



Subsidized working capital loans and firm growth in times of crisis

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ABSTRACT

I estimate the effects of subsidized working capital loans on Hungarian firms during the COVID-19 pandemic with panel data and matching methods. Sales and employment rose, with sales growing in expanding sectors and employment increasing in declining ones.

1. Introduction

Many governments assist firms with subsidies and preferential loans to shelter them from the negative effects of capital market frictions, and the crisis induced by the COVID-19 pandemic made such programs even more widespread. This paper examines working capital loans, an underexplored topic despite their inclusion in industrial policy measures. For example, the European Commission implemented programs providing working capital to firms in need during the pandemic (European Association of Long-Term Investors, 2020). The optimal level of working capital leads to superior performance as larger inventories help the company to serve unplanned orders quickly, to give credit to its buyers, and it also can reduce the negative impacts of input price fluctuations (Aktas et al., 2015).

In this paper, I analyze the effects of subsidized working capital loans on sales and employment growth given to Hungarian firms during the COVID-19 pandemic. In addition to establishing an average effect, I also divide the sample into firms from growing and contracting sectors to analyze the heterogeneity of the effect by the business environment.

As most of such studies, I combine matching methods with fixed-effects regressions to decrease the bias arising from firms selecting into the subsidy program. I study only short-run effects when the post-treatment period is the year of the loan issuance and the subsequent year. The reason for this is partly data availability (the last year of my data is from 2021), but I also wish to analyze loans during the pandemic, which was curved down by 2022.

The paper relates to the small literature on the effects of subsidized loans during the pandemic using firm-level data. Hoshi et al. (2023) and Morikawa (2021) finds that Japanese firms with low credit score

and productivity were more likely to receive state aid while Lalinsky and Pál (2022) finds the opposite in Slovakia. Telegdy (2024) estimates positive effects on firm growth of investment loans in Hungary. Fasano et al. (2022) finds that government aid in Italy did not affect growth and profitability.

2. Working capital loans

I study the working capital loans financed by Eximbank Hungary, a state-owned bank which is the official export agency of the country. Eximbank does not process loan applications directly (except very few cases), but it finances firms through domestic commercial banks within the framework of refinancing schemes. The commercial bank provides the loan at a lower than the market interest rate, and Eximbank refinances the loan. The commercial bank is responsible for the credit assessment and the selection of the borrowers. It also bears the risk of default.

Working capital loans were issued in 2020 and 2021, with the aim to ease the liquidity problems of otherwise viable firms. Exporters or suppliers of exporters were eligible for the loan, which experienced at least one of the following difficulties: a decline in sales, profits or orders, decreased working time or wages, temporary shut down (for reasons other than seasonality), liquidity deterioration (measured by current assets/short term liabilities), an increase (decrease) in the payment tenure of buyers (suppliers).

The maximum loan amount was 200% of the wage bill or 25% of sales in 2019. Loans were given predominantly in HUF and Euro. The maturity of the loan was maximized in 3 years, and the interest rate

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Table 1
Characteristics of subsidized and not subsidized firms.

	Did not receive loan	Received loan
Employment	12.1 (136.1)	124.8 (238.8)
Sales (log)	10.72 (1.94)	14.77 (1.22)
Sales Growth	0.087 (0.69)	0.069 (0.27)
Productivity (log)	9.63 (1.28)	10.77 (1.03)
Exporter	0.02 (0.14)	0.54 (0.49)
Industrial Firm	0.11 (0.31)	0.47 (0.50)
Contracting Sector	0.44 (0.49)	0.48 (0.50)
Observations	244 923	608

Notes: Statistics are from 2019. Contracting sector: sectors with declining aggregate sales between 2019 and 2020.

was predetermined. For loans denominated in HUF, it was 2.7% for the whole repayment period and for those in Euro it was 2.09% for the first year and 2% for the subsequent period. These interest rates were rather close to the market interest rate. Thus, it was predominantly the availability of the loan that eased firms' liquidity constraints.

3. Data

I use proprietary data on the loans provided by Eximbank Hungary. The data have a product code, the date of loan issuance, its denomination, and the value of the loan. I use the product code to select loans which were given in the framework of the COVID-19 measures for working capital in 2020 and 2021. I link this information with the help of anonymized firm IDs to the balance sheet data maintained by the Hungarian Tax and Customs Authority, which contain balance sheet and income statement variables and other variables like employment and the sector of activity. I use the years between 2017 and 2021. All financial variables are adjusted to their 2021 levels using 2-digit price deflators.

I drop firms from the finance sectors and those without registered employees. 41 firms received working capital loans from Eximbank outside the COVID-19 measures, and I also drop them (but the results do not change if they are added to the data).

I observe a total of 608 loans, out of which 290 were issued in 2020 and 318 in 2021. 417 were denominated in HUF and 191 in Euro. The average (median) size of the loan relative to the total sales of the company was 15 percent (11%) of the firms' sales, with quite a large variation: at the 10th percentile of the distribution it was 4%, at while at the 90th 28%.

Table 1 presents the characteristics of subsidized and unsubsidized firms in 2019, before the pandemic started. Firms that received the subsidized loan were much larger than the average Hungarian firm: they had 125 employees as opposed to 12 of firms that did not receive a subsidy. Sales growth between 2018 and 2019 was rather similar across the two groups (8.7% and 6.9%) while labor productivity (sales over employment) was much larger in the subsidized sample. There is a large difference in the sectoral distribution of firms, as almost half of the subsidized firms belong to industrial sectors while this figure is only 11% in the other group. Sectors affected by the pandemic (defined as having negative real sales growth from 2019 to 2020) take up 44% of subsidized firms and 48% of the other group.¹ Thus, subsidized

¹ Contracting and growing sectors and the corresponding numbers of subsidized firms are presented in Appendix Table A1.

Table 2
The effect of loans on firm outcomes.

	Sales	Employment
Working capital loan	0.073*** (0.023)	0.038* (0.020)

Notes: N = 6766. The dependent variables are logged. Controls: firm fixed effects, common time trends around treatment year. Standard errors clustered at the firm level. *** p < 0.01, ** p < 0.05, * p < 0.10.

firms differ from the average Hungarian firm but their relative average quality is not straightforward to determine: they are larger and have higher labor productivity, but lower sales growth.

4. Methodology and results

Estimation. To estimate the effect of the subsidized loan on firms, I run fixed effects regressions. The estimation equation is as follows:

$$Y_{igt} = \gamma \cdot Loan_{igt} + \alpha_i + v_{gt} + \theta_\tau + \epsilon_{igt}, \quad (1)$$

where i indexes firms, g indexes the year of treatment (2020 or 2021), τ indexes the years relative to g and t indexes calendar years. α_i is a firm fixed effect. The parameter of interest is γ .

The first challenge in estimating Eq. (1) is the staggered implementation of the treatment, which may bias the estimation. I use the method developed by Sun and Abraham (2021) to avoid this bias (the method also removes the joint effect of the year of treatment and calendar year (v_{gt})). To further decrease the selection into the subsidized loan program, I add time dummies around the treatment year (θ_τ) to the regression, to control for common trends around the treatment year. Standard errors are clustered at the firm level.

Table 1 demonstrated that firms that received the subsidized loan differ from the rest of the sample: they are much larger, more export oriented, more productive and more likely to be industrial. To construct a control group similar to treated firms pre-treatment, I perform a combination of exact and propensity score matching. The exact match involves the year before receiving the loan, three categories of employment size, two categories of sales growth (defined relative to the median value of the distribution) and 1-digit NACE codes. Within these groups, I perform a nearest neighbor propensity score matching with replacement (caliper of 0.01) and select a maximum of three control firms for each treated firm (the variables and the estimated coefficients are in Appendix Table A2). In the regression analysis, controls are weighted by their prevalence in matching (e.g., if a treated firm is matched to three controls, they all receive the weight of 0.33).

Of the 608 treated firms, I can match 600 with similar controls. The means (standard deviations) of several firm characteristics of the control and treated groups in the year before the treatment are presented in Appendix Table A3. The average employment size of the treated and control firms before treatment is 124 and 116, respectively. Treated firms have somewhat larger sales and labor productivity. The share of exports is identical as well as the share of firms in industrial sectors. The standardized difference mostly very small and is always less than 0.25 which, according to Imbens and Wooldridge (2009) is acceptable.

Results. The average effect of the working capital loan on firm outcomes is shown in Table 2. Subsidized firms' sales grew by 7.3% and employment by 3.8% relative to unsubsidized firms (note that these effects are measured over a short time horizon of maximum two years.)

Fig. 1 shows the dynamic effects of the loans (the corresponding estimations are in Appendix Table A4). The estimated pre-trends are flat, suggesting that matching and the estimation method eliminated any observable differences between the two groups before the treatment. Relative to the pre-treatment year, sales grow by 9% and employment by 6% one year after the treatment.

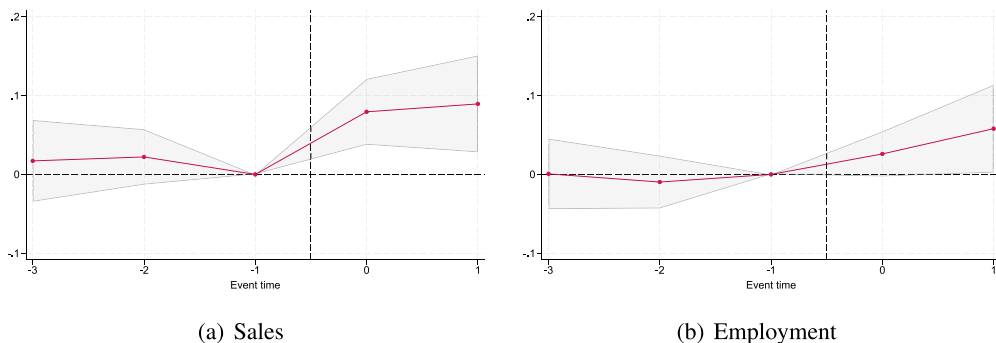


Fig. 1. Dynamic effects of working capital loans.

