



Rapid credit expansion and firm behavior: A case study from Türkiye

İbrahim Yarba^{*}, Tarık Alperen Er, Aykut Şengül

Central Bank of the Republic of Türkiye, Research and Monetary Policy Department, Türkiye

ARTICLE INFO

JEL classification:

C23
D22
G30
E50

Keywords:

Rapid credit growth
Firm behavior
Credit allocation
SMEs
Foreign currency purchases

ABSTRACT

This study examines the impact of a sudden and remarkable credit expansion experienced in Türkiye during the first half of 2022 on firm behavior by utilizing a novel dataset containing the universe of all incorporated firms in Türkiye. The results of the combination of coarsened exact matching and difference-in-differences methodology show that, amid the credit expansion coupled with the deterioration in expectations of inflation and depreciation in local currency, the firms with higher credit usage tended to engage in alternative channels rather than undertaking real economic activities in short term, such as pulling-forward imports and input demand and taking position against local currency to gain financial profit more than those with less credit usage during the first half of 2022. While SMEs with higher credit usage increased their imports, domestic input purchases, foreign currency purchases, and foreign currency-denominated debt settlement before maturity, large firms increased their foreign currency purchases relative to their counterparts with less credit usage.

1. Introduction

While real sector firms can realize their short and long-term plans by utilizing bank loans, they also contribute to the growth of a country by supporting economic activity. In addition, channeling accessed loans into new investments also affects the economy by increasing employment opportunities (Azariadis, 2018). However, in cases where the corporate loans are not effectively allocated, a rapid credit expansion may play a critical role in leading the economy to underperform and be more vulnerable against external shocks by deteriorating price and financial stability and causing macroeconomic imbalances (Alessi & Detken, 2018; Hsieh & Klenow, 2009; Mendoza & Terrones, 2008). Mendoza and Terrones (2008) show that excessive credit expansions in developing countries generally do not lead to productivity gains, and

financial crises are mostly associated with excessive credit expansions. Reis (2013) also reports that the European Union's lending to relatively inefficient firms in non-tradable sectors caused these firms to grow more than productive firms operating in tradable sectors. Therefore, examining the channels of credit disbursements on a micro basis is vital to evaluate the potential outputs of loan growth, especially for emerging economies where bank loans are the main source of firms' external finance.

Türkiye, as a large emerging economy with a bank-dominated financial system,¹ provides a good laboratory to examine the firm-level outputs of rapid credit growth. In 2022, Türkiye reached the highest corporate loans to GDP ratio over the last decade (Fig. 1).² This significant rise in bank lending had been driven by Turkish lira (TL)-denominated corporate loans in the first six months of 2022. Annualized

Peer review under responsibility of Borsa İstanbul Anonim Şirketi.

^{*} Corresponding author.

E-mail addresses: ibrahim.yarba@tcmb.gov.tr (İ. Yarba), tarik.er@tcmb.gov.tr (T.A. Er), aykut.sengul@tcmb.gov.tr (A. Şengül).

¹ According to the Financial Stability Board database, as of 2022, while banks' financial assets to total financial assets ratio is 80% in Türkiye, the average ratio for emerging countries is 60%. Moreover, as of 2022, bank loans account for 88.5% of the total financial debt of non-financial firms in Türkiye (CBRT Real Sector Company Accounts Statistics).

² We also implemented threshold methods in the literature that are employed to identify the credit booms (Gourinchas et al., 2001; Mendoza & Terrones, 2008). According to the methodologies of both Gourinchas et al. (2001), and Mendoza and Terrones (2008), the year of 2022 stands out as the outlier period of credit expansions in Türkiye over the period 2010–2022.

<https://doi.org/10.1016/j.bir.2024.07.003>

Received 11 November 2023; Received in revised form 24 June 2024; Accepted 9 July 2024

Available online 10 July 2024

2214-8450/Copyright © 2024 Borsa İstanbul Anonim Şirketi. Published by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

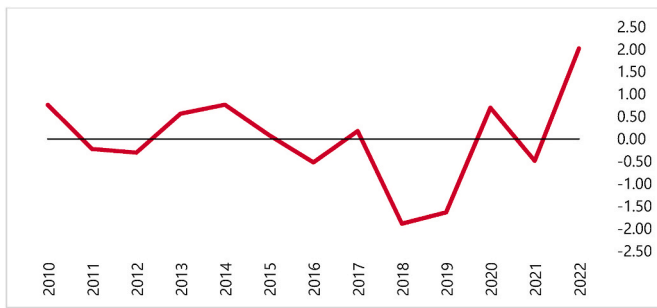


Fig. 1. Corporate Loan to GDP in Türkiye. This figure shows the standardized value of the ratio of inflation- and exchange rate-adjusted annual change in outstanding corporate loans to the real GDP over the period 2010–2022. The mean and standard deviations of the ratios over the period 2010–2022 are used for standardization. Source: Authors' calculations using data from the Banking Regulation and Supervision Agency (BRSA) database.

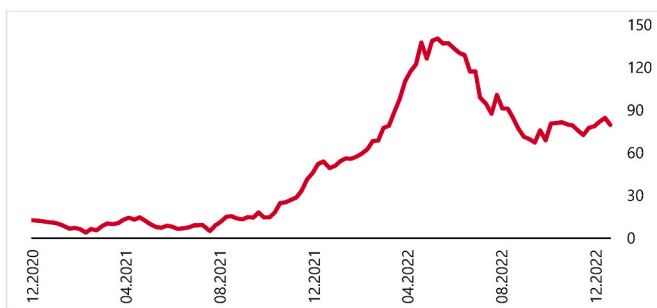


Fig. 2. Corporate Loan Growth. This figure shows 13-week annualized percentage growth of TL denominated corporate loans in Türkiye based on the authors' own calculations using data from the BRSA database.

