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Banking on the State: Does State Investment Bank Lending Increase Firm Investment?

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Banking on the State: Does State Investment Bank Lending Increase Firm Investment?

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Abstract:

State-backed institutions disburse substantial volumes of loans to the private sector to finance investment. In some major economies, this accounts for over 20% of bank credit for investment. Despite this, the microeconomic effects of state investment bank lending have received limited empirical attention. This paper examines the impact of a major lending programme of in the European Union: the European Fund for Strategic Investments (EFSI). Using a unique dataset on loan recipients, it estimates the effect of lending on firm investment through a difference-in-differences design, matching recipients with controls expected to follow the same dynamics of investment demand. Receiving an EIB loan under EFSI is found to have caused substantial additional growth in fixed assets, averaging approximately 12 percentage points during the post-treatment period. This is the first causal evidence on the additionality of large state investment bank loans made directly to firms.

1 Introduction

Financial constraints are a serious drag on economic activity. They reduce the investments of affected firms, retard firm growth and, ultimately, weaken macroeconomic performance (Winker 1999; Levine 2005; Savignac 2008; Angelini & Generale 2008; Beck et al. 2008; Kraemer-Eis et al. 2015). Moreover, they disproportionately affect investments with the largest social returns, such as blue-sky innovation and, historically, green energy investments (Hall & Lerner 2010; Nanda, Younge & Fleming 2015; Mazzucato & Semieniuk 2017, 2018; Polzin 2017; Lahr & Mina 2021). This provides a motivation for state intervention, including directly providing finance through state investment banks.

A priori, it is unclear whether providing loans will cause firms to invest more. Additionality depends on whether the investments are financially constrained, either because the firm is credit rationed or because the cost of credit is too high. Loans will not have additionality if they go to firms who could finance investments anyway but wish to take advantage of the more favourable terms offered by state investment banks. This is one reason state investment bank lending has been criticised as inefficient and ineffective (Sapienza 2004; Dinç 2005; Berger et al. 2008; Lokshin & Mohnen 2012).

Yet little evidence exists on whether state investment bank loans actually generate additional investment or merely subsidise the investments of well-connected firms. This contrasts with the rich literature on investment subsidies and grants[1]. New evidence on the effects of loans – which operate differently from subsidies and grants as they have a cost to the firm and need to be repaid – is therefore a significant contribution to the field of work on public investment policies, especially given the current prominence of loans in major policy initiatives (for example, the US Inflation Reduction Act is providing $350bn of loans for green investments).

Existing research on the causal effects of loans is limited to state investment bank operations supporting SMEs, where a loan portfolio guarantee or preferential credit line is provided to a private bank on the condition that finance is subsequently lent out to SMEs. This has found positive effects across a range of contexts (Cassano et al. 2013; Endresz et al. 2015; Briozzo & Cardone-Riportella 2016; Brown & Earle 2017). This includes the European Investment Bank Group's own research on the impact of its intermediated lending to SMEs, which finds sizeable positive effects on the assets, sales and employment of final recipients (Asdrubali & Signore 2015; Bertoni et al. 2018a, 2018b, 2019; Gereben et al. 2019; Amamou et al. 2020).

In terms of direct lending, a review of the literature identified only two studies. Bah et al. (2011) find large increases in employment from USAID technical and financial support to Macedonian SMEs, while an internal EIB study of its venture debt operations – a special type of debt targeted at young and innovative firms – found large effects on firm assets and value added[2] (Gatti et al. 2022). Prior to this paper, no research had examined the causal effects of the largest share of state investment bank finance that is lent directly to large firms.

The distinction between intermediated lending and allocating finance directly is not trivial since public and private agents allocate finance based on different incentives. Additionally, information collection may vary considerably between private and state investment banks. Distinguishing

1 Recent evidence on R&D grants to SMEs in the US and EU based on high-quality regression discontinuity designs has shown sizeable effects on investment (Howell 2017; Santoleri et al. 2021). Whilst evidence on subsidies overall is mixed, there is strong evidence of substantial effects for R&D subsidies to small firms (Bronzini & Iachini 2014; Becker 2015).

2 An examination of event study plots suggests parallel trends may be violated, potentially biasing the difference-in-differences estimates upwards. The exclusion of firms that received venture debt from other sources from the control group is also questionable as it assumes they would not have received venture debt without the EIB (although, since venture debt markets in the European Union are not well-developed, this exclusion is unlikely to have a significant impact on results).

between lending to small and large firms is important because economic theory suggests large firms should be less vulnerable to financial constraints and less in need of public support due to lower information asymmetries and possessing appropriate collateral (Myers & Majluf 1984; Berger & Udell 1995, 2006). Research on other forms of state support for firm investment also finds larger effects for small firms (Bronzini & Iachini 2014; Becker 2015).

This paper presents the first causal evidence of the microeconomic effects of lending by public sector institutions to large firms. It examines the impact of loans provided by the European Investment Bank (EIB) – the EU's public investment bank and the largest in the world – as part of the EU's Investment Plan for Europe (commonly known as the 'Juncker Plan'). These loans were backed by fiscal guarantees that reduced the EIB's exposure to risk, administered through the dedicated vehicle of the European Fund for Strategic Investments (EFSI). EFSI supported over €60 billion of EIB loans between 2015 and 2020, around €20 billion of which was lent directly to large firms[3]. Along with supporting additional lending, EFSI was intended to direct loans at higher-risk investments. It has been argued the most effective use of state investment bank lending is to support risky investments that have large potential societal spillovers, which makes EFSI an important case study (Mazzucato & Penna 2016; LSE Growth Commission 2017; Mazzucato & Semieniuk 2017; Besley & Stern 2020, Martin et al. 2020). Despite its scale and significance, this is the first paper to assess the effects of EFSI lending on firm investment and performance.

This paper leverages a unique dataset specifically collected for this research on the recipients of EFSI loans. Causal effects are identified using a difference-in-differences strategy that matches firms with untreated controls based on industry-location-size clusters, thereby accounting for cluster-specific shocks and secular trends in the demand for investment that might lead firms to seek EIB finance. This set up is designed to capture only the investment that is additional to what a recipient would have made in the absence of the policy.

Receiving an EIB loan under EFSI is found to have caused an average of 12 percentage points additional growth in fixed assets during the post-treatment period. This large effect on investment is attributed to maturity rationing, which constrained access to long-term credit in the years following the Eurozone crisis. No effects were found on revenue or employment. This is the first causal evidence of additionality from direct lending by public institutions to large firms.

3 This €20bn excludes finance provided under EFSI to special purpose vehicles set up by major multinational companies for large scale energy and public infrastructure projects, which are treated here as a separate category of financing operation.

2 Policy Context

The European Investment Bank (EIB), collectively owned by the EU member states, has a mandate to finance investments that promote economic and social development and foster integration within the EU. It is the largest multilateral bank in the world, disbursing over €50bn of finance in 2023, of which 90% supported investments in the EU (Xu et al. 2023; EIB 2024). The EIB finances investment directly through 'project finance' and indirectly by supporting lending to small firms via local financial intermediaries[4]. This paper focuses on the former, which accounts for around two thirds of EIB financing and typically targets investments with high capital intensity, long payback periods and low-to-moderate risk profiles (Griffith-Jones & Naqvi 2021). These projects must secure at least 50% of finance from other sources.

