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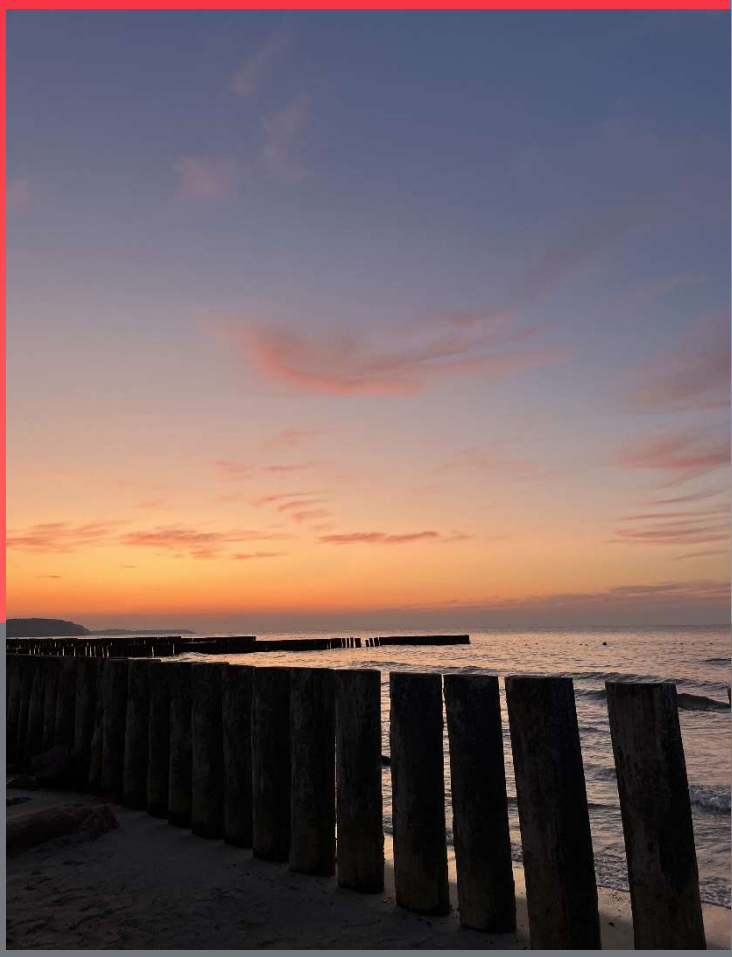

THE EFFECT OF SUBSIDIZED LENDING PROGRAMS ON THE ECONOMIC PERFORMANCE OF SMALL AND MEDIUM-SIZED ENTERPRISES: EVIDENCE FROM RUSSIA

No. 140 / December 2024

WORKING PAPER SERIES

E. Bessonova
S. Popova
K. Styrin

Evguenia Bessonova
Bank of Russia and HSE University. Email: BessonovaEV@cbr.ru

Svetlana Popova
Bank of Russia. Email: PopovaSV@cbr.ru

Konstantin Styrin
Bank of Russia and NES. Email: StyrinKA@nes.ru

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Address: 12 Neglinnaya street, Moscow, 107016
Tel.: +7 495 771-91-00, +7 495 621-64-65 (fax)
Website: www.cbr.ru

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Abstract

We study the effect of the participation in a subsidized lending program on economic outcomes of small and medium-sized enterprises (SMEs) in Russia. The estimated effect on sales and employment is statistically and economically significant and robust. The annual growth of sales increases by 10.7-11.4 p.p. and of employment by 4-7 p.p. The effect on profits is sizeable but not robust, being very sensitive to the way the control sub-sample is constructed.

Keywords: Firm dynamics; Small and medium-sized enterprises; Subsidized lending; Loan guarantee programs.

JEL Codes: D22, G38, L25.

1 Introduction

In all countries small and medium-sized enterprises (SMEs) experience limited access to external financing. Economics research emphasizes information asymmetry as the main cause why SMEs are underfinanced. Namely, commercial banks are not able adequately assess credit risk on loans to SMEs and there for are inclined to refuse in financing to a substantial number of borrowers from this category of enterprises.

To resolve the problem of the SME financing gap, which is due to this market failure, SME subsidized lending programs of various sorts exist almost in all countries, but wherein there us a great degree of heterogeneity in terms of implementation of these programs and targeted SME groups.

Since the design of subsidized lending and government guarantee programs varies considerably, a new strand of literature has emerged where the impact evaluation of these programs in different countries (mainly, in the EU where such programs are more widespread) is done. Since recently, the impact evaluation is normally carried out using the difference-in-differences method with alternative approaches to the construction of control group for a specific study.

In most cases, the main objective of subsidized lending programs, which government authorities have in mind, is to support employment in small and medium-sized businesses. Indeed, the empirical analysis carried out for different countries and different time spans suggests that subsidized loans and/or government guarantees usually leads to a rise in employment in SMEs. Many studies also find a positive effect of sales growth. Some studies document a positive effect from the participation in subsidized lending programs on productivity and profitability of SMEs, although these estimates are not always robust.

This paper studies the effect of subsidized lending programs on the economic outcomes of SMEs in Russia. More specifically, we consider the effect on sales, profits, and the number of firm's employees. In this study, we use credit register data for 2018–2019. We have chosen this particular time period in order to isolate the effect of subsidized lending from the influence of the COVID-19 pandemic and economic sanctions in the subsequent

time period.[1]

Our estimates suggest that the participation in a subsidized lending program in 2019 had a positive effect on SME employment and sales. The estimated effect is statistically and economically significant. According to our estimates, a subsidized loan makes sales grow faster by 10.5–14.7 p.p. and employment by 4–7 p.p. during the year of loan reception. For profitability, We find a positive and statistically significant in some specifications but not in the others, so this result is not robust.

The rest of the paper is structured as follows. Section 2 surveys related literature. Section 3 lays out methodology. Section 4 describes data. Section 5 presents findings. Section 6 concludes.

2 Related literature

Economic studies based on bank-level data as well as on surveys of firms have demonstrated that the access to bank finance for small business is substantially worse than for big enterprises. The terms of credit for SMEs also appear less favorable than for larger market participants.

The main reason of low level of lending to SMEs, which is highlighted in the economics literature, is the problem of asymmetric information, since it is more pronounced in the case of small business. Banks are not able adequately assess the risk related to granting loans to such firms, and this is why, in most instances, they just refuse to approve any loans to small businesses. Furthermore, various studies also emphasize the tendency that credit organizations offer loans on stricter terms due to high estimated risk (the causes of the under-financing of SMEs are surveyed in detail in Abdulsaleh and Worthington [2013]). Statistical data show that if a small business manages to get an access to financing, then the comparison of asset composition indicates that SMEs turn

[1]Subsidized loans to SMEs during the COVID-19 pandemic had very special features that are difficult to compare other subsidized lending programs. Over that period, a substantial number of loans granted were small-size and short-term. However, the effect of subsidized lending on small and micro enterprises during the pandemic is close to what we find of our study. Furthermore, a positive effect on employment and sales was documented (see "Distressed firms and loan guarantee programs during the COVID-19 crisis," Bank of Russia working paper No. 102, November 2022)

out to be more indebted than larger companies, with loan rates for small businesses being always higher (see Ciani et al. [2015] based on EU data).

The opportunities for raising external financing for SMEs may differ on different stages of the company's life cycle (Berger and Udell [1998]). At the point when a company is established and during first years of its existence, the access to bank finance is substantially limited due to the absence of credit history and the data on company's operations and due to the high risk of business closure. Thus, during first years of their existence SMEs have to rely almost exclusively on internal and/or informal sources of finance (Klapper et al. [2002]; Quartey [2003]). The SME organizational structure, which often implies either a single owner or a highly concentrated ownership, also creates barriers to raising external finance since it increases the informational opaqueness with regard to internal financial flows on the enterprise and raises the likelihood of collateral requirement from the part of financiers (Hutchinson [1999]; Petty and Bygrave [1993]). Thus, SMEs to a large degree have to rely on internal sources for the expansion of the scale of production, which might reduce the potential of the company's development.

The empirical analysis shows that young firms tend to be in need for external finance more often, since, in contrast to firms that are on the market for a long time, they do not have the opportunity to accumulate their own earnings to invest them in the growth and development of the company (Gregory et al. [2005]; Sánchez-Vidal and Martín-Ugedo [2005]). Klapper et al. [2002] and Quartey [2003] also confirm that young firms have to rely on informal sources of finance and that only as long as a company matures it manages to get the access to bank lending. The problem of raising external finance appears especially severe for micro enterprises, newly established firms, small firms involved into innovative activities, and also for companies located in geographically remote and underdeveloped regions (Brown and Lee [2018]; Cassar [2004]; Carpenter and Petersen [2002]).

Theoretical models also point out that the availability of different sources of finance for SMEs depends considerably on the type of an enterprise. On the one hand, slow-growing SMEs can rely on internal sources of finance without seeking external sources. On the other hand, fast-growing SMEs, especially in the innovative area, are in the

need of external sources of finance. In the latter case, since the problem of asymmetric information is aggravated by the higher riskiness of a business, it gets even harder for these firms to raise external finance from any sources (see Brown and Lee [2018] for a detailed survey of theoretical models).

Substantial difficulties of raising external finance faced my SMEs and a hight cost of borrowed funds, especially during the early years of existence, narrow the opportunities for growth and sustainable development of this form of business. The economics literature relates this "SMEs' financing gap" to that because of the problem of asymmetric information the market is not able to deliver the efficient level of external finance of small and medium-sized businesses (Chatzouz et al. [2017]; Beck and Demirguc-Kunt [2006]). The presence of market failures requires government intervention in order to provide SMEs with a sufficient for sustainable development level of external financing (Bechri et al. [2001]; Boocock and Shariff [2005]; Riding et al. [2007]; Zecchini and Ventura [2009]). The "SMEs' financing gap" is viewed as a problem that requires government policy intervention since the under-financing of small businesses is likely to yield losses in output, employment, and productivity at the aggregate level (OECD [2006]). For this reason, governments in all countries develop programs of subsidized lending for SMEs with the purpose to increase the number of enterprises that are able to obtain bank credit, to expand the horizon of lending, and to reduce the cost of such lending for small businesses.

The use of subsidized lending programs in most cases is viewed as a more efficient way for the government to supports small businesses than direct subsidies since, on the one hand, subsidized lending implies the repayment of the main part of funds by a firm, on the other hand, it implies the interaction between market participants (a bank and a firm) where the bank is interested in the adequate evaluation of the risk of default, and this should reduce the likelihood of the inefficient allocation of loans supported/funded by the government program.

However, the attitude towards the efficiency of the SMEs support government programs in the economics literature has not always been unanimous. Some authors assert

that, in general, SMEs support programs, which facilitate the access to finance, prove to be efficient since they make up for/correct market failures (Bechri et al. [2001]; Boocock and Shariff [2005]). Others stress the importance of the design of a program, especially with regard to offering an non-discriminated access for different market participants who need additional financing for development (Riding et al. [2007]; Zecchini and Ventura [2009]).

Provided that it is not straightforward to estimate the unsatisfied demand for finance by SMEs, such studies typically are based on surveys since the share of refused commercial loan applications often does not account for a significant part/group of SMEs that would have taken a loan on more favorable terms whereas, given the existing commercial loan offerings, they do not even bother to apply for bank loans. The estimation of unsatisfied loan demand are done relatively rarely due to the difficulty of collecting data necessary for analysis.

Subsidized lending programs for SMEs, in one form or another, exist virtually in all countries but, at the same time, a large degree of heterogeneity is observed in terms of approaches to the implementation of these programs and of targeted SMEs groups. Given that the design of subsidized lending and government guarantees programs varies substantially, a new thread of literature has emerged that performs the impact evaluation for these programs in different countries (mainly, in the EU where these programs are more widespread). In recent years, the analysis of impact evaluation usually is implemented by the difference-in-differences method combined with various approaches to the appropriate construction of control group for running a study.

Most often, the principle objective of subsidized lending programs, which governments have in mind, is the support of employment in small and medium-sized businesses. Indeed, the empirical analysis shows that subsidized loan or government guarantees programs typically lead to an increase in employment in SMEs. Cassano et al. [2013] analyzed EBRD support programs for micro, small, and medium-sized enterprises in a number of transition economies (Bulgaria, Georgia, Russia, and Ukraine). Their study has found a significant positive effect of receiving credit on main economic outcomes of a firm

(employment, earnings, fixed capital). Using data on EU-sponsored subsidized lending programs in Central and Eastern Europe in 2005-2012, Asdrubali and Signore [2015] have documented a positive effect on the employment and sales growth. Gereben et al. [2019] analyze support programs of the European Investment Bank (EIB) in Central and Eastern Europe in 2008–2014 and find that the loans of the EIB resulted in the growth in employment, earnings, and also profitability of firms. Brown and Earle [2017] also find a positive effect of the participation in one subsidized lending program on the employment growth for SMEs, the positive influence being stronger for young firms as well as for larger enterprises. Bertoni et al. [2018] also find a positive influence of the participation by French small businesses in subsidized lending programs on job creation. A study by Bertoni et al. [2019] based on data covering several countries has demonstrated a positive long-run effect of the participation in subsidized lending programs in the EU in 2002–2016 on the growth in employment, sales, and assets of SMEs. The estimates obtained in this study suggest that the effect is more pronounced for smaller and younger firms. Bertoni et al. [2019] explain the difference in the estimated effect across countries not by country specifics but rather the composition of program participants by size and age. It is worth noting that this study does not find a positive influence on earnings. Using data on Korea for 2000–2003, Oh et al. [2009] also show the presence of a positive effect of the participation in subsidized lending programs on the size of enterprise and the likelihood to survive although no positive effect on investment growth in SMEs is found.

At the same time, some studies based on data of transition and developing economies did not find any positive effect of the participation in various subsidized lending programs on the economic outcomes of SMEs. The absence of positive influence is usually associated with a limited coverage of SMEs. For example, a study based on Croatia has shown a fairly low rate of approval of loan applications on subsidized lending programs for SMEs (Cziráky et al. [2005]). In underdeveloped countries, more efficient proved to be those programs that distributed loans of relatively small size among large number of borrowers (Satta [2006]).

Overall, the authors of studies on advanced economies have found a positive influ-

ence of the participation in various programs of subsidized lending on the employment and sales growth for SMEs. The influence on the indicators of efficiency (profitability and productivity) as well as of innovative activity and the likelihood of survival on the market not always appear statistically significant. Recently, a few papers have studied the relationship between subsidized and commercial lending. For example, Bach [2014] make an attempt to show on the level of firms that the obtaining of a subsidized loan by a SME does not lead to a reduction of the use of other lending sources. Using data of euro zone for 2009–2020, Boccaletti et al. [2024] have shown that the participation in government-sponsored SMEs support programs can increase the likelihood of raising additional financing via market mechanisms in the future.

3 Methodology

We employ the method Difference-in-Differences (DiD), which is commonly used in policy evaluations studies similar to ours. The starting point is a conventional DiD specification:

$$Y_{i,t} = \beta_0 \, POST_t + \beta_1 \, TREAT_i \times POST_t + \alpha_i + \epsilon_{i,t} \tag{1}$$

where $i \in \{1, \ldots, n\}$ is a firm; $t \in \{2018, 2019\}$ is time; $Y_{i,t}$ firm i's economic outcome of interest in year t; $TREAT_i = 1$ if firm i received a subsidized loan in 2019 and 0 otherwise; $POST_t = 1$ if $t = 2019$ and 0 if $t = 2018$; α_i are firm fixed effects that absorb all time-invariant firm-specific factors, such as the quality of management as well as $TREAT_i$; $\epsilon_{i,t}$ is regression error. Subtracting equation (1) for 2018 from (1) for 2019 yields equation

$$\Delta \, Y_{i,2019} = \beta_0 + \beta_1 \, TREAT_i + u_{i,2019} \tag{2}$$

where $\Delta \, Y_{i,2019} \equiv Y_{i,2019} - Y_{i,2018}$; and $u_{i,2019} \equiv \epsilon_{i,2019} - \epsilon_{i,2018}$.

Specification (2) is the main specification. It essentially represents the comparison of the average growth of Y in 2019 between treated firms, i.e. those that received a subsidized loan in 2019, and untreated firms, i.e. those that did not.

The parameter β_0 is interpreted as a common trend (time fixed effect) in Y for treated and untreated in the absence of treatment. An important identifying assumption needed for the DiD to produce consistent estimates is *common trends*, i.e. that in the absence of treatment the average $\Delta Y_{i,2019} \equiv Y_{i,2019} - Y_{i,2018}$ would the same for the treated and for the untreated. Obviously, this cannot be verified for 2019 since the counterfactual outcome for the treated of being untreated is not available. But one can check the equality of trends in the pre-treatment period 2018.

To test the parallel trend assumption we estimate the following regression:

$$\Delta Y_{i,2018} = \gamma_0 + \gamma_1 \, TREAT_i + u_{i,2018} \tag{3}$$

where $\Delta \, Y_{i,2018} \equiv Y_{i,2018} - Y_{i,2017}$; and $TREAT_i$ is defined as before. The null hypothesis of parallel trends in the pre-treatment period is

$$H_0 : \quad \gamma_1 = 0 \tag{4}$$

The identifying assumption is that the equality of trends in the absence of treatment, if present, persists from 2018 to 2019. Essentially, the coefficient β_1 in specification (2) has the interpretation of the average difference in $\Delta Y_{i,2019}$ between an average treated and an average untreated firm assuming that, in the absence of treatment, the $\Delta \, Y_{i,2019}$ would be the same between the two groups of firms.

In a sense, the test of parallel trends might seem redundant provided that we carefully construct our control group with the use of the Coarsened Exact Matching (CEM) method [Iacus et al., 2012]. In our dataset, a relatively small fraction of firms, only about 7.5 percent, received subsidized loans in 2019 so that each firm in the remaining pool of untreated can potentially be included to the control group in the sub-sample that we use to estimate our regression (2). The CEM offers a specific procedure to select untreated units to the control group. For each treated firm, it finds an untreated counterpart that is similar in terms of the set of pre-treatment characteristics. If a sufficiently close match is not identified, the respective treated unit is discarded. Given that the set of

pre-treatment characteristics, which serve as the base for matching, is comprehensive enough, the approach yields a well balanced estimation sample, and this can be formally tested. Section 4 provides some additional details about the implementation of the CEM in our study.

4 Data

This study employs three sources of data. First, economic indicators of individual firms, namely, sales, employment, and earnings before taxes (EBT) are obtained from their annual financial reports, and these reports are provided by the SPARK, a financial data service. Second, the information needed to construct the *TREAT* dummy is taken from the credit registry, reporting form 0409303. The credit registry covers all business loans granted by commercial banks in Russia since 2017. Among other variables, the data contains an indicator of a subsidized loan. Detailed data on subsidized loans began to be collected only in 2024. Prior to this, the banks provided data to the credit register only about whether the provided loan refers to the subsidized or not. Thus, we cannot distinguish by what SME support programs subsidized loans were received if we are considering the period from 2018 to 2019. In 2023, the Service of the Consumer Rights Protection of the Bank of Russia, the Service hereafter, conducted a survey of several banks on the implementation of one of the SME support programs, namely, the Program for Stimulating Lending to SMEs (PSK hereafter). We use this survey data as a third data source. Since this data is collected only for one of the existing programs and not all participating banks took part in the survey, we use this data mainly for robustness check. Table 1 contains the definition of variables involved in the subsequent analysis.

The universe of SMEs amounts to 4 962 038 unique IDs. These are firms that at least once were listed on the official registry of SME over the period of 2017-2023. In 2018, the composition of the pool of SMEs was 91.3% micro, 7.9% small, and 0.8% medium-size firms.

The credit registry covers the time period since 2017. As of the end of 2023, it

contained records of 5 857 738 business loans. The number of unique SME borrowers on the same date was 517 778, of which 16 475 medium-size, 110 338 small, and 390 965 micro firms.

Table 2 shows the distribution of loans to SMEs between subsidized and regular ones according to the credit registry. One can see that the share of subsidized loans typically does not exceed 15% of all loans granted to SMEs, the pandemic 2020 year being a notable exception. In absolute terms, subsidized loans have a tendency to remain roughly constant over time whereas the number of regular loans demonstrates a steady growth.

The list of subsidized loans provided by the Service contains 9 645 unique IDs, of which 983 medium-size, 4 192 small, and 4 470 micro firms. It covers the time period from 2015 to October 2023 and 26 332 loans.

The official registry of SMEs, both with and without loans, has 3 950 607 unique IDs over the period 2018-2019. Table 3 shows the distribution of indebtness of SMEs in 2018–2019. One stark observation is that the overwhelming majority of SMEs, 3 340 492 out of 3 950 607, do not ever take loans, either commercial or subsidized. Among those who do, some firms are stuck to commercial credit in both years, others, although on a smaller scale, to subsidized loans. There are firms that have both commercial and subsidized loans on their balance sheet. Some firms switch from commercial loans in 2018 to subsidized loans in 2019, some others take the opposite route. In terms of counts, borrowing on commercial terms naturally dominates subsidized loans.

For this study, we merged the official registry of SME, the credit registry, and the financial statements of firms. All variables were winsorized at 1%. In addition, the firms that were granted oversized subsidized loans were discarded from the analysis. Only those firms, for which data on sales, employment, and EBT for 2018–2019, were kept, and the rest were discarded.

The way to construct the treatment group is straightforward. We include there all firms that received a subsidized loan in 2019 according to the credit registry. The construction of the control group is tricky. Table 4 suggests that the subpopulation of untreated firms, i.e. those that did not receive subsidized loans in 2019, is dominated

by micro enterprises. It follows that if we draw firms from the pool of untreated units randomly then the composition of the resulting control group will be severely biased toward micro firms and therefore be very different from the composition of the treatment group so that the estimation sample will be unbalanced as a result. In order to avoid this unwanted outcome, we employ the method of Coarsened Exact Matching (CEM) [Iacus et al., 2012].

Before running the CEM, some preliminary preparation of data was done. On the first stage, All firms from the treatment group were stratified along four dimensions:

1. region of the Russian Federation;
2. industry/sector according to the broad classification of OKVED 2;
3. age: older than 15 years, 10 to 15 years, 5 to 10 years, 3 to 5 years, and younger than 3 years;
4. size as measured by sales and labor productivity.

This stratification stage ends up in 1,192 strata.

On the second stage, we draw up to 15 candidates, depending on availability, from the pool of untreated units, i.e. those firms that did not receive a subsidized loan in 2019, for each stratum. As a result, we obtain the average number of candidate controls per stratum equal to 11.6.

Table 5 contains descriptive statistics for the pre-treatment period 2018, separately for the treatment and control groups. One can see that the descriptive statistics are very much alike between the two groups, which suggests that the two subsamples are well-balanced one with respect the other.

The CEM method, which is used on the second stage for the construction of the control subsample, plays the role of "fine tuning." Inside each stratum, it identifies a control observation that is the closest to a treated observation of interest in terms of statistical distance. Those observations, for which a matching observation from the other group is missing, are discarded.

In this study, we use several modifications of the approach to construct the control subsample by the CEM method in combination with pre-stratification. Each version of the approach is labeled accordingly.

1. "CEM": a loan is classified as subsidized according to the flag in the Credit Register Form 0409303; the pre-stratification is done by region, production sector, age, and size (sales deciles).

2. "CEM–PSK": a loan is classified as subsidized according to the list of subsidized loans provided by the Service; the pre-stratification is done by region, production sector, age, and size.

3. "CEM–above/below median": a loan is classified as subsidized according to the flag in the Credit Register Form 0409303; only loans that are above/below the median in size of all subsidized loans are kept in the treatment group whereas the rest are discarded; the pre-stratification is done by region, production sector, age, and size.

4. "CEM–LP": a loan is classified as subsidized according to the flag in the Credit Register Form 0409303; the pre-stratification is done by region, production sector, age, and productivity (labor productivity deciles)

We discarded observations with suspiciously large subsidized loan sizes from our sample.

5 Findings

5.1 Immediate effect of a program

In this section, we report our findings with regard to the estimated effect of subsidized lending on sales, employment, and profits for participating SMEs. The definition of variables can be found in Table 1. The estimated regressions for the main specification (2) are reported in Tables 6, 8, and 10. The companion regressions for specification (3), which tests the parallel trend assumption, are shown in Tables 7, 9, and 11, respectively.

In our study, the Difference-in-Differences method is implemented via regressions, which is standard in the literature. The regressor of interest is a binary variable *TREAT*, which equals 1 if the enterprise received a subsidized loan in 2019 and 0 otherwise. The dependent variables are the annual percentage change in sales or employment, which corresponds to $Y_{i,t} = 100 \ln(Sales_{i,t})$ and $Y_{i,t} = 100 \ln(Employees_{i,t})$, respectively, or the annual percentage point change in the EBT-to-sales ratio, which corresponds to $Y_{i,t} = 100\, EBT_{i,t}/Sales_{i,t}$ from 2018 to 2019 – for sales and profitability – or from the end of 2018 to the end of 2019 – for employment.

The value of the coefficient on *TREAT* is interpreted as the effect of the participation in a subsidized lending program. A positive value of the estimated coefficient on *TREAT* indicates that for those enterprises that received a subsidized loan in 2019 the annual percentage growth in the respective outcome variable in 2019 was higher that for the firms that did not receive such a loan by this value. This means that the effect of the program is growth enhancing.

For each of the three outcome variables – sales, employment, and profitability – and for each alternative ways to construct the control sub-samle – CEM, CEM–PSK, CEM–above median, CEM–below median, and CEM–LP – we estimate a separate regression (2) as shown in a respective table. The regression contains only the regressor of interest *TREAT* and a constant. In each case, we also report a companion regression (3) that implements the test of parallel trends in the pre-treatment period 2017 to 2018. These regressions are a differenced version of the DiD specification (1) that contains fixed effects at the firms level, in order to control for time-invariant firm's characteristics, and time fixed effects, in order to control for all time-varying factors that have a uniform effect on all firms.

Tables 6 and 7 report estimated regressions for sales. The estimated coefficient on *TREAT* lies in the interval between 10.6 and 14.7 depending on specification and the way the control sub-sample is constructed. The estimated effect is statistically and economically significant. The estimates suggest that the participation in a subsidized lending program makes annual sales grow faster by 12–13 p.p. on average, which quantitatively

is non-negligible. Taking into account standard errors, the overlap of 95% confidence intervals for different specification is considerable. This means that the point estimate of the effect is robust with regard to the method of the control sub-sample design. The estimated coefficient on $TREAT_i$ in the companion regressions for the pre-treatment period as shown in Table 7 is never statistically significant, which is consistent with the parallel trend assumption.

Tables 8 and 9 show our findings for employment. The estimated effect of subsidized lending now appears more sensitive to the method of control group design. The point estimates of the effect if $TREAT$ are spread within the 4.1–7.0 interval. The most conservative value of point estimate of the effect of interest, which is given by the lower bound of this interval, implies a faster growth of employment in firms received a subsidized loan by 4.1 p.p. in 2019 in annual terms, which is quite remarkable quantitatively. In all specifications, the estimated effect is statistically and economically significant. Based on companion regressions shown in Table 9 we do not reject the null hypothesis of parallel trends in the pre-treatment period.

Tables 10 and 11 present the findings for profitability as measured by the EBT-to-sales ratio. Statistical significance of the effect of interest is obtained only for two methods of the control sub-sample construction, CEM–below median and CEM–labor productivity. In the first case, the point estimate is located around 40, in the second case around 30. These values imply that the participation in a subsidized lending program makes the profits grow faster by 30-40 p.p. annually in the year of 2019 compared with those firms that did not participate in such a program. The point estimate of 40 is obtained for the sub-sample that covered only loans below the sample median in size. It is conceivable that such loans were taken mainly by enterprises of relatively smaller size, which are likely to face stricter financial constraints such as the availability of regular bank credit on market terms, and that is why the benefits from participation in subsidized lending programs might be more pronounced for them. Nonetheless a very high sensitivity of the point estimate of the effect with respect to the way the control sub-sample is constructed makes it difficult to treat the estimate as satisfactorily reliable. The

companion regressions shown in Table 11 support the identifying assumption of parallel trends in the pre-treatment period.

5.2 Medium-term effect of a program

The findings discussed in the previous subsection are related to the immediate, or *short-term* effect of subsidized lending programs on firms' economic outcomes. In this subsection, we report results on the *medium-term* effect of a program, up to two years ahead. The estimates are obtained with the use of specification (2) where the dependent variable is now the cumulative percentage change in sales or employment or the cumulative percentage point change for the EBT-to-sales ratio over the respective time interval. The time horizons considered are 2018 to 2019, 2018 to 2020, and 2018 to 2021. Table 12 reports point estimates of the effect of interest, the coefficient on $TREAT_i$ in (2), for different outcome variables and different time horizons. The control group is designed by the baseline version of the CEM method (see Section 4, pp. 11-12, for details).

The estimates shown in Table 12 suggest that the medium-term (up to two years) effect on firms' economic outcomes persists over time being positive and economically and statistically significant. The year-to-year incremental change is nearly constant for employment and diminishing with time for sales and profitability.

5.3 Substitutability between a subsidized loan and a loan on market terms

In this subsection, we investigate to what extent (if any) a subsidized loan serves as a substitute for a loan on market terns for firms. We estimate an extended version specification (2) augmented by a dummy $MarketLoan2018_i$, which equals one if a firm had a loan on market terms on its balance sheet as of the end of 2018 and zero otherwise, as well as the interaction of this dummy with $TREAT_i$:

$$\begin{aligned} \Delta Y_{i,2019} &= \delta_0 + \delta_1 TREAT_i + \delta_2 MarketLoan2018_i \\ &\quad + \delta_3 MarketLoan2018_i \times TREAT_i + e_{i,2019} \end{aligned} \tag{5}$$

Tables 13 and 14 show the estimated regressions (5) and the expected economic outcomes of firms, respectively. The estimation results feature two patterns. First, the effect of the participation in a subsidized lending program on sales is more prominent, by 6.3 p.p. – 13 p.p. against 7 p.p., for firms that did not have the access to market credit in the pre-treatment period. No statistically significant difference between firms with and without access to market credit is found though with regard to employment and profitability (Table 13). Second, all three economic outcomes – sales, employment, and profitability – of a firm that had a loan on market terms on their balance sheet in the pre-treatment period (the end of 2018) grow faster if this firm receives a subsidized loan in 2019 (Table 14). If the firm only replaced market credit by a sibsidized program-sponsored loan, then the resulting effect would be close to neutral.

6 Conclusion

In this paper, we study the effect of the participation in subsidized lending programs on economic outcomes of small and medium-sized enterprises, namely, sales, employment, and profits, in 2018–2019.

Credit register data suggest small and medium-sized businesses rarely use bank credit to finance their operations. According to the credit register, only 3.3% of enterprises that appear on the official SME registry took bank loans in 2019. Moreover, among those enterprises that took any loans in 2019, 92.5% received commercial loans and only 7.5% had the access to subsidized lending programs.

Despite fairly low involvement of small and medium-sized businesses to subsidized lending, our research, as well as empirical studies on other countries, documents the existence of a stimulating impact of such programs. The participation in a subsidized lending program has a positive statistically and economically significant effect on employment and sales. Our estimates suggest that the annual growth of sales accelerates by 10.5–14.7 p.p. and employment by 4–7 pp. within a year. The estimated effect on profits appears very sensitive to the ways the control sub-sample is constructed.

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Tables

Table 1: Definition of variables

Variable name	Definition
	Dependent variables:
Sales	Annual sales, RUB
Employees	Employees as of the end of year
EBT	Earnings before tax, RUB
TREAT	1 if the firm received a subsidized loan in 2019 and 0 otherwise

Table 2: Subsidized loans to small and medium-size enterprises

	Subsidized loans		Non-subsidized loans		
Year	Count	Share (%)	Count	Share (%)	Total
2017	0	0.0	476,705	100.0	476,705
2018	95,464	15.8	507,828	84.2	603,292
2019	55,579	7.5	681,931	92.5	737,510
2020	544,889	44.4	682,689	55.6	1,227,578
2021	111,484	12.4	787,553	87.6	899,037
2022	86,145	10.0	773,417	90.0	859,562
2023	75,048	7.1	979,006	92.9	1,054,054
Total	968,609	16.5	4,889,129	83.5	5,857,738

Table 3: The distribution of subsidized and non-subsidized loans in 2018-2019

		2018			
		non-subsidized	subsidized	both	none
2019	non-subsidized	48,568	1,625	2,668	52,471
	subsidized	434	2,009	977	1,781
	both	2,097	3,513	7,243	1,976
	none	34,529	3,322	2,003	3,340,492

Table 4: The distribution of enterprises between treated and untreated

	treated	untreated
micro	83.8%	43.6%
small	14.8%	43.5%
medium-size	1.5%	12.9%
total	100%	100%

Table 5: Descriptive statistics

		Mean	Median	Std.dev.	Min	Max
$\ln(Sales)$	Treat	18.6	18.6	1.29	12.7	21.8
	Control	18.5	18.6	1.30	9.80	24.3
$\ln(Employees)$	Treat	3.54	3.66	1.17	0	5.64
	Control	3.08	3.18	1.37	0	8.57
$EBT/Sales$	Treat	0.11	0.07	0.15	-1.13	1.89
	Control	0.08	0.04	0.25	-9.83	4.16

Table 6: The effect of subsidized loan programs on sales

	Dependent: $100 \times \ln(Sales_{i,2019}/Sales_{i,2018})$				
	Control group construction method:				
	CEM	CEM–PSK	CEM–below med.	CEM–above med.	CEM–LP
$TREAT_i$	12.5***	13.7***	10.6***	11.5***	14.7***
	(1.6)	(3.0)	(1.8)	(1.6)	(1.3)
Const	-5.6***	-4.8***	-5.0***	-3.4***	-7.8***
	(0.7)	(1.4)	(0.8)	(0.8)	(0.6)
No. obs	6,077	1,402	4,756	3,967	8,222

Notes: See Table 1 for the definition of variables. Heteroskedasticity–robust standard errors are shown in the parentheses. *, **, and *** denote statistical significance at 10%, 5%, and 1%, respectively.

Table 7: The test of parallel trends in the pre-treatment period for sales

	Dependent: $100 \times \ln(Sales_{i,2018}/Sales_{i,2017})$				
	Control group construction method:				
	CEM	CEM–PSK	CEM–below med.	CEM–above med.	CEM–LP
$TREAT_i$	0.3	-0.7	-0.3	0.3	0.5
	(1.0)	(2.2)	(1.4)	(1.3)	(1.0)
Const	18.7***	17.1***	16.0***	19.8***	17.4***
	(0.5)	(1.0)	(0.6)	(0.6)	(0.5)
No. obs	9,057	1,402	4,765	4,316	8,293

Notes: See Table 1 for the definition of variables. Heteroskedasticity–robust standard errors are shown in the parentheses. *, **, and *** denote statistical significance at 10%, 5%, and 1%, respectively.

Table 8: The effect of subsidized loan programs on employment

	Dependent: $100 \times \ln(Employees_{i,2019}/Employees_{i,2018})$				
	Control group construction method:				
	CEM	CEM–PSK	CEM–below med.	CEM–above med.	CEM–LP
$TREAT_i$	6.0***	5.3***	4.1***	5.9***	7.0***
	(1.0)	(2.0)	(1.1)	(0.9)	(0.7)
Const	-4.8***	-0.3	-4.7***	-3.1***	-5.4***
	(0.5)	(1.1)	(0.5)	(0.5)	(0.4)
No. obs	5,212	1,031	4,188	3,353	7,326

Notes: See Table 1 for the definition of variables. Heteroskedasticity–robust standard errors are shown in the parentheses. *, **, and *** denote statistical significance at 10%, 5%, and 1%, respectively.

Table 9: The test of parallel trends in the pre-treatment period for employment

	Dependent: $100 \times \ln(Employees_{i,2018}/Employees_{i,2017})$				
	Control group construction method:				
	CEM	CEM–PSK	CEM–below med.	CEM–above med.	CEM–LP
$TREAT_i$	0.4	0.2	-0.0	0.4	0.3
	(0.6)	(1.5)	(0.9)	(0.8)	(0.6)
Const	4.0***	6.5***	3.8***	4.1***	3.3***
	(0.3)	(0.8)	(0.4)	(0.4)	(0.3)
No. obs	8,058	1,031	4,362	3,834	7,531

Notes: See Table 1 for the definition of variables. Heteroskedasticity–robust standard errors are shown in the parentheses. *, **, and *** denote statistical significance at 10%, 5%, and 1%, respectively.

Table 10: The effect of subsidized loan programs on profitability

	Dependent: $100 \times \Big((EBT/Sales)_{i,2019} - (EBT/Sales)_{i,2018} \Big)$				
	Control group construction method:				
	CEM	CEM–PSK	CEM–below med.	CEM–above med.	CEM–LP
$TREAT_i$	25.1*	19.4	41.2***	24.9*	31.2***
	(14.0)	(25.2)	(14.6)	(14.5)	(11.3)
Const	4.7	13.6	-4.9	3.3	-0.3
	(5.5)	(8.8)	(5.7)	(6.2)	(4.4)
No. obs	7,847	3,202	6,239	5,774	12,948

Notes: See Table 1 for the definition of variables. Heteroskedasticity–robust standard errors are shown in the parentheses. *, **, and *** denote statistical significance at 10%, 5%, and 1%, respectively.

Table 11: The test of parallel trends in the pre-treatment period for profitability

	Dependent: $100 \times \Big((EBT/Sales)_{i,2018} - (EBT/Sales)_{i,2017} \Big)$				
	Control group construction method:				
	CEM	CEM–PSK	CEM–below med.	CEM–above med.	CEM–LP
$TREAT_i$	6.3	2.9	1.3	7.5	9.8
	(6.9)	(7.4)	(9.8)	(7.8)	(7.0)
Const	25.1***	12.7***	40.8***	21.5***	26.3***
	(3.0)	(2.6)	(3.8)	(3.3)	(2.8)
No. obs	11,052	3,202	6,236	6,044	12,933

Notes: See Table 1 for the definition of variables. Heteroskedasticity–robust standard errors are shown in the parentheses. *, **, and *** denote statistical significance at 10%, 5%, and 1%, respectively.

Table 12: Medium-term effect of the participation in a subsidized lending program

Dependent variable	Year		
	2019	2020	2021
$100 \times \ln\left(Sales_{i,\text{Year}}/Sales_{i,2018}\right)$	12.5***	23.4***	26.3***
	(1.6)	(1.8)	(2.2)
$100 \times \ln\left(Employees_{i,\text{Year}}/Employees_{i,2018}\right)$	6.0***	8.9***	12.9***
	(1.0)	(1.1)	(1.4)
$100 \times \Big((EBT/Sales)_{i,\text{Year}} - (EBT/Sales)_{i,2018}\Big)$	25.1*	40.2*	49.1**
	(14.0)	(17.9)	(21.4)

Notes: This table reports the point estimates of the slope coefficient on $TREAT_i$ in the OLS regression of the respective dependent variable on $TREAT_i$ and a constant. See Table 1 for the definition of variables. The control group is constructed using the baseline version of the CEM method (see Section 4, pp. 11–12, for details). Heteroskedasticity–robust standard errors are shown in the parentheses. *, **, and *** denote statistical significance at 10%, 5%, and 1%, respectively.

Table 13: Substitutability between a subsidized loan and a loan on market terms

Regressor	Dependent variable		
	$\%\Delta Sales_i$	$\%\Delta Employees_i$	$\Delta(EBT/Sales)_i$
$TREAT_i$	13.2***	4.7***	39.1**
	(1.7)	(1.0)	(16.8)
$MarketLoan2018_i$	6.4***	2.8***	-39.3***
	(1.4)	(0.9)	(13.1)
$TREAT_i \times MarketLoan2018_i$	-6.3**	0.7	20.8
	(2.6)	(1.5)	(24.9)
Const	-6.2***	-4.1***	2.9
	(0.6)	(0.4)	(5.5)
No. obs	9,057	8,058	11,052

Notes: The dependent variables are the annual percentage change of firm i's sales, the annual percentage change of firm i's employment, and the annual change in the firm i's EBT-to-sales ratio in percentage points, respectively, from 2018 to 2019. See Table 1 for the definition of variables. The control group is constructed using the baseline version of the CEM method (see Section 4, pp. 11–12, for details). All regressions contain a constant. Heteroskedasticity–robust standard errors are shown in the parentheses. *, **, and *** denote statistical significance at 10%, 5%, and 1%, respectively.

Table 14: Expected economic outcomes of firms depending on the participation in a subsidized lending program and the availability of credit on market terms in the pre=treatment period

	$MarketLoan2018_i = 0$	$MarketLoan2018_i = 1$
	$\Delta Y_{i,2019} = 100\,\Delta \ln Sales_{i,2019}$	
$TREAT_i = 0$	-6.2	0.2
$TREAT_i = 1$	7.0	7.1
	$\Delta Y_{i,2019} = 100\,\Delta \ln Employees_{i,2019}$	
$TREAT_i = 0$	-4.1	-1.3
$TREAT_i = 1$	0.6	4.1
	$\Delta Y_{i,2019} = 100\,\Delta\,(EBT/Sales)_{i,2019}$	
$TREAT_i = 0$	2.9	-36.4
$TREAT_i = 1$	42.0	23.5

Notes: This table reports the point estimates of expected economic outcomes of firms – annual percentage growth of sales and employment and the annual percentage point growth of profitability depending on the participation in a subsidized lending program in 2019 and the availability of credit on market terms in the pre-treatment period. These estimated values are obtained from estimated regressions (5) as shown in Table 13. See Table 1 for the definition of variables.