are unable to boost them to a sufficient degree. It is, however, difficult to disentangle the exact reason for the success of the loans to small firms and the relative failure of the loans to larger firms. Further studies could hopefully address this issue.

Despite the increase in sales, there is less evidence for a large increase in the number of employees. There are several possible explanations for this lack of evidence. Firms might lack a desire to grow more than their current size, which would

require the firm owner to accept even more responsibility for the personnel and potentially to work harder. There might be a lack of individuals with the correct skills to hire, rendering it difficult to find a good match. The increase in the capital stock could allow the firm to substitute labor for capital by, e. g., replacing manual labor for machines. Finally, Sweden's strict labor protection laws might make firms reluctant to hire.

For other countries than Sweden, especially those with similarly regulated labor markets, increasing SMEs' access to credit can have positive effects for productivity and therefore economic growth, but it is not as efficient a way to reduce unemployment. However, the results could differ in countries with weaker financial markets, especially countries that still suffer from the effects of the recent financial crisis (Ferrando et al. 2017). It should be noted that most OECD-countries do increase access to SME credit with credit guarantees, rather than using Sweden's more hands on method of direct lending in conjunction with commercial banks. From an economic perspective, the methods should however be quite similar in terms of increasing credit supply. One caveat is that increasing public subsidies, either via joint-lending or via credit guarantees, might not expand the credit supply as much as increase profits for commercial banks that are able to offload risk onto the taxpayers.

While this paper attempts to control for selection bias, it is possible that firms without Almi loans would still have been able to raise sufficient amounts of credit. Commercial banks are able to reduce their risk by demanding that firms that they otherwise would lend to also seek Almi loans. In these cases, Almi increases the profits of commercial banks by reducing their credit losses in cases of default and does not increase overall access to credit. If so, then the main beneficiary of Almi's loans might be the shareholders of commercial banks that are able to reduce their risk. This problem is similar to efforts to increase firm access to credit via credit guarantees, which are common in, e. g., the U.S. and Germany. While the gains in sales and labor productivity are substantial, they must also be weighed against the costs of collecting taxes to fund Almi, which could be high in Sweden due to high marginal taxes and hence the high cost of public funds (Lundberg 2017).

Despite several caveats, Almi seems to be successful in increasing firm growth via expensive loans to credit-constrained firms. The results vary between firm types, with the greatest effect coming from firms with 10 or fewer employees that also have a commercial bank loan as well. This outcome suggests that, while it is possible to increase economic growth via increased access to credit, it is important to target this credit to the types of firms that most use addition credit, such as small firms that are restricted on the intensive, rather than the extensive, margin.

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Appendix A. Information on Almi loans and background statistics

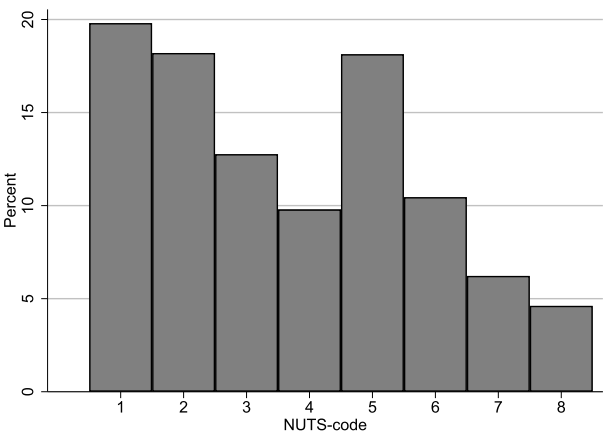

Figure 8: Distribution of Almi's regional lending.

The percentage of loans to firms depending on their location. Location is defined as NUTS region, with a total of 8 different regions. 1=Stockholm, 2=East Middle Sweden, 3=Småland and the islands, 4=South Sweden, 5=West Sweden, 6=North Middle Sweden, 7=Middle Norrland, 8=Upper Norrland.

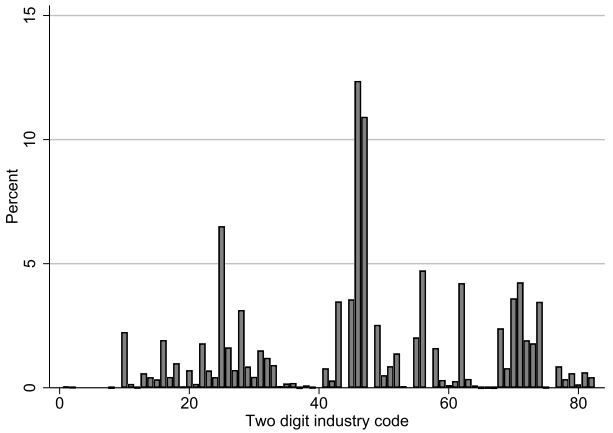

Figure 9: Distribution of Almi's financed industries.

Industries on a two-digit scale. Translation of codes provided in Table 7.

Table 7: Description of industry codes.

Industry Code	Translation
01	Crop and animal production, hunting and related service activities
02	Forestry and logging
03	Fishing and aquaculture
05	Mining of coal and lignite
06	Extraction of crude petroleum and natural gas
07	Mining of metal ores
08	Other mining and quarrying
09	Mining support service activities
10	Manufacture of food products
11	Manufacture of beverages
12	Manufacture of tobacco products
13	Manufacture of textiles
14	Manufacture of apparel
15	Manufacture of leather and related products
16	Manufacture of wood and of products of wood, cork, straw and plaiting materials, except furniture
17	Manufacture of paper and paper products
18	Printing and reproduction of recorded media
19	Manufacture of coke and refined petroleum products
20	Manufacture of chemicals and chemical products
21	Manufacture of basic pharmaceutical products and pharmaceutical preparations

Table 7: (continued)

Industry Code	Translation
22	Manufacture of rubber and plastic products
23	Manufacture of other non-metallic mineral products
24	Manufacture of basic metals
25	Manufacture of fabricated metal products, except machinery and equipment
26	Manufacture of computer, electronic and optical products
27	Manufacture of electrical equipment
28	Manufacture of machinery and equipment n. e. c.
29	Manufacture of motor vehicles, trailers and semi-trailers
30	Manufacture of other transport equipment
31	Manufacture of furniture
32	Other manufacturing
33	Repair and installation of machinery and equipment
35	Electricity, gas, steam and air conditioning supply
36	Water collection, treatment and supply
37	Sewerage
38	Waste collection, treatment and disposal activities; materials recovery
39	Remediation activities and other waste management services
41	Construction of buildings
42	Civil engineering
43	Specialized construction activities
45	Wholesale and retail trade and repair of motor vehicles and motorcycles
46	Wholesale trade, except motor vehicles and motorcycles
47	Retail trade, except motor vehicles and motorcycles
49	Land transport and transport via pipelines
50	Water transport
51	Air transport
52	Warehousing and support activities for transportation
53	Postal and courier activities
55	Accommodation
56	Food and beverage service activities
58	Publishing activities
59	Motion picture, video and television program production, sound recording and music publishing activities
60	Programming and broadcasting activities
61	Telecommunications
62	Computer programming, consultancy and related activities
63	Information service activities
64	Financial services activities, except insurance and pension funding
65	Insurance, reinsurance and pension funding, except compulsory social security
66	Activities auxiliary to financial services and insurance activities
68	Real estate activities
69	Legal and accounting activities

Table 7: (continued)

Industry Code	Translation
70	Activities of head offices; management consultancy activities
71	Architectural and engineering activities; technical testing and analysis
72	Scientific research and development
73	Advertising and market research
74	Other professional, scientific and technical activities
75	Veterinary activities
77	Rental and leasing activities
78	Employment activities
79	Travel agency, tour operator and other reservation service and related activities
80	Security and investigation activities
81	Services to buildings and landscape activities
82	Office administrative, office support and other business support activities
84	Public administration and defense; compulsory social security
85	Education
86	Human health activities
87	Residential care activities
88	Social work activities without accommodation
90	Creative, arts and entertainment activities
91	Libraries, archives, museums and other cultural activities
92	Gambling and betting activities
93	Sports activities and amusement and recreation activities
94	Activities of membership organizations
95	Repair of computers and personal and household goods
96	Other personal service activities
97	Activities of households as employers of domestic personnel
98	Undifferentiated goods- and services-producing activities of private households for own use
99	Activities of extraterritorial organizations and bodies

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