13-week growth in TL-denominated corporate loans increased rapidly, and reached 140 percent in May 2022 (Fig. 2).³ The acceleration in the corporate loan growth rate had been slowed down in the second half of 2022 with the macroprudential measures such as additional reserve requirements, maintenance of securities, and cap on TL-denominated loan growth with the exception of targeted areas (SMEs, export, agriculture and investment loans), implemented by the Central Bank of the Republic of Türkiye (CBRT) with the aim of stable development of loan growth.⁴ Unlike the previous credit expansion periods, there was also a considerable deterioration in the expectations of inflation and foreign exchange (FX) rates during the first half of 2022. The expectations of the 1-year ahead inflation and the 1-year ahead USD/TL parity climbed up by 77.2% and 33%, respectively.⁵ On the other hand, both ex-post and ex-ante real commercial loan interest rates were negative during this period. Considering the significantly cheaper access to credit with the deterioration in expectations of inflation and depreciation in local

³ FX-denominated loans were in a downward trend during this period, and exchange rate-adjusted total loan growth reached the level of 90 percent in May. Since there is no rise in the FX-denominated loans of firms during the relevant period, this study focuses on TL-denominated loans. We also analyze whether the firms with similar levels of FX-denominated debt stock but higher usage of TL-denominated loans in the relevant period tend to relatively increase their FX-denominated debt settlement before maturity or not, using the stock level of FX-denominated loans at the end of 2021 as a criterion in our matching process. The details are discussed in Section 2 and Section 3.

⁴ With the implementation of these macroprudential measures, the acceleration in loan growth, the deterioration in expectations of inflation and depreciation in local currency had been curbed in the second half of 2022. For the detailed information, see CBRT (2022a).

⁵ Source: "CBRT, Survey of Market Participants".

currency, and with the lack of arrangements that ensure the stable development of loans, firms may direct the funds they accessed in this period to alternative channels rather than undertaking economic activity. Firms may take position against local currency-denominated assets with the aim of hedging against currency movements and gaining financial profit (CBRT, 2022b; Kaplan et al., 2006; Lall, 1997; Thomas, 1985; Yeyati, 2006). In a similar vein, firms may tend to reduce their future costs and pull-forward their import and input demand before the expected price changes materialize (CBRT, 2022c; Coibion et al., 2020), and they may obtain new loans to pay down their existing loans if they expect the cost of existing loans or the cost of rolling over the existing loans will be higher in the future (Ropele et al., 2022). Thanks to our novel and rich micro dataset,⁶ we are able to test these arguments and analyze whether the loans accessed in the first six months of 2022 had been channeled towards alternative channels such as pulling-forward imports and input demand and taking position against the local currency to gain financial profit during the first half of 2022.

There is a growing literature that examines the impact of credit expansions on firms' performance and behavior. The studies that focus on the credit expansion driven by government-sponsored credit programs in emerging economies mostly show that these programs have positive impacts on firms' performance, such as export revenues, employment, and profitability (e.g., Akçigit et al., 2021; Lopez-Acevedo & Tan, 2011; Maffioli et al., 2017).⁷ On the other hand, the studies that focus on the firm-level impact of stimulus and/or monetary policy driven credit expansions provide mixed evidence (Acharya et al., 2019; Bonomo et al., 2015; Cai, 2021; Cong et al., 2019; Ferrando et al., 2019; Shen et al., 2016).⁸ Contrary to the arguments that firms that benefited from the relevant credit expansions reflected this credit usage in their employment and short-term investments (Cong et al., 2019; Ferrando et al., 2019; Shen et al., 2016), there are significant evidence that firms that benefited from the credit expansions do not channel these funds to undertake real economic activity (Acharya et al., 2019; Bonomo et al., 2015; Cai, 2021). While Cai (2021) finds that firms are more active in financial asset purchases during the period of credit expansion, Acharya et al. (2019) show that these firms channeled the funds they accessed to increase their cash reserves, and they suggest that a targeted policy framework could result in more positive real effects through an efficient credit allocation.

Our contribution to the existing literature is twofold. First, unlike most previous studies, we examine the impact of a sudden and remarkable credit expansion on firms' behavior with a representative and unique dataset covering the universe of all incorporated firms in Türkiye. Second, utilizing a novel dataset that contains confidential loan-level credit registry data along with the confidential datasets of firm-level foreign trade transactions, firm-to-firm level domestic transactions, firm-level FX transactions, firm-level debt settlements, and firm-level provisional income statements enables us to examine various channels. To the best of our knowledge, our study is the first to analyze the impact of a credit expansion on firm behavior by examining the set of channels that are not previously analyzed at the firm level, e.g., net

⁶ The details of our dataset including the firm-level foreign currency transactions over the 2021–2022 period are given in Section 2.

⁷ See Akçigit et al. (2021) for evidence on firm-level short-term effects of the Turkish credit guarantee program.

⁸ Acharya et al. (2019) and Ferrando et al. (2019) study the firm-level impact of positive credit supply shock stemming from the European Central Bank's Outright Monetary Transactions (OMT) program, whereas Cong et al. (2019), Shen et al. (2016), and Cai (2021) study the allocation and real effects of the rise in credit supply driven by China's credit expansion policies implemented through lower bank reserve requirements and lower benchmark interest rates as a part of China's economic stimulus plan of 2009–2010. Bonomo et al. (2015) investigate the firm-level effects of government-driven credit expansion, which was implemented with the aim of countervailing the private credit crunch in Brazil triggered by the Global Financial Crisis (GFC) in 2007/2008.

foreign currency purchases and FX-denominated debt settlement.

To examine the impact of rapid credit expansion on firms' behavior, we first classify the firms that benefited relatively more from the credit supply in the first six months of 2022 by comparing the total loan usage/net sales ratio to the same period in 2021. Since the lending process is not a random process, classifying firms only according to the total loan usage/net sales may be exposed to a potential selection bias. The group of firms that use relatively higher amount of credit may be concentrated in a set of firms with specific characteristics or specific sectors, and this set of firms may differ in terms of their behaviors compared to the firms with relatively less amount of loan usage. To deal with this potential selection bias and perform a valid comparison analysis, we establish a control group using Coarsened Exact Matching (CEM) methodology.⁹ Thanks to our novel dataset, we match treatment and control group firms based on an inclusive criteria set consisting of sector, firm-size groups, net sales, exports, imports, and FX-denominated debt level at the end of 2021. This enables us to find reliable and comparable control firms, which is crucial for the quality of impact analysis (Haukoos & Lewis, 2015). Then, we employ difference-in-differences (DID) methodology on matched treatment and control groups to compare the behaviors of the firms that have similar characteristics before the credit expansion period but differ in loan usage during the expansion period.

Our results reveal that, amid the credit expansion coupled with the deterioration in expectations of inflation and depreciation in local currency, the firms with higher credit usage tended to engage in alternative channels such as pulling-forward imports and input demand and taking position against local currency to gain financial profit more than those with less credit usage during the first half of 2022. The results show that the firms that used significantly higher amounts of loans in the first half of 2022 increased their import expenses, domestic input purchases, FX-denominated debt settlement before maturity, and net foreign currency purchases compared to the firms with less usage of credit (control group) in the relevant period. On the other side, there is no statistically significant difference in export performances between treatment and control groups.

We then re-estimate the models separately for the subsamples of small and medium-sized enterprises (SMEs) and large firms. The results show no significant difference in the export performances of SMEs. On the other hand, large firms that used higher amounts of credit experienced a relatively lower performance in their export revenues compared to large firms with relatively less credit usage. The results reveal that while SMEs in the treatment group relatively increased their imports, domestic input purchases, FX-denominated debt settlement before maturity, and net FX purchases, large firms with higher use of corporate loans increased their net FX purchases relative to their counterparts with less credit usage. These findings are in line with recent studies revealing that firms with higher usage of credit during the period of credit expansions tend to increase their cash reserves or their financial asset purchases rather than channel these additional funds to undertake real economic activity, suggesting the importance of the policies that provide a more positive real effects through an efficient credit allocation (Acharya et al., 2019; Cai, 2021).¹⁰

⁹ We discuss the details of Coarsened Exact Matching (CEM) methodology in Section 2.

¹⁰ Considering the prior findings in the literature suggesting that the effectiveness of macroeconomic policies in curbing credit expansions is questionable, macroprudential policies can offer a more targeted approach to smooth credit cycles and prevent their adverse effects (Dell'Aricecia et al., 2012; Merino et al., 2024). For the case of Türkiye, to curb the acceleration in loan growth and improve credit allocation, CBRT conducted several macroprudential measures in 2022, such as imposing extra reserve requirements, maintenance of securities, and cap on loan growth with the exception of SMEs, export, agriculture, and investment loans (CBRT, 2022a). However, the inferences about the effectiveness of these policies should be based on data-driven analyses. Since data comes with a time lag, we leave it for future research.

The remainder of the paper is structured as follows. Section 2 describes the dataset we employed and explains our empirical setting. Section 3 presents the estimation results and robustness tests on the main findings. Lastly, Section 4 concludes the paper.

2. Data and methodology

We construct a unique and comprehensive dataset using various data sources. Our main data source is the confidential Credit Registry of the Banks Association of Türkiye, which is the loan-level data that contains the universe of loan agreements between borrowers and banks over the period 2009–2022. It includes detailed information on loan type, loan amount, issuance date, currency denomination, etc. The Credit Registry data is linked to the Provisional Income Statements database of all incorporated firms in Türkiye collected by the Turkish Revenue Administration,¹¹ which allows us to obtain information on firm size, sector, region, and net sales. Additionally, we use firm-level foreign trade transactions data provided by the Ministry of Trade, firm-to-firm level transactions data between domestic firms provided by the Ministry of Treasury and Finance, firm-level FX market transactions data, and firm-level debt settlements data provided by CBRT to obtain information on firm-level exports/import, domestic input purchases, FX-denominated debt settlement, and net FX purchases, respectively. All databases cover firm-level information over the 2009–2022 period with the exception of firm-level FX market transactions and firm-level debt settlements databases, which cover the 2021–2022 period. The firms that are not obliged to report income statements or the firms that are obliged to report income statements only under particular conditions are excluded from our analyses due to data constraints. The final sample in our analyses, which is constructed by combining all the micro databases mentioned above, captures 81.8% of all TL-denominated corporate loans granted in the period covered by our study.

In order to classify the firms that benefited relatively more from the credit expansion in the first six months of 2022, treatment and control groups were formed by comparing the total loan usage/net sales ratio to the same period in 2021.¹² In this way, we aim to analyze how the firms, which increased their credit usage more than their net sales, utilized these loans they accessed in the period of rapid credit expansion. Table 1 reports the growth rates of the variables included in this study.

The basic comparison reported in Table 1 suggests quite interesting results. First of all, there may be different reasons for the increase or decrease in the loan/sales ratio arising from developments in the use of loans or net sales. For example, credit developments may be decisive while changes in net sales may be similar in two groups, or while credit developments are similar, differentiation in sales performances or a combination of developments in the numerator and denominator may play a fundamental role in the formation of the groups. The first two columns of Table 1 show that the two groups are separated mainly due to loan usage. The loan usage of firms that increased their loan/sales ratio rose by more than five times, while the loan usage of firms whose loan/sales ratio decreased only grew by 14 percent. On the other side, sales growth in the relevant period seems to be quite close between the two groups. In the first six months of 2022, it is also seen that there is no significant difference in terms of domestic input purchases, imports, and export performances between the firms whose credit/sales ratio increased and firms whose credit/sales ratio decreased compared to the same period of the previous year. On the other hand, firms using

¹¹ Since the dataset containing the information on financial statements comes with a time lag, we use the most recent provisional income statement data for the first six months of 2022 in our analyses.

¹² Flow loans are used to measure TL-denominated corporate loan usage by firms. We obtain similar results when we employ the net change in firms' outstanding amount of loans instead of flow loans. The details are discussed in Section 3.2.

Table 1
Comparison (Periods of first six months in 2022 and 2021, % change).

Panel A: Group of Firms Increasing Their Total Loan Usage/Net Sales Ratio						
<u>Net Sales</u>	<u>Corporate Loans</u>	<u>Exports</u>	<u>Imports</u>	<u>Domestic Input Purchases</u>	<u>FX-Denominated Debt Settlement</u>	<u>Net FX Purchases</u>
120%	442%	128%	131%	77%	245%	773%
Panel B: Group of Firms Decreasing Their Total Loan Usage/Net Sales Ratio						
<u>Net Sales</u>	<u>Corporate Loans</u>	<u>Exports</u>	<u>Imports</u>	<u>Domestic Input Purchases</u>	<u>FX-Denominated Debt Settlement</u>	<u>Net FX Purchases</u>
152%	14%	130%	131%	82%	-86%	151%

Net Sales refers to gross sales minus discounts and returns from sales; Corporate Loans refers to TL-denominated flow loans, Exports refers to gross export revenues; Imports refers to import expenses; Domestic Input Purchases refers to the value of inputs purchased from the other firms located in Türkiye, FX-Denominated Debt Settlements refers to the amount of FX-denominated bank credit paid off before maturity, and Net FX Purchases refers to the net value of firms’ foreign currency purchases.

relatively higher levels of credit tend to pay off their FX-denominated debts before maturity and buy foreign currency.

However, the comparisons reported in Table 1 have the potential to be misleading due to possible selection bias. The group of firms that use relatively higher amount of credit may be concentrated in a set of firms with specific characteristics or specific sectors, and this set of firms may differ in terms of their behaviors compared to the firms with relatively less amount of loan usage. To mitigate the possible selection bias and endogeneity problems, the Coarsened Exact Matching (CEM) method was used to match each firm in the treatment group with a firm from the control group, which had very similar characteristics with its peer in the treatment group at the beginning of 2022 but used a relatively lower amount of loans.

In CEM, each variable selected as a matching criterion is coarsened into groups, which are divided by author-chosen cut-off points for groups within each matching criterion, and observations are categorized under these groups for each matching criterion. Afterward, each unique observation unit is classified and assigned to a “stratum” by bundling their placements in these groups under each matching criterion.¹³ Lastly, each observation in the treatment group is attempted to match with an observation that has an identical “stratum” in the control group, and the observations whose stratum does not contain at least one treated and one control unit are dropped from the sample (Blackwell et al., 2009). For the matching procedure, it is important to consider the trade-off between the balance of matched pairs and the number of matched pairs. Fewer cut-off points (larger bins) generate fewer strata. Fewer strata result in more varied observations in the same strata, hence, higher imbalance within matched pairs (Blackwell et al., 2009). On the other side, more cut-off points (narrower bins) reduce the probability that treated observations have identical stratum with observations in the control group by constructing a higher number of strata; thus, it may lead to a large drop in sample size after matching. Thanks to our granular dataset, we are able to increase the number of cut-off points and reduce the imbalance within the matched pairs without losing a significant amount of unmatched treatment firms.¹⁴

The matching quality is of great importance for the validity of the comparison analyses between treatment and control groups (Haukoos & Lewis, 2015). In this regard, we conduct one-to-one matching based on observable firm characteristics, including net sales, exports, imports, and FX-denominated debt level (outstanding credit balance) at the end of 2021 (before the treatment period). In each variable, we employ 10 groups.¹⁵ Additionally, two-digit sector code (NACE Rev.2), and firm-size groups (micro, small, mid-sized, and large) are preserved in the

¹³ In CEM, a maximum level of imbalances can be assigned separately for each variable selected as a matching criterion, and adjusting the maximum imbalance on one variable never has any effect on the maximum imbalance specified for any of the other variables.

¹⁴ See Iacus et al. (2012), Blackwell et al. (2009), and Yarba and Yassa (2022) for further details about the methodology of CEM.

¹⁵ With the exceptions of net sales that is employed with 20 groups. This differentiation in the number of groups is to improve the matching quality.

matching. We ended up with a 76% matching rate with 90,467 pairs. Table 2 reports the balancing tests for the firms that increased their total loan usage/net sales ratio (treatment group) and firms that decreased their total loan usage/net sales ratio (control group). None of the covariates appear to be unbalanced, and all these balancing tests confirm the matching quality. We fail to reject the null hypothesis of zero difference between means of the treatment and control firms for all variables after matching. The percentage bias between the two groups for all variables reduces significantly with a magnitude above 97 percent.

For further examination of the performance of our matching, we also present the distribution of net sales for the treatment and control groups in Fig. 3a and b. The left panel exhibits the distribution before the matching, and the right panel exhibits the distribution after the matching procedure. The distributions of treatment and control groups visually emphasize the quality of our matching.¹⁶

After the matching conducted to deal with possible selection bias and endogeneity problems, we utilize difference-in-differences (DID) methodology to analyze the impact of the rapid credit expansion on firm behavior. Econometric specification for the analysis is formed as follows:

$$Y_{it} = \alpha + \beta Treatment_i + \theta Post_t + \lambda (Treatment_i \times Post_t) + \rho_j + (\psi_s \times \phi_t) + (\gamma_k \times \phi_t) + \varepsilon_{i,t} \tag{1}$$

In Equation (1), *i* represents firms, *k* represents regions, *s* represents each sector in which the firm *i* operates, and *t* represents years. *Y_{it}* represents the dependent variables such as Net FX purchases, FX-denominated debt settlement, imports, domestic input purchases, exports, net sales, and corporate loans. The *Treatment_t* dummy variable takes the value of 1 for the firms that increase their level of credit usage more than their net sales and 0 otherwise. The *Post_t* dummy variable takes the value of 1 for the first six months of 2022 and 0 otherwise. Our parameter of interest showing the impact of high credit usage on firm behavior is the coefficient of the interaction variable, which is denoted by λ . ρ_j represents the pair fixed effect for each group of the treatment and control firms. Alternatively, firm fixed effects are included to control for any time-invariant and unobservable firm characteristics. The details are discussed in Section 3.2. Moreover, sector x time ($\psi_s \times \phi_t$) and region x time ($\gamma_k \times \phi_t$) fixed effects were included in the model in order to capture time-varying sectoral and regional dynamics. Based on EUROSTAT classifications, sectors and regions are defined at the 2-digit NACE Rev.2 and NUTS-3 levels, respectively.¹⁷ Lastly, $\varepsilon_{i,t}$ represents the idiosyncratic error term in our econometric specification.

¹⁶ Distributions of other variables used as matching criteria also support the matching quality (Fig. S1, available online).

¹⁷ NUTS-3 includes 81 sub-regions, each corresponding to a province in Türkiye.

Table 2
Descriptive statistics and balancing tests for treatment and matched control firms.

Variables		# of Firms		Mean		Percentage bias reduction	T test	
		Treated	Control	Treated	Control		t-statistics	p-value
Net Sales	Unmatched	119,659	102,828	14.40	14.08	97.86%	-35.64	0.00
	Matched	90,467	90,467	14.18	14.18		-0.80	0.42
Exports	Unmatched	119,659	102,828	1.90	1.37	99.56%	-29.78	0.00
	Matched	90,467	90,467	1.14	1.14		-0.14	0.89
Imports	Unmatched	119,659	102,828	1.62	1.23	99.92%	-23.64	0.00
	Matched	90,467	90,467	0.96	0.96		0.02	0.98
FX-Denominated Debt Level	Unmatched	119,659	102,828	0.47	0.31	99.60%	-20.38	0.00
	Matched	90,467	90,467	0.18	0.18		-0.11	0.91
NACE Rev.2 Sector Code	Unmatched	119,463	102,575	44.39	44.78	100%	5.07	0.00
	Matched	90,467	90,467	45.09	45.09		0.00	1.00
Firm Size Group	Unmatched	119,463	102,575	1.80	1.75	100%	-17.23	0.00
	Matched	90,467	90,467	1.71	1.71		0.00	1.00

NACE Rev.2 Sector Code represents firms’ two-digit sector code based on the economic activity classification released by EUROSTAT, and Firm Size Group takes the value of 1, 2, 3, and 4 for micro-, small-, medium-sized, and large firms, respectively. Net Sales refers to gross sales minus discounts and returns from sales; Corporate Loans refers to TL-denominated flow loans, Exports refers to gross export revenues; Imports refers to import expenses; Domestic Input Purchases refers to the value of inputs purchased from the other firms located in Türkiye, and FX-Denominated Debt Level is the firm’ outstanding amount of FX-denominated credit balance at the end of 2021 (before the treatment period). All variables are in logarithmic form with the exception of firm size groups and sector code. The “T-test” column contains the t-statistics and p-values that show the statistical significance of mean differences between treatment and control groups before and after matching.

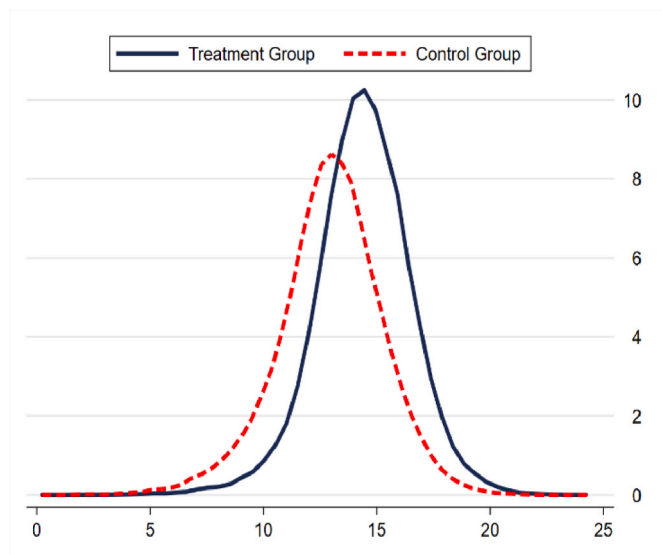


Fig. 3a. Distributions of net sales. (Before matching, %).

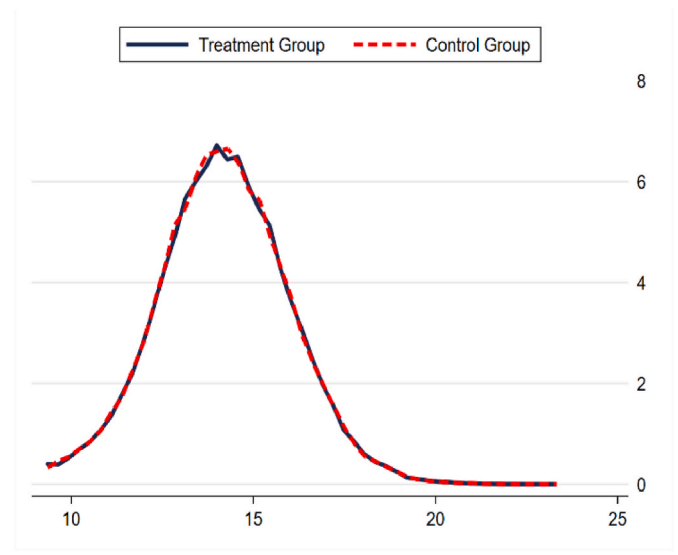


Fig. 3b. Distributions of net sales (after matching, %).

3. Results

3.1. Empirical findings

The full sample results of our empirical model are reported in Table 3. The results show that the firms that used significantly higher amounts of loans in the first six months of 2022 relatively decreased their net sales by 12.8% on average compared to the firms that used relatively less amounts of credit in the same period (Column 1). On the other hand, there is no statistically significant differentiation between the export performances of treatment and control groups (Column 3). The potential reason why the firms with remarkably higher credit usage could not outperform the firms with less credit usage in export revenues might be that these firms shift their focus to alternative channels. They may utilize the funds they obtained to increase their import expenses and domestic input purchases to augment their current inventories, especially in case they expect a price rise on their imported goods and inputs of their production in the future (CBRT, 2022c; Coibion et al., 2020). Moreover, in cases where a depreciation of domestic currency is expected in the near future, firms may tend to take position against

domestic currency, and direct their funds to purchase foreign currency (FX) in the spot market and settle their FX-denominated debt before maturity with the aim of hedging against currency movements and/or gaining financial profit (CBRT, 2022b; Kaplan et al., 2006; Lall, 1997; Thomas, 1985; Yeyati, 2006). Firms may also obtain new loans to pay down their existing loans if they expect the cost of existing loans or the cost of rolling over the existing loans will be higher in the future (Ropele et al., 2022).¹⁸ In line with these arguments, the results show that the firms that used relatively more credit increased their imports by 8% (Column 4), their domestic input purchases by 15.7% (Column 5), and their FX-denominated debt settlement before maturity by 0.6% (Column 6) compared to the control group. Additionally, these firms relatively increased their net FX purchases by approximately 28 thousand USD on

¹⁸ Ropele et al. (2022) argue that the firms with higher inflation expectations take on new loans to pay down existing loans to benefit from interest rate savings because they anticipate that higher future inflation will be met with higher future interest rates. In our case, the expected appreciation of foreign currencies against TL might be another motivation for firms to settle their existing FX-denominated loans before maturity.

Table 3
Regression results for the full sample.

	Net Sales	Corporate Loans	Exports	Imports	Domestic Input Purchases	FX-Denominated Debt Settlement	Net FX Purchases
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Treatment x Post	-0.128*** (0.005)	5.934*** (0.012)	0.000 (0.012)	0.080*** (0.011)	0.157*** (0.005)	0.006** (0.003)	28.621*** (6.626)
Firm Pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector x Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region x Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	361,868	361,868	361,868	361,868	361,868	361,868	361,868
Adj. R ²	0.77	0.63	0.75	0.74	0.82	0.60	0.59

This table reports the coefficient estimates of the regressions in Equation (1) for the full sample. The definitions of dependent variables are given in the note for Table 1. Net FX Purchases is in thousand USD while rest of the dependent variables are in natural logarithm. Robust standard errors clustered at the firm level are reported in parentheses. *, **, and *** indicate statistical significance at 10%, 5% and 1%, respectively.

average (Column 7). While firms that used relatively higher amounts of loans could not reflect this excess credit usage in their export performance, they increased their imports, domestic input purchases, FX-denominated debt settlement before maturity, and net FX purchases compared to the firms that used relatively lower amounts of credit. The findings are in support of the recent arguments in the literature that firms with higher usage of credit during the period of credit expansions tend to increase their cash reserves or their financial asset purchases rather than channel these additional funds to undertake real economic activity (Acharya et al., 2019; Cai, 2021). On the other hand, it is noteworthy that, in response to deterioration in macroeconomic expectations, firms can be expected to postpone their current investments and direct the funds they accessed to increase their inventories, strengthen their balance sheet, increase their precautionary funds and rebalance the composition of their liabilities with the aim of reducing future costs, which may enable them to undertake investments in the long term (Akçigit et al., 2021; Coibion et al., 2020; Ropele et al., 2022).

To examine whether firm size matters, we separately repeat our analysis for small and medium-sized enterprises (SMEs) and large firms.¹⁹ Panel A and B of Table 4 present the regression results for SMEs and large firms, respectively.

Panel A of Table 4 shows that SMEs with remarkably higher usage of credit in the first half of 2022 have experienced a decline in their net sales by 12.7%, compared to the SMEs that used relatively less amount of credit in the same period (Column 1). On average, SMEs with relatively higher usage of loans increased their imports by 8.1% (Column 4), domestic input purchases by 15.9% (Column 5), FX-denominated debt settlement by 0.6% (Column 6), and net FX purchases by around 8 thousand USD (Column 7) compared to the control group. However, we do not obtain a statistically significant difference in export performances between treatment and control groups of SMEs as in full sample results (Column 3).

The results reported in Panel B of Table 4 reveal that large firms that used relatively higher amounts of loans in the relevant period have shown a remarkably lower performance in terms of net sales and export revenues compared to large firms with less usage of loans. The negative coefficients for large firms in Column 1 and Column 3 do not necessarily imply that the large firms decreased their net sales and exports in this period. Instead, considering the descriptive statistics reported in Table 1, these negative coefficients indicate that large firms with higher credit usage experienced relatively lower increases in their net sales and export revenues by 13.7% and 26.6%, respectively (Column 1 and Column 3). Results also show that large firms with higher credit usage increased their net FX purchases by around 1.23 million USD more compared to

the large firms with less credit usage in the control group (Column 7). When the domestic inflation rate is expected to rise or domestic currency is expected to depreciate against foreign currencies, economic agents may also take position against their domestic currency to optimize their risk/return profile (Thomas, 1985; Yeyati, 2006). In these periods, taking position against domestic currency-denominated assets may be part of hedging activities or may be conducted with the aim of speculation for financial profit (Lall, 1997). The relative increase in net FX purchases coupled with lower export performance of large firms with higher credit usage indicate that they tended to engage more aggressively in taking position against local currency to optimize their risk/return profile and to gain financial profit.

Briefly, our findings imply that while there is no statistically significant difference in export performances between treatment and control groups of SMEs, it is noteworthy that the large firms with relatively higher usage of credit experienced significantly lower export performance compared to the large firms that used relatively less credit. On the other hand, large firms with relatively higher usage of credit increased their net FX purchases significantly more than those with less usage of credit.

We next analyze whether our results differ between the subsamples of exporters and non-exporters. Panel A and B of Table 5 show the regression results for the sample of exporters and non-exporters, respectively.

The results for the subsamples of exporters and non-exporters are parallel with the full sample results in general. Table 5 shows that exporter firms with higher usage of credit experienced a decline in their net sales by 9% (Column 1). The most remarkable finding for the sample of exporters is that exporter firms with higher usage of credit could not significantly outperform the exporters with less usage of credit in terms of their export performance in the relevant period (Column 3). Unlike the results of the full sample and non-exporters sample, however, we could not find a statistically significant result regarding the FX-denominated debt settlement tendencies of exporter firms with higher usage of credit (Column 6). On the other hand, differences in terms of import expenditures and net FX purchases between the firms with higher and lower usage credit are wider for the sample of exporter firms relative to non-exporter firms. Exporter firms with higher usage of bank loans increased their imports by 17.9% (Column 4), and their FX purchases 195 thousand USD more compared to exporters with less amount of credit usage (Column 7), whereas these differences are estimated as 7.1% and 10 thousand USD for the sample of non-exporter firms (Panel B of Table 5). On the other hand, we find that non-exporter firms with higher loan usage relatively decreased their net sales by 13.1% (Column 1), increased their FX-denominated debt settlement by 0.4% (Column 6), and their domestic input purchases by 16.9% (Column 5) in line with the full sample results.

The re-estimated results for the subsamples of manufacturing and non-manufacturing firms are reported in Table 6. The results show no statistically significant differences in terms of the export revenue and

¹⁹ Following the official SME definition of Small and Medium Enterprises Development Organization of Türkiye (KOSGEB), a firm is classified as SME if its number of employees is less than 250 employees and annual net sales do not exceed 250 million Turkish lira and large otherwise.

Table 4
SMEs vs. large firms.

	Net Sales	Corporate Loans	Exports	Imports	Domestic Input Purchases	FX-Denominated Debt Settlement	Net FX Purchases
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>Panel A: SMEs</i>							
Treatment x Post	-0.127*** (0.05)	5.940*** (0.012)	0.004 (0.012)	0.081*** (0.011)	0.159*** (0.005)	0.006** (0.003)	8.339*** (1.727)
Firm Pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector x Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region x Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	355,876	355,876	355,876	355,876	355,876	355,876	355,876
Adj. R ²	0.76	0.62	0.74	0.73	0.82	0.56	0.4
<i>Panel B: Large Firms</i>							
Treatment x Post	-0.137*** (0.02)	5.540*** (0.144)	-0.266** (0.122)	0.067 (0.125)	0.032 (0.03)	0.023 (0.096)	1232.608*** (408.336)
Firm Pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector x Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region x Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5992	5992	5992	5992	5992	5992	5992
Adj. R ²	0.82	0.56	0.84	0.83	0.85	0.71	0.61

This table reports the coefficient estimates of the regressions in Equation (1) for the SMEs and large firms. The definitions of dependent variables are given in the note for Table 1. Net FX Purchases is in thousand USD while rest of the dependent variables are in natural logarithm. Robust standard errors clustered at the firm level are reported in parentheses. *, **, and *** indicate statistical significance at 10%, 5% and 1%, respectively.

Table 5
Exporters vs. non-exporters.

	Net Sales	Corporate Loans	Exports	Imports	Domestic Input Purchases	FX-Denominated Debt Settlement	Net FX Purchases
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>Panel A: Exporters</i>							
Treatment x Post	0.090*** (0.012)	5.695*** (0.042)	0.038 (0.075)	0.179*** (0.066)	0.055*** (0.013)	0.022 (0.024)	195.100*** (54.840)
Firm Pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector x Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region x Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	35,944	35,944	35,944	35,944	35,944	35,944	35,944
Adj. R ²	0.81	0.62	0.54	0.76	0.83	0.7	0.62
<i>Panel B: Non-Exporters</i>							
Treatment x Post	0.131*** (0.005)	5.960*** (0.013)	-	0.071*** (0.011)	0.169*** (0.006)	0.004** (0.002)	10.284*** (4.241)
Firm Pair FE	Yes	Yes	-	Yes	Yes	Yes	Yes
Sector x Time FE	Yes	Yes	-	Yes	Yes	Yes	Yes
Region x Time FE	Yes	Yes	-	Yes	Yes	Yes	Yes
Observations	325,924	325,924	-	325,924	325,924	325,924	325,924
Adj. R ²	0.76	0.64	-	0.72	0.82	0.59	0.58

This table reports the coefficient estimates of the regressions in Equation (1) for the exporter and non-exporter firms. The definitions of dependent variables are given in the note for Table 1. Net FX Purchases is in thousand USD while rest of the dependent variables are in natural logarithm. Robust standard errors clustered at the firm level are reported in parentheses. *, **, and *** indicate statistical significance at 10%, 5% and 1%, respectively.

FX-denominated debt settlement for the sample of non-manufacturing sectors and the import revenues for the sample of manufacturing firms. On the other hand, relative differences in net FX purchases and import expenses of firms with high and low credit usage in manufacturing sector firms are wider than those in the non-manufacturing sectors.

3.2. Additional robustness checks

To achieve further robustness of the results reported in Section 3.1, we employ several additional tests.²⁰ First, in order to test that the results are not driven by outliers, we winsorize the data to be at the 0.5% and 1% quantiles in each tail and re-estimate our model. The results obtained with the winsorized data are quite similar, suggesting that the outliers in our sample are not a significant problem for the findings discussed in Section 3.1 (Table S1 and Table S2, available online).

²⁰ The results of robustness checks are shared in supplementary materials, which are available online.

Moreover, we replace TL-denominated flow loans with the net change in firms’ outstanding amount of bank loans to measure TL-denominated loan usage during the relevant period and reconstruct our treatment and control groups. When we repeat our analyses on these alternative treatment and control groups, we obtain similar results to those reported in Section 3.1 (Table S3, available online). We also use an alternative measurement to examine firms’ tendencies to repay their FX-denominated debt. We use the total payment of FX-denominated debt as a dependent variable instead of the FX-denominated debt settlement utilized in our estimations. Similar to our main findings, analyses conducted with the dependent variable of the total payment of FX-denominated debt also show that firms with higher use of bank loans tend to reduce their FX-denominated debt stock relatively more than their counterparts (Table S4, available online).

Following Brown and Earle (2017), we include the pair fixed effect for each group of the treatment and control firms in our model estimations. Alternatively, we repeat our analyses by replacing the pair fixed effects in our main specification with firm fixed effects that enable us to control for any time-invariant and unobservable firm characteristics. We also apply cross-sectional analyses using the first differenced dependent

Table 6
Manufacturers vs. non-manufacturers.

	Net Sales	Corporate Loans	Exports	Imports	Domestic Input Purchases	FX-Denominated Debt Settlement	Net FX Purchases
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>Panel A. Manufacturers</i>							
Treatment x Post	0.039*** (0.009)	5.905*** (0.028)	0.035 (0.041)	0.206*** (0.036)	0.126*** (0.010)	0.022** (0.010)	72.20*** (26.124)
Firm Pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector x Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region x Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	68.844	68.844	68.844	68.844	68.844	68.844	68.844
Adj. R ²	0.81	0.64	0.75	0.73	0.84	0.64	0.63
<i>Panel B. Non-Manufacturers</i>							
Treatment x Post	0.148*** (0.006)	5.940*** (0.014)	−0.008 (0.012)	0.051*** (0.010)	0.165*** (0.010)	0.002 (0.008)	18.32*** (5.480)
Firm Pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector x Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region x Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	293.024	293.024	293.024	293.024	293.024	293.024	293.024
Adj. R ²	0.77	0.62	0.73	0.76	0.82	0.56	0.49

This table reports the coefficient estimates of the regressions in Equation (1) for the firms in manufacturing sectors and the firms in non-manufacturing sectors. Definitions of all dependent variables are given in the notes for Table 1. *, **, and *** indicate statistical significance at 10%, 5% and 1%, respectively.

variables regressed on the treatment variable and controlling sector x province fixed effects as an alternative to our main estimations. The results are qualitatively and quantitatively similar to those in Section 3.1 (Table S5 and Table S6, available online). We also test our findings by extending the period covered in this study. For the dependent variables that are not exposed to data constraints, we repeat our analyses by extending the impact period until the end of 2022. The results are in line with the findings reported in Section 3.1 (Table S7, available online). Lastly, we include firm-level control variables, which we did not use as matching criteria in CEM, in our regressions to test the robustness of our results. This analysis also yields similar findings to the baseline results (Table S8, available online).

4. Conclusion

In this study, we examine the impact of a sudden and remarkable credit expansion experienced in Türkiye during the first half of 2022 on firm behavior by using a unique and confidential dataset constructed using various data sources covering the universe of all incorporated firms in Türkiye.

Utilizing the combination of the CEM approach and difference-in-differences methodology, we document that, amid the credit expansion coupled with the deterioration in expectations of inflation and depreciation in local currency, the firms with higher credit usage tended to engage in alternative channels such as pulling-forward imports and input demand and taking position against local currency to gain financial profit more than those with less credit usage during the first half of 2022. Results reveal that SMEs with higher credit usage increased their imports, domestic input purchases, FX-denominated debt settlement before maturity, and net FX purchases, while large firms that use more loans tend to increase their net FX purchases more than those with lower credit usage. Results also indicate a significantly lower export performance for large firms that used higher amounts of credit relative to their counterparts with relatively less usage of credit. On the other hand, there is no significant difference in the export performances of SMEs. These findings are in line with recent studies showing that firms with higher usage of credit during the period of credit expansions tend to increase their cash reserves or their financial asset purchases rather than channel these additional funds to undertake real economic activity, suggesting the importance of the policies that provide a more positive real effects through an efficient credit allocation (Acharya et al., 2019; Cai, 2021).

In this study, we discuss the firm-level effects of a sudden credit growth in the short run. However, we also consider that it is critical to

examine firm-level impacts in the medium and long term, as well as the risk factors and impacts that excessive credit growth and corporate indebtedness may cause in terms of price stability and financial stability. Since the data comes with a time lag, we aim to address these issues in future studies once data constraints are eliminated.

Declaration of competing interest

None.

Acknowledgements

The views expressed in this study are those of the authors and do not necessarily represent the official views of the Central Bank of the Republic of Turkey.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.bir.2024.07.003>.

References

- Acharya, V. V., Eisert, T., Eufinger, C., & Hirsch, C. (2019). Whatever it takes: The real effects of unconventional monetary policy. *Review of Financial Studies*, 32(9), 3366–3411.
- Akçigit, U., Seven, Ü., Yarba, I., & Yılmaz, F. (2021). Firm-level impact of credit guarantees: Evidence from Turkish credit guarantee fund. *Central Bank of the Republic of Türkiye*. Working Paper No. 21/10.
- Alessi, L., & Detken, C. (2018). Identifying excessive credit growth and leverage. *Journal of Financial Stability*, 35, 215–225.
- Azariadis, C. (2018). *Credit cycles and business cycles*. Available at: SSRN: <https://ssrn.com/abstract=3105905>. (Accessed 20 October 2023).
- Blackwell, M., Iacus, S., King, G., & Porro, G. (2009). Cem: Coarsened exact matching in stata. *STATA Journal*, 9(4), 524–546.
- Bonomo, M., Brito, R. D., & Martins, B. (2015). The after crisis government-driven credit expansion in Brazil: A firm level analysis. *Journal of International Money and Finance*, 55, 111–134.
- Brown, J. D., & Earle, J. S. (2017). Finance and growth at the firm level: Evidence from SBA loans. *The Journal of Finance*, 72(3), 1039–1080.
- Cai, Y. (2021). Expansionary monetary policy and credit allocation: Evidence from China. *China Economic Review*, 66, Article 101595.
- CBRT. (2022a). *Financial stability report – november 2022*. Technical report, the directorate for banking at the Central Bank of the republic of Türkiye.
- CBRT. (2022b). *Financial stability report – may 2022*. Technical report, the directorate for banking at the Central Bank of the republic of Türkiye.
- CBRT. (2022c). *Inflation report 2020-II*. Technical report, the directorate for banking at the Central Bank of the republic of Türkiye.
- Coibion, O., Gorodnichenko, Y., & Ropele, T. (2020). Inflation expectations and firm decisions: New causal evidence. *Quarterly Journal of Economics*, 135(1), 165–219.

- Cong, L. W., Gao, H., Ponticelli, J., & Yang, X. (2019). Credit allocation under economic stimulus: Evidence from China. *Review of Financial Studies*, 32(9), 3412–3460.
- Dell'Ariccia, G., Igan, D., Laeven, L., & Tong, H. (2012). *Policies for macrofinancial stability: How to deal with credit booms*, 12/06. IMF Staff Discussion Note.
- Ferrando, A., Popov, A., & Udell, G. F. (2019). Do SMEs benefit from unconventional monetary policy and how? Microevidence from the eurozone. *Journal of Money, Credit, and Banking*, 51(4), 895–928.
- Gourinchas, P. O., Valdés, R., & Landerretche, O. (2001). *Lending booms: Latin America and the world* (NBER working paper No. 8249). National Bureau of Economic Research.
- Haukoos, J. S., & Lewis, R. J. (2015). The propensity score. *JAMA*, 314(15), 1637–1638.
- Hsieh, C. T., & Klenow, P. J. (2009). Misallocation and manufacturing TFP in China and India. *Quarterly Journal of Economics*, 124(4), 1403–1448.
- Iacus, S. M., King, G., & Porro, G. (2012). Causal inference without balance checking: Coarsened exact matching. *Political Analysis*, 20(1), 1–24.
- Kaplan, C., Özmen, E., & Yalcin, C. (2006). The determinants and implications of financial asset holdings of non-financial firms in Turkey: An empirical investigation. *Central Bank of the Republic of Türkiye, Research and Monetary Policy Department*. Working Paper No. 06/06.
- Lall, S. (1997). *Speculative attacks, forward market intervention and the classic bear squeeze* (IMF Working Paper No. 97/164). Available at: SSRN: <https://ssrn.com/abstract=883045>.
- Lopez-Acevedo, G., & Tan, H. W. (2011). *Impact evaluation of SME programs in Latin America and Caribbean*. World Bank Publications.
- Maffioli, A., De Negri, J. A., Rodriguez, C. M., & Vazquez-Bare, G. (2017). Public credit programmes and firm performance in Brazil. *Development Policy Review*, 35(5), 675–702.
- Mendoza, E. G., & Terrones, M. E. (2008). *An anatomy of credit booms: Evidence from macro aggregates and micro data* (NBER working paper No. 14049). National Bureau of Economic Research.
- Merino, S., Lesam, K., & Chondrogiannis, I. (2024). Macroprudential policy and credit allocation: Evidence from South Africa. *South African reserve bank working paper series*. Working Paper No. 24/09.
- Reis, R. (2013). *The Portuguese slump and crash and the euro crisis* (NBER Working Paper No. 19288). National Bureau of Economic Research.
- Ropele, T., Gorodnichenko, Y., & Coibion, O. (2022). *Inflation expectations and corporate borrowing decisions: New causal evidence* (NBER working paper No. 30537). National Bureau of Economic Research.
- Shen, J., Firth, M., & Poon, W. P. (2016). Credit expansion, corporate finance and overinvestment: Recent evidence from China. *Pacific-Basin Finance Journal*, 39, 16–27.
- Thomas, L. R. (1985). Portfolio theory and currency substitution. *Journal of Money, Credit, and Banking*, 17(3), 347–357.
- Yarba, I., & Yassa, A. D. (2022). Does stock market listing boost or impede corporate investment? *Borsa Istanbul Review*, 22(2), 285–294.
- Yeyati, E. L. (2006). Financial dollarization: Evaluating the consequences. *Economic Policy*, 21(45), 62–118.