Spreads on EIB loans are 'benchmarked' to market rates (the exact methodology is not publicly disclosed), but interest rates will typically be lower than loans from private banks. This is because the EIB, which has a AAA rating, can borrow at very low cost on bond markets, so the spread is applied to a lower benchmark. EIB loans also generally have longer tenors and lower collateral requirements. As a result, borrowing from the EIB is potentially attractive even to those applicants whose investment projects could be financed from alternative sources. This makes the question of whether loans actually alter recipients' investment relevant.

The EIB played a central role in the EU's response to the economic fallout from the 2008 financial crisis and the subsequent Eurozone crisis. In 2014, amid high European unemployment and weak GDP growth, the European Commission announced The Investment Plan for Europe, also known as the 'Juncker Plan'. The level of investment in the EU had fallen to well below its pre-2008 peak (see Figure 1, with Japan included for comparison with a developed economy with a relatively high level of investment). One factor in this decline was the destabilisation and fragmentation of the European financial system, which especially reduced the availability of finance in periphery countries (Barkbu et al. 2015; Acharya et al. 2018; Palm´en 2020). Bank balance sheets had low risk bearing capacity and were now subject to more stringent capital and supervisory regulations, which encouraged credit rationing, greater collateral demands and shortening of loan tenors (van der Veer & Hoeberichts 2016; Acharya et al. 2018; Gropp et al. 2019). At the same time, risk premiums on equity investments remained persistently higher than their pre-crisis levels (Kapp & Kristiansen 2021).

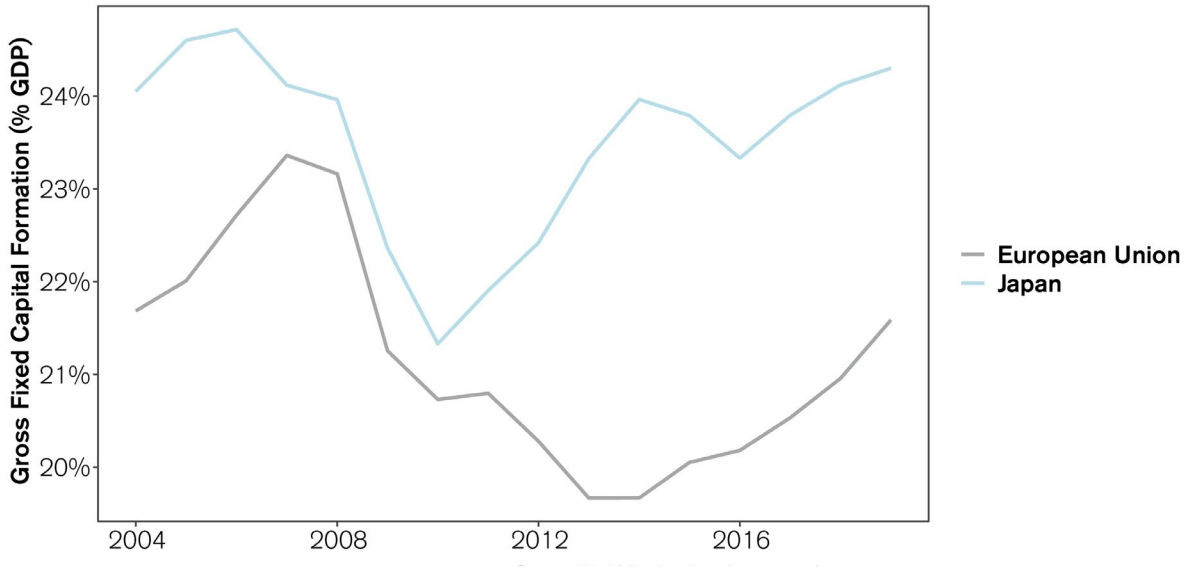
The Investment Plan for Europe supported the EIB in addressing this finance gap through the creation of the the European Fund for Strategic Investments (EFSI)[5]. EFSI underwrote first losses on selected new loans with fiscal guarantees backed by the EU budget, initially up to a maximum of €16 billion at any given moment, increased to €26bn in 2016. EIB loans are not normally underwritten by guarantees, and this feature of EFSI was intended to enable the EIB to lend more to higher-risk investments[6]. The guarantee allowed for longer loan tenors and reduced collateral requirements compared to other EIB lending (pricing of the loan was subject to the standard EIB methodology).

4 These operations are often carried out by the EIB Group's dedicated SME arm, the European Investment Fund (EIF).

5 EFSI was one of three pillars of the Investment Plan for Europe, alongside establishing the European Investments Advisory Hub and the European Investment Project Portal, aimed at improving investment advisory services, and promoting the removal of regulatory and administrative barriers at both the national and EU levels.

6 In 2013, the year prior the announcement of EFSI, the EIB received a €10bn capital injection from the EU member states, which also supported the expansion of its lending.

Figure 1: Level of investment in the EU vs Japan



Source: World Bank national accounts data

Use of the EFSI guarantee was subject to its own governance structure with projects approved by an independent EFSI Investment Committee. Firms across the EU could apply for EIB finance as usual on a rolling basis, providing details of the planned investment project and evidence of the ability to finance part from other sources. The EIB assessed these projects based on its standard criteria: the viability of proposed investments, the degree to which EIB participation provided additionality, and a set of social and economic criteria reflecting the EIB's shift towards financing more investments with positive societal spillovers (including its stated aim of becoming the EU's 'climate bank'). At this stage, some projects were selected by the EIB for consideration under the EFSI guarantee and referred to the Investment Committee. The Committee assessed projects on criteria similar to internal EIB criteria and on their alignment with wider European Union policies, such as promoting smart, sustainable and inclusive growth. Finance backed by the guarantee also had to fall within one of the following areas: transport; energy and the digital economy; environment and resource efficiency; human capital, culture and health; research, development and innovation; and support to SMEs and mid-caps. At the end of 2017, this was extended to include bioeconomy and regional development. The large majority of projects referred to the Investment Committee were approved for use of the guarantee (EIB 2021).

EFSI guarantees were granted on loans approved between 2015 and 2020, by which time €60 billion of EIB financing had been signed off under EFSI[7]. Half of this amount was lent directly to large, private non-financial enterprises (including cooperatives but not state-owned enterprises which are treated separately – see Appendix A for a detailed breakdown by recipient type). The effects of this part of EFSI finance are addressed in this paper.

7 Additional EIB finance not covered by EFSI was also extended for some of these investment projects. Recipients generally also had to finance 50% of investments from other sources. Consequently, the total investment associated with EFSI lending was larger.