Notes: The figures present the estimated coefficients and 95-percent confidence intervals of event-time regressions. See the notes of Table 2. Coefficients are in Appendix Table A4.

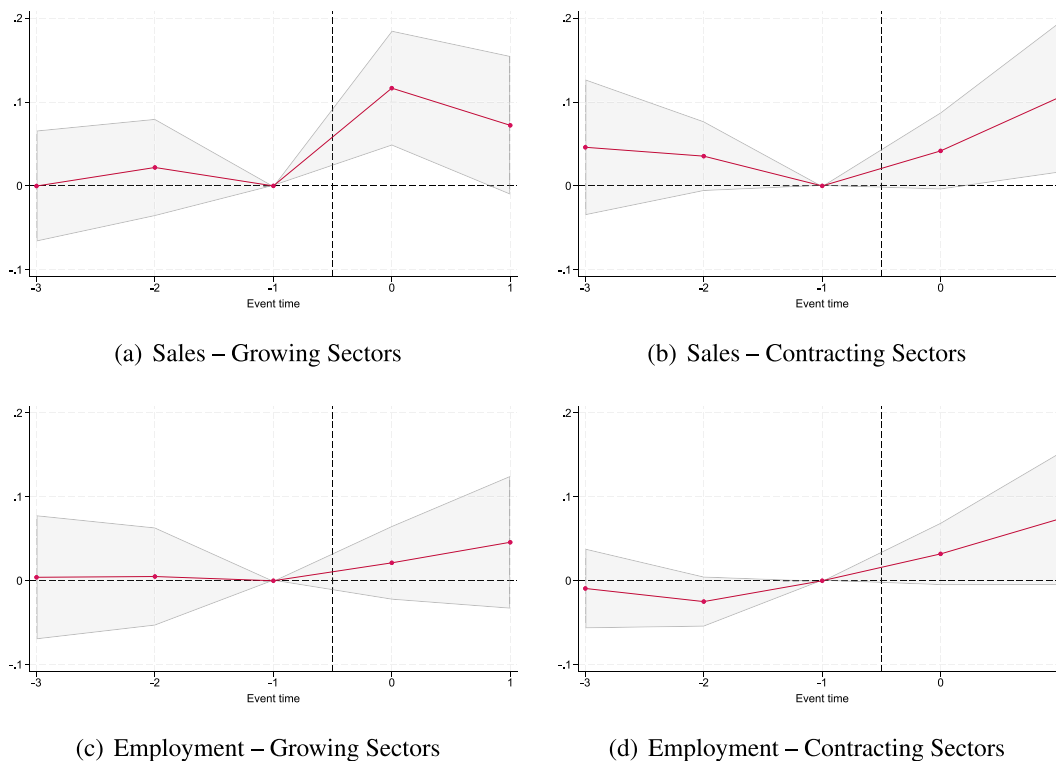


Fig. 2. Dynamic Effects of Working Capital Loans Growing and Contracting Sectors.

Notes: The figures present the estimated coefficients and 95-percent confidence intervals of event-time regressions. See the notes of Table 3. Coefficients are in Appendix Table A5.

Table 3

The effect of loans on firm outcomes growing and contracting sectors.

	Sales	Employment
Growing sectors		
Working capital loan	0.103*** (0.036)	0.022 (0.029)
Contracting sectors		
Working capital loan	0.038 (0.029)	0.056** (0.027)

Notes: N = 3130 (growing sectors) 3618 (contracting sectors). See the notes of Table 2. Contracting sectors: sectors where aggregate sales declined between 2019 and 2020.

Next, I run separate regressions for firms in growing and contracting industries. The effect of the working capital loan is rather different in these two samples (Table 3). In the growing sectors, firms use the loan to increase their sales (by 10%). However, in these sectors I cannot

uncover an employment effect. In the contracting sectors, the effect of the subsidized loan on sales is small and not significant in statistical terms, but I find a substantial employment effect of 5.6%. The event time estimations suggest more similar effects across the two sectors. One year after the treatment, sales growth is similar in the two samples, but in the growing sectors it happens already in the year when the loan was received, while in contracting sectors it takes one year to build up. The employment effect is 4.6% in the growing sectors but the estimated coefficient is insignificant, and it is 6% in the contracting sectors (see Fig. 2 and Appendix Table A5).

5. Conclusions

This paper showed that subsidized working capital loans can contribute to firm growth, and these effects depend on the business environment. Firms in growing sectors use the loan predominantly to boost the value of sales while those in contracting sectors increase employment.

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Appendix A. Supplementary data

Supplementary material related to this article can be found online at <https://doi.org/10.1016/j.econlet.2024.112053>.

Data availability

The authors do not have permission to share data.

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