3 Data collection

Information about investment projects financed by the EIB under EFSI is contained in a diverse range of publicly available documents (although in a number of cases documents had to be specially requested from the EIB). This includes EIB project summary sheets, EIB project data sheets, Environmental and Social Data Sheets (ESDS), Environmental and Social Completion Sheets (ESCS), EFSI Operation Scoreboards, EIB press releases, and EFSI reports to the European Parliament and Council. These sources were used to identify recipients of loans, as well as detailed information about the investments being made. In total, 691 projects were identified as having received support under EFSI, of which around half consisted of a loan to a single firm (rather than another financial intermediary or state entity). Most of these EIB documents have not been used for research before, so this is a unique dataset on the investments financed by EFSI.

Special purpose corporate entities set up with the sole purpose of fulfilling a single investment project were excluded, partly because there is no appropriate control group in these cases. Venture debt operations – a small minority of lending to firms that are smaller and younger than those receiving conventional loans – were also excluded as this is a different type of operation that has been addressed elsewhere (Gatti et al. 2022). A further six laggards who signed contracts in 2021 having had loan agreements in place in 2020 were dropped because, at the time of data collection and analysis, they could not be observed post-treatment. This leaves a group 194 firms who received a loan under EFSI, accounting for around €20 billion (one third) of total EFSI finance (an average loan size of around €100mn[8]).

These recipients were linked to accounting data taken from Bureau van Dijk's Orbis database. Orbis data is collected from company annual reports and official registry filings and is the standard source for firm level analysis covering multiple countries due to providing a standardised data format and definitions (Bajgar et al. 2020; Autor et al. 2020). Search and extraction of data was done manually to maximise the number and accuracy of entries identified. Location of entries was based on the entity identified by the EIB as the 'project promoter', whether this was the parent company or a subsidiary[9]. This was crosschecked with the named counterparties in the financial reporting in EFSI Reports.

Orbis entries were checked to ensure they matched the name, country and industry of the project promoter. In a number of cases, additional research was required to deal with small discrepancies caused by, for example, a change of name by the recipient firm since it signed the loan agreement. Care was taken during extraction to identify implausible values, such as where a value was negative despite this being precluded in the variable definition, and either replacing with n.a. or, where such cases occurred multiple times in a firm entry, dropping the firm from the retained sample. Firms were also dropped if they had no data in Orbis for the year immediately before treatment, since it is not possible to estimate treatment effects using difference-in-differences without this. Entries of sufficient quality and coverage were located for 184 out of 194 firms.

Data coverage at the time of analysis was insufficient for before 2012 or after 2020, so these years were dropped. Data coverage within this period is generally very good, being virtually perfect for most outcome variables in post-treatment years and not below 80% of firms for any

8 In keeping with the EIB rule of only financing 50% of a project, average total planned investment for a project was €213mn. Some loans were much larger than average – up to €500mn

9 In a small number of instances, Orbis did not list the named subsidiary separately from the parent, or both parent and subsidiary were listed as counterparties in EFSI reports, and some judgement had to be applied in matching the named recipient to an appropriate entry (based on the country location of the investment project and relative quality of the Orbis data entries).

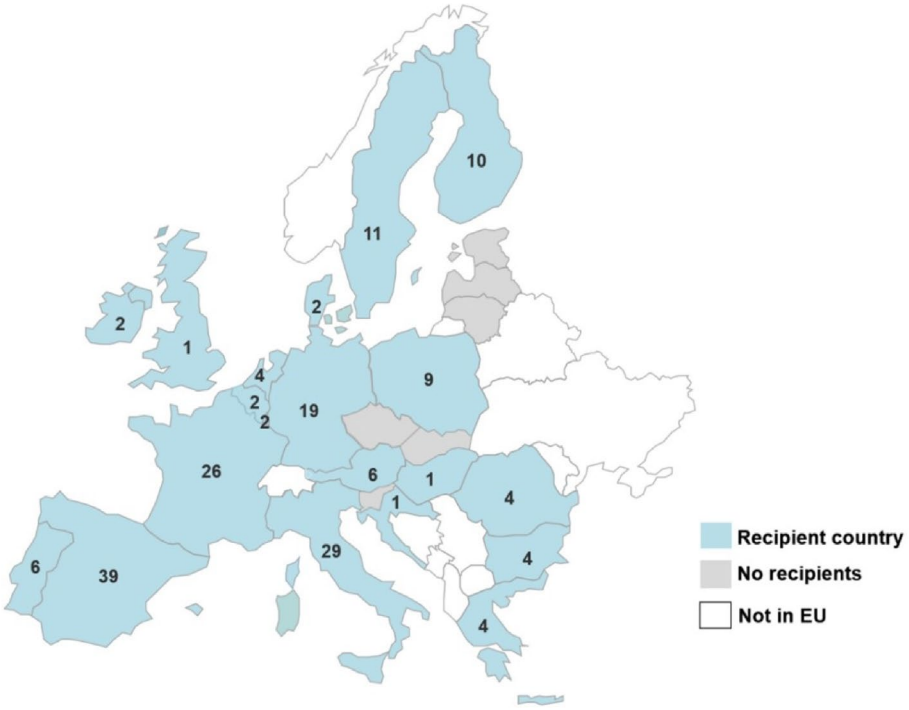
variable in any year (with the exception of employment in the 2012 and 2013). All data from Orbis was extracted in Orbis' 'global standard format' and in euros, even when the firm is not resident in the eurozone. The type of filing and consolidation method of the most recent set of accounts was used for each firm, except in cases where switching provided data for the year immediately prior to treatment. If dates and coverage were equivalent, consolidated accounts were preferred to ensure capture of investments by subsidiaries. Consequently, consolidated accounts were used for most firms. Where a firm's 4-digit NACE industry classification was given as 'activities of head offices', 'activities of head holding companies' or 'accounting, bookkeeping and auditing activities; tax consultancy' (NACE codes 6420, 7010, 6920), additional information from company websites and reports was used to replace these generic headings with an NACE 4-digit industry classification consistent with the goods and services actually produced by the firm.

The outcome variables taken from Orbis were fixed assets, long-term debt, revenue and number of employees. Changes in the fixed assets of a firm are defined here as net investment, which is the primary outcome of interest. Long-term debt describes the policy mechanism, although its reporting depends on national accounting practices and can cover debt with relatively short maturities (commonly, owed credit and bonds with over one year to maturity). Employment data in Orbis is of a lower quality than for assets and is affected by the complex nature of modern corporate structures (firms with very large assets can sometimes have small numbers of employees on their books). Provided these errors remain constant over time, this is of less consequence for this analysis which relates to changes. The distributions for all variables are highly skewed, and they are transformed into natural logs for analysis (as is standard).

4 Recipient and investment characteristics

A striking feature of the firms who received EFSI-backed loans from the EIB is their large size. In 2014, the year before the first firms were treated, mean total assets was €3.5bn (median €0.7bn), with mean revenues of €2.4bn (€0.4bn) and mean number of employees of 9,406 (1,421). Only 10 (5%) met the EU definition of an SME[10]. Recipients were far more likely to innovate than the average European firm, with around 60% having published a patent in the five years before their treatment date. They were also concentrated in manufacturing, which over half had listed as their primary activity. Figure 2 shows the country of incorporation of recipients was spread across the EU, although large Southern European economies were notably well represented.

Figure 2: Location of loan recipients



Over half of the loans made directly to firms financed projects that featured R&D, with over 40% being majority or entirely composed of R&D. This is highly unusual for a bank loan portfolio, as banks tend to prefer to finance tangible investments that generate suitable collateral. Dividing investments according to the typology set out in Appendix B, around half of investment projects consisted entirely of expansion investments (addition of production capacity or introduction of new products). Only a sixth of investment projects consisted solely of improvements in efficiency or existing product quality. There is also evidence of a societal orientation to lending, with half of investments found to be green (have environmental benefits as an important intended outcome). At the time of research, just under half of investment projects were identified as completed.

10 The European Commission defines an SME as a firm that has less than 250 employees and either an annual turnover not exceeding €50mn or total assets not exceeding €43mn (European Commission 2016).

5 Methodological Strategy

The effect of receiving a loan is identified through a difference-in-differences (diff-in-diff) strategy, with a control group of firms who did not receive EIB finance constructed through prior matching. This is the standard strategy in the literature on the effects of state investment bank support, although this paper diverges in using an alternative matching approach to propensity score matching. Propensity score estimates of the probability of receiving a loan from a state investment bank tend to be highly sensitive to model specification and other methodological choices like matching caliper, and would be significantly more noisy for direct lending to large firms where the number of treated firms is smaller. Instead, context-based (local) matching is preferred where units are matched within the same geographic/economic context (Heckman, Ichimura & Todd 1997; Stuart & Rubin 2008). This follows the literature on bank credit supply shocks, which shows clustering firms by industry, location and size effectively controls for credit demand (Popov & van Horen 2015; Degryse et al. 2019; Acharya et al. 2019; Berg et al. 2021). Firms select to apply for a loan based on demand for investment, meaning shocks to this are the most likely source of violations in parallel trends.

Each treated firm was matched one to one with a control firm located in the same country, with its primary activity in the same 4-digit NACE industry classification and in the same coarsened firm size category[11]. When there was more than one potential match, the firm closest in size measured by total assets to the treated firm in the year before treatment was used[12]. Matching was done without replacement and after potential control firms were checked and cleaned for implausible values, with one case where multiple instances resulted in the replacement of the firm.

Of the sample of 184 treated firms, appropriate country-industry-size matches were located for 167 (a loss of less than 10%). A full listed of treated firms with their matched controls can be found in Appendix C. Data coverage in Orbis is very good for the 167 control firms: above 85% of firms for any variable in any year (with the exception of employment in 2012 and 2013).

Balance checks show matching achieved close to perfect balance in means for assets and revenue, with normalised differences[13] for other variables well below the 0.25 threshold suggested by Imbens and Wooldridge (2009) as indicative of covariate imbalance. This is shown for the outcome variables in 2014[14] in Table 1. Log distributions demonstrate good distribution balance for the log of fixed assets, total assets, revenue and employment, although less so for the log of long-term debt (see Appendix D). Ex ante, balance on observed characteristics is supportive of the plausibility of parallel trends (Abadie 2005; Kahn-Lane & Lang 2020).

11 For convenience, this followed the Orbis definitions of SME, large and very large. Very large firms meet any one of the following criteria: operating revenue ≥ 100 million EUR, total assets ≥ 200 million EUR, employees ≥ 1,000, or being listed. Large firms meet any one of the following: operating revenue ≥ 10 million EUR, total assets ≥ 20 million EUR, or employees ≥ 150. Any firms below the threshold for large were classified as SMEs. Since the majority of firms met the threshold for very large, matching on coarsened size primarily served purpose of excluding firms insufficiently large to be comparable to our treated sample.

12 This accounted for whether the treated firm's data came from consolidated or unconsolidated accounts.

13 The difference in the group means scaled by the square root of the average of the within-group variances.

14 Matching was done for each treated firm based on the year prior to treatment, but for presenting overall balance 2014 is the best year since this is the final year of data when no firm had been treated.

Table 1: Balance in expectations in 2014

	Fixed assets (millions)	Revenue (millions)	Employees	Long term debt (millions)
Treated mean (standard deviation)	€1,341 (€2,504)	€1,584 (€4,735)	5,678 (11,689)	€458 (€1,018)
Control mean (standard deviation)	€1,338 (€3,172)	€1,516 (€3,837)	4,278 (9,876)	€394 (€1,088)
Normalised difference in means	0.00	0.02	0.13	0.06

Diff-in-diff subtracts the change in outcomes of control firms from the post-treatment change in outcomes of treated firms to produce estimates of average treatment effects for the treated (ATTs). This is estimated using the Callaway and Sant'Anna (2021) diff-in-diff estimator, one of a number of new diff-in-diff estimators that are robust to arbitrary treatment effect heterogeneity when there is variation in treatment timing. When not including covariates as part of estimation, the Callaway and Sant'Anna estimator will give very similar estimates to other heterogeneity robust estimators, so this choice is not consequential for results. Identification relies on the standard diff-in-diff assumptions of parallel trends, no anticipation and no spillovers on the control group (the Stable Unit Treatment Value Assumption (SUTVA)). Since outcomes are in logs, the parallel trends assumption becomes one of common rates of growth.

Treatment is defined as binary and staggered, with a firm designated as treated in the period it signs an EIB loan contract and remaining treated for all subsequent periods. Firms are treated in different years, meaning there are different treatment cohorts. Inference is conducted using a multiplier bootstrap (Callaway & Sant'Anna 2021).

It is important to emphasise that the appearance of loans on the balance sheets of firms after treatment will not automatically register as a treatment effect in this research design. Provided parallel trends hold, treatment effects will only be positive if EIB finance was additional to what the firm would have obtained absent the policy. Thus, estimates reflect additionality.

6 Results

The main results reported are the 'overall' average treatment effects on the treated (ATTs), which are constructed by averaging the cohort-year average treatment effects for each cohort across all their post-treatment years and then averaging these cohort averages weighting by cohort size. Since all variables are transformed into natural logs, estimates approximate at smaller magnitudes as the percentage point difference between the average percentage growth for treated firms since the pre-treatment baseline and the average percentage growth for the control firms[15].

Results are summarised in Table 2 and Figure 3. Receiving a loan is found to have caused a large increase in investment. Log fixed assets in the treatment group increased 0.12 more than in the control group from before to after treatment, which roughly approximates as an average of 12 additional percentage points of growth. Estimates of the effect on total assets are similar. Clear evidence is also found of the policy mechanism that would explain this result. Receiving an EIB loan is estimated to have increased the log of long-term debt on a firm's balance sheet by 0.55 – a huge increase in firm borrowing that suggests the EIB loan was a major positive shock to firm credit supply.

Table 2: Average change in logs caused by EIB loan

	ATT	Std. Error	95% CI lower	95% CI upper
Fixed assets	0.12***	0.05	0.03	0.22
Long-term debt	0.55**	0.25	0.06	1.03
Revenue	0.03	0.09	-0.15	0.21
Employment	-0.01	0.08	-0.17	0.14

***p<0.01; **p<0.05; *p<0.1

In contrast, no effects are found for either revenue or employment. The estimated overall average treatment effects are small in magnitude and insignificant at any level. There is no evidence that increased investment translated in the short to medium term into increased demand for labour or better market performance. This is in contrast to previous work on intermediated lending operations which found evidence of short-run effects on the employment and revenue of the SMEs receiving loans (Cassano et al. 2013; Brown & Earle 2017; Gereben et al. 2019).

15 This can only be an approximation since we cannot apply the formula (eln(x) –1) ×100 to the output of our DiD estimator (we would have to apply this to the treatment and control group changes prior to taking their difference).

Figure 3: Average change in logs caused by EIB loan (95% CIs)

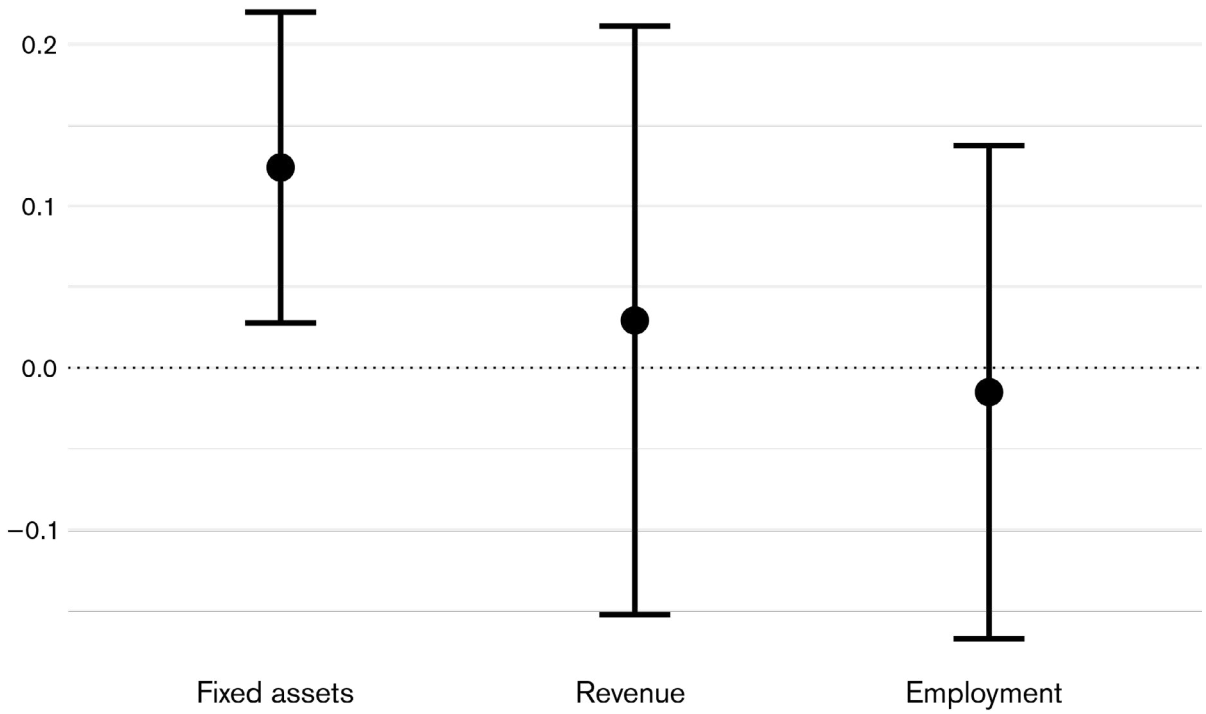
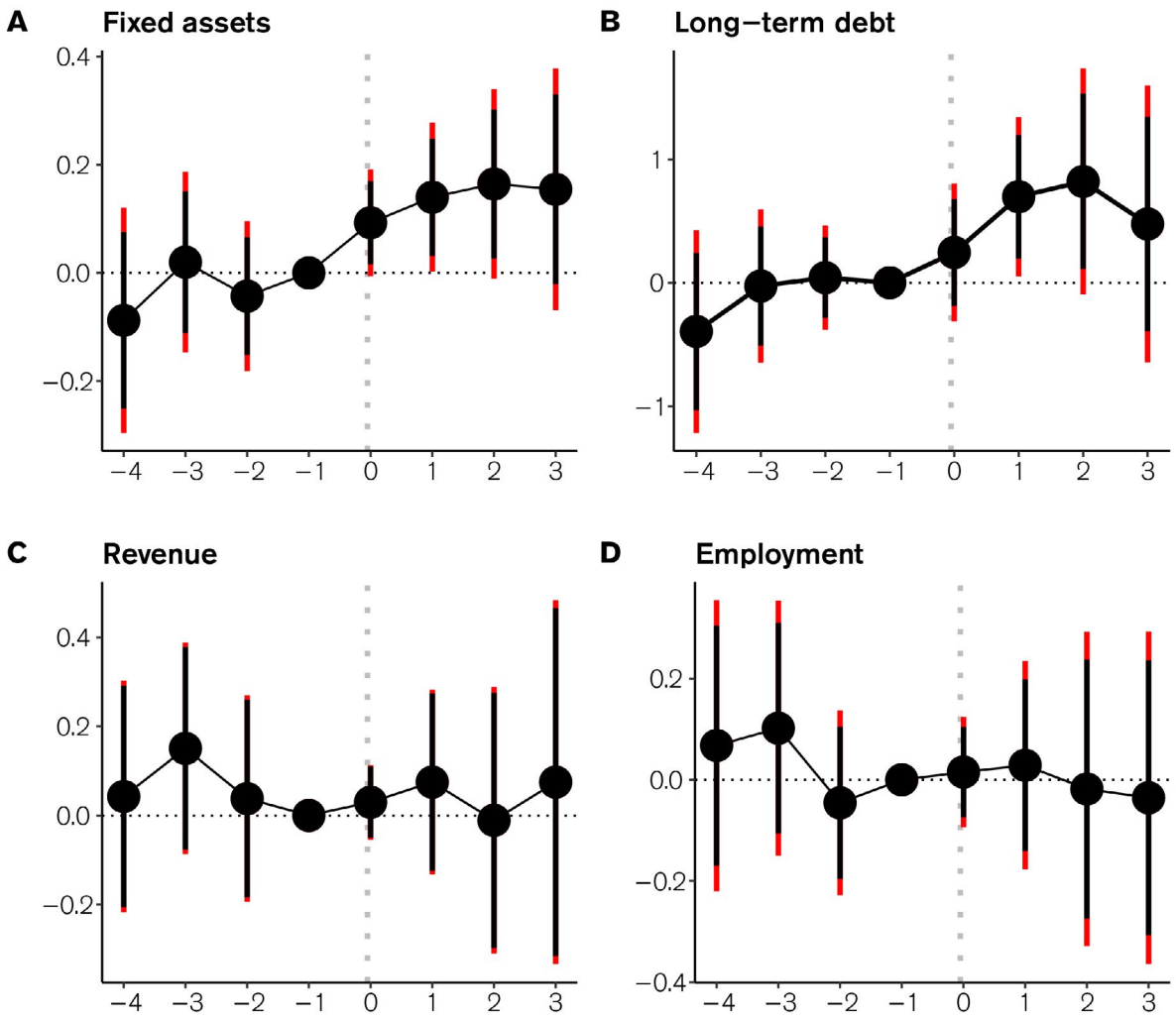


Figure 4 shows treatment effects estimated relative to the year of treatment, with 0 the year of treatment and -1 being the pre-treatment baseline against which long differences are calculated (treatment effects are mechanically zero for this relative year). For fixed assets and long-term debt, treatment effects appear to cumulate in the years immediately after treatment, reaching a maximum in the third treated year (year 2). This makes sense given the disbursement of loan tranches is staggered. There is no evidence of systematic violations of parallel trends in the run up to treatment for any variable, with no individual pre-treatment year coefficient statistically significant. However, a Wald test of the joint significance of the coefficients of all years before treatment rejects the null of parallel pre-trends for long-term debt at the 5% level. This is driven by estimates at longer leads than shown in the event study plot. Whilst the predictive power of pre-trends is strongest closer to the treatment year, if these estimates reflect linear violations of parallel trends, they will produce an upward bias to post-treatment estimates (with a linear trend, the sign of relative year coefficients flips across the baseline year). However, given the magnitude of the estimated effect on long-term debt and the close to exact matching of trends for the two periods prior to the baseline, it is unlikely potential violations explain the entire estimated treatment effect.

Figure 4: Treatment effects by year around treatment (95% CIs)

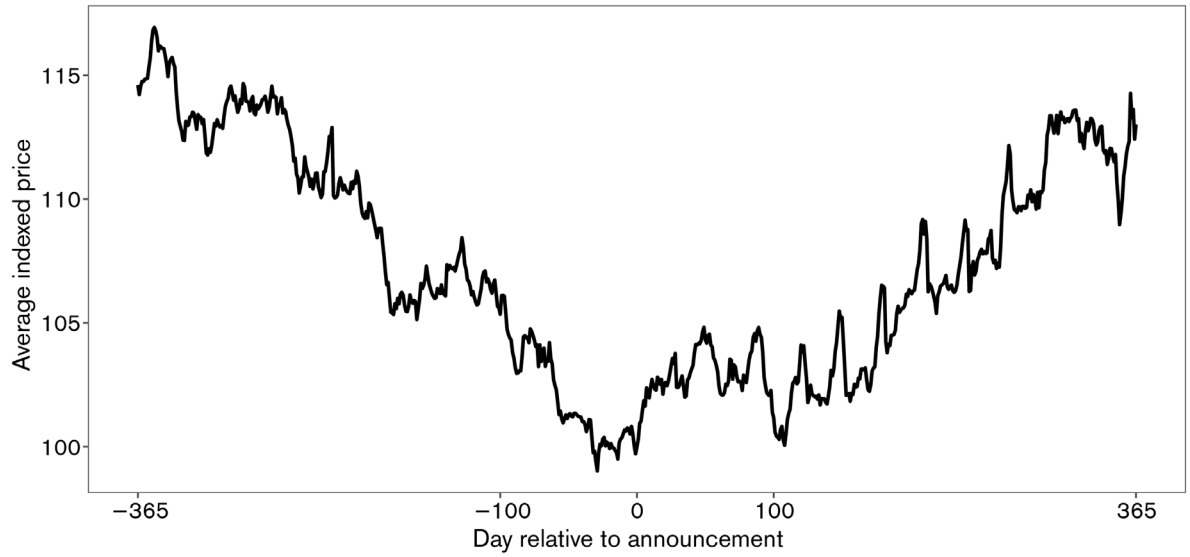


Pointwise confidence intervals in black. Simultaneous confidence intervals in red.

7 Robustness checks

The residual threat to identification after matching within country-industry-size clusters is that receiving a loan is correlated with idiosyncratic (firm-specific) shocks that are not shared at the industry- or country-level. Or, alternatively, with industry- and country-level shocks that are asymmetric across firms. This possibility is tested for by examining stock price data for those firms listed on the stock market (around a third of treated firms). If treated firms exhibit a growth spurt in stock prices in the months leading up to the announcement of the loan agreement with the EIB, this would suggest a positive shift in expectations of future performance that would be indicative of economic shocks that increase demand for investment. Figure 6 shows the evolution of the stock price for treated firms listed on the stock market one year either side of treatment, with prices indexed for each firm to be equal to 100 at the announcement date[16].

Figure 5: Indexed stock price of treated firms (loan announcement date = 100)



Source: Google Finance

There is no evidence of positive shocks in the run up to treatment, with stock prices declining steadily up to the announcement date. Stock prices then start to increase immediately after the announcement of a loan. This indicates that EIB participation was itself a positive shock, with no evidence of preceding shocks incorporated in stock prices. A positive reaction of investors to an EIB loan would make sense if it allowed additional investment in profitable projects and fits with previous work showing that the announcement of a new bank credit facility has a positive effect on stock price (James 1987; Nini, Smith & Sufi 2009; Demiroglu & James 2010). No change in the trend in indexed stock price around the announcement date is found for control firms who are listed on the stock market, whose stock prices in fact performed better than their matched recipients in the run up to the recipient's loan announcement.

Results are robust to the exclusion of the year 2020, when firms faced the major shock of the Covid-19 pandemic. Estimates using only the period 2012 to 2019 yield virtually identical average treatment effects for all outcomes.

16 This is taken as the earliest of either the 'release date' or 'approval date' listed by the EIB for each project.

8 Discussion

The economic magnitude of the estimated effect on investment is large, with estimated effects on log fixed assets comparable to those from work on intermediated loans to SMEs (Bertoni et al. 2019, Amamou et al. 2020). For a rough idea of the scale of effects in terms of the pace of recipient investment, the average change in log fixed assets for recipients between 2014 (the year before the first firms received a loan) and 2020 was 0.62. The growth of 0.12 estimated to be caused by treatment therefore likely represents a significant share of the investments made by recipient firms over this period, and a sizable increase relative to the counterfactual where they did not receive a loan.

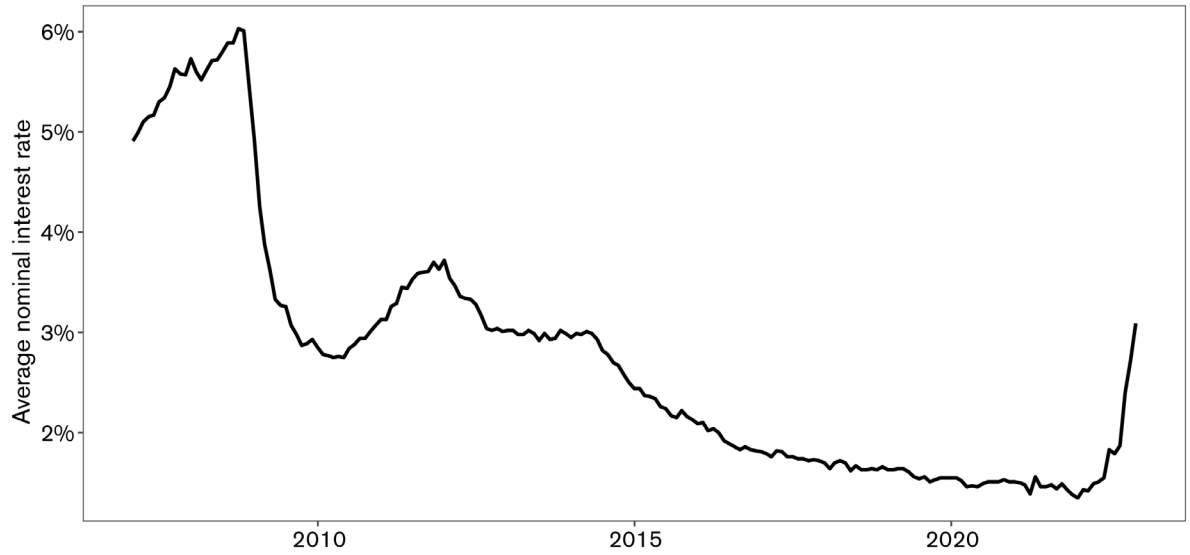
This additionality could arise through two channels. Firstly, investments could be constrained by the price of private bank loans being too high due to excessive risk premiums (the 'wedge' conception of financial constraints) (Fazzari, Hubbard & Petersen 1988; Berger & Udell 2006; Tirole 2006; Revest & Sapio 2012). By offering loans with lower risk premiums, the EIB would enable these investments to go ahead. Secondly, EIB loans could relieve financial constraints caused by credit rationing, where banks refuse to lend at any price (Stiglitz & Weiss 1981; Whited & Wu 2006; Almeida and Campello 2007).

Contextual evidence offers much stronger support for the quantity constraints channel. Corporate borrowing between 2015 and 2020 was generally at low interest rates, as highlighted in the extensive literature on 'zombie firms' (Acharya et al. 2020; Helmersson et al. 2021). Figure 6, which shows an ECB composite cost of borrowing indicator for Eurozone nonfinancial corporations (a weighted average of interest rates on new corporate loans), makes it clear that the rise in risk premiums after the global financial crisis was on average more than offset by the fall in the ECB's policy rate, resulting in a sharp decline in nominal borrowing costs in Europe. Between 2015 and 2020, the period over which effects are measured, nominal corporate borrowing costs for Eurozone firms mostly averaged less than 2%, and lower in real terms once inflation is accounted for.

In contrast, there is direct evidence from firm surveys of problems for large Eurozone firms in accessing long term debt. Figure 7 shows the proportion of large firms in EU economies reporting in the 2016 EIB Investment Survey that the availability of finance in 2015 was an obstacle to long term investment. In the year the first EFSI loans were made, 42% large EU firms reported access to finance as an obstacle to long term investment, with 23% reporting it as a major obstacle. In Greece, Italy and Spain, who account for over 40% of EFSI loan recipients, more than 60% of large firms reported availability of finance as an obstacle to long-term investment, with more than 40% reporting it as a major obstacle.

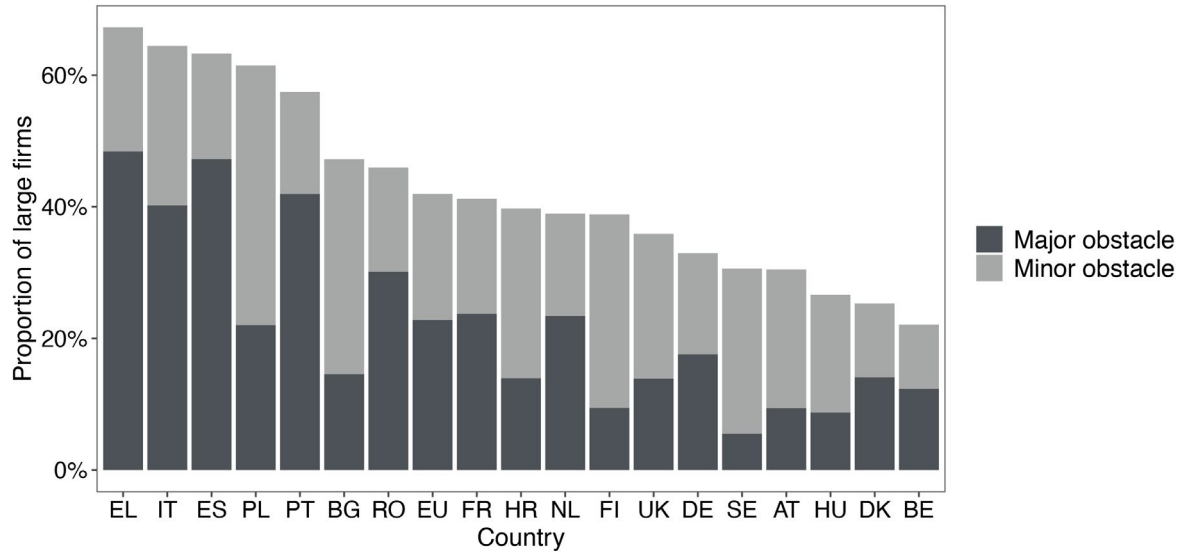
That the large and established firms who received loans under EFSI were credit rationed and increased investment in response to being granted credit raises important questions about the theory of financial constraints that typically frames discussions of public support for corporate investment. The primary theoretical explanation given for financial constraints is information asymmetries, where creditors do not have access to all information known by the firm and are unable to accurately price risk (Stiglitz & Weiss 1981; Myers & Majluf 1984; Ang 1992). Theory and evidence suggest these should be significantly lower for large firms, especially if they have a bond rating or are listed on the stock market (Myers & Majluf 1984; Berger & Udell 1995, 2006; Whited & Wu 2006; Hadlock & Pierce 2010). Large firms also possess more acceptable collateral that can mitigate moral hazard problems.

Figure 6: Cost of borrowing for corporations in the Eurozone



Source: ECB MFI Interest Rate Statistics

Figure 7: Availability of finance as obstacle to long-term investment in 2015



Source: EIBIS 2016

One potential explanation is that access to credit was conditional on the type of debt being sought. All recipients were seeking finance for large projects where the upfront investment would be paid off over the long term. Long maturities present a distinct and sometimes intractable source of friction in debt markets (Frayman 2025). For a creditor, they increase exposure to credit (default) risk, interest rate risk and liquidity risk. They also exacerbate moral hazard and agency problems as they remove the implicit threat of refusing to rollover debts (Rajan 1992; Diamond & Rajan 2001). However, a firm will seek to match the maturity of their assets and liabilities, with a repayment structure that aligns with the timing of project returns (Rajan & Zingales 1995; O'Sullivan 2004; Milbradt & Oehmke 2014). Firms will not typically finance long-term investments with shorter maturity debt since exposes them to rollover risk (Duchin et al. 2010; Almeida et al. 2012; Vermoesen et al. 2013). This risk sharing problem causes a mismatch in maturities and the abandonment of longer-term investment projects (Duchin et al. 2010; Almeida et al 2012; Vermoesen et al. 2013; Milbradt & Oehmke 2014).

In this interpretation, recipients with no problem obtaining cheap bank credit to rollover existing debt or for working capital were unable to locate appropriate finance for investment projects with high upfront capital costs and long payback periods. The additionality generated by lending was a function of the EIB offering a different type of credit to private sources, one with much longer maturities. If this is correct, then the presence of the EFSI guarantee may have made a material difference to the scale of additionality as it allowed the EIB to provide longer maturities, as well as lend to a riskier profile of investment than would be typical for bank credit (note the substantial share of investments that were in R&D).

An important question is why the positive effects found for investment were not associated with effects on employment and revenue. A simple explanation is that there are greater lags in effects for these variables because it takes time for investments to translate into changes in factor demand, output and market performance. The earliest treated cohort (2015) can be observed for 6 years after treatment, but most treated firms in the population are observed for less than this (the largest treatment cohort was 2017, for which there are 4 years of post-treatment data). Estimated effects on revenue are positively signed, but the limited population of treated firms means analysis is underpowered to detect any potential small effects.

For employment, it is less clear a priori that additional investment would be predicted to increase labour demand. Employment effects will depend on whether investments were, on balance, labour-saving, labour-augmenting or labour-neutral, and on price effects and the elasticity of demand for a firm's products. A significant minority of investments were in the upgrading of existing facilities, which is unlikely to have significant positive effects on labour demand. It is also worth noting that employment data in Orbis is of a weaker quality than financial data and often gives an incomplete measure of a firm's employment footprint due to the complex structure of large corporate entities and modern outsourcing practices. This is a limitation of this type of microeconometric analysis, which does not capture general equilibrium effects.

9 Conclusions

This paper offers new evidence on the whether loans from state investment banks increase private investment. Unlike previous literature on state investment bank support, it addresses the larger share of operations where finance is provided directly to firms. This is the first study to test the effects of large loans made by a public sector institution to private firms. Lending by the European Investment Bank that was supported by EU fiscal guarantees is found to have had a large positive effect on firm investment. There is no evidence loans affected employment and revenue in the short to medium term.

An open question is to what extent the size of effects is a function of the economic context of EFSI. The European financial system was emerging from a period of significant distress, at which times state investment bank lending takes on greater importance (Brei & Schclarek 2013; Bertay et al. 2015; Mazzucato & Penna 2016). If, as this paper argues, additionality stemmed from the EIB offering maturities that matched the long-term profile of returns from major investment projects, then results may be more generalisable. Maturity rationing, though most acute during financial distress, is a general feature of debt markets. This paper suggests state investment bank lending can have high additionality when it targets longterm investments. Fiscal guarantees can support this by reducing the associated risks to the bank. Given the increasing societal orientation of state investment bank lending, supporting long-term can play a substantial role in addressing critical societal challenges such as climate change. Whether this financing promotes long-run economic efficiency is a separate matter, to which this paper does not speak.

Appendices

Appendices for Banking on the State: Does State Investment Bank Lending Increase Firm Investment? David Frayman, London School of Economics, University College London, December 2024.

References

Abadie, A. (2005). Semiparametric Difference-in-Differences Estimators. The Review of Economic Studies, 72 (1), pp. 1–19.

Acharya, V.V., Eisert, T., Eufinger, C. and Hirsch, C. (2018). Real Effects of the Sovereign Debt Crises in Europe: Evidence from Syndicated Loans. Review of Financial Studies, 31 (8), pp. 2855-2896.

Acharya, V.V., Eisert, T., Eufinger, C. and Hirsch, C. (2019). Whatever It Takes: The Real Effects of Unconventional Monetary Policy. Review of Financial Studies, 32 (9), pp. 3366–3411.

Almeida, H. and Campello, M. (2007). Financial Constraints, Asset Tangiblity, and Corporate Investment. Review of Financial Studies, 20 (5), pp. 1429-1460.

Almeida, H., Campello, M., Laranjeira, B., and Weisbenner, S. (2012). Corporate debt maturity and the real effects of the 2007 credit crisis. Critical Finance Review, 1 (1), pp. 3-58.

Amamou, R., Gereben, A., Wolski, M. (2020).´ Making a difference: Assessing the impact of the EIB's funding to SMEs. EIB Working Papers, No. 2020/04.

Ang, J. (1992). On the Theory of Finance for Privately Held Firms. Journal of Small Business Finance, 1 (3), pp. 185–203.

Angelini, P., and Generale, A. (2008). On the Evolution of Firm Size Distributions. American Economic Review, 98 (1), pp. 426–38.

Asdrubali, P. and Signore, S. (2015). The economic impact of EU guarantees on credit to SMEs: Evidence from CESEE countries. European Commission's European Economy Discussion Paper 002 and EIF Working Paper 2015/29.

Autor, D., Dorn, D., Katz, L. F., Patterson, C. and Van Reenen, J. (2020). The fall of the labor share and the rise of superstar firms. The Quarterly Journal of Economics, 135 (2), pp. 645-709.

Bah, E., Brada, J., and Yigit, T. (2011). With a little help from our friends: The effect of USAID assistance on SME growth in a transition economy. Journal of Comparative Economics, 39 (2), pp. 205-220.

Bajgar, M., Berlingieri, G., Calligaris, S., Criscuolo, C., and Timmis, J. (2020). Coverage and representativeness of Orbis data. OECD Science, Technology and Industry Working Paper No. 2020/06.

Barkbu, B., Berkmen, S. P., Lukyantsau, P., Saksonovs, S., and Schoelermann, H. (2015). Investment in the Euro Area: Why Has It Been Weak? IMF Working Paper, 15/32. International Monetary Fund.

Beck, T., Demirgu¨c¸-Kunt, A. and Maksimovic, V. (2005). Financial and Legal Constraints to Growth: Does Firm Size Matter? The Journal of Finance, 60 (1), pp. 137–177.

Beck, T., Demirguc-Kunt, A., Laeven, L. and Levine, R. (2008). Finance, Firm Size, and Growth. Journal of Money, Credit and Banking, 40 (7), pp. 1379–1405.

Becker, B. (2015). Public R&D policies and private R&D investment: A survey of the empirical evidence. Journal of Economic Surveys, 29 (5), pp. 917-942.

Berg, T., Saunders, A., Sch¨afer, L., and Steffen, S. (2021). Brexit and the contraction of syndicated lending. Journal of Financial Economics, 141 (1), pp. 66–82.

Berger, A. and Udell, G. (1995). Relationship Lending and Lines of Credit in Small Firm Finance. The Journal of Business, 68 (3), pp. 351–381. https://doi.org/10.1086/296668

Berger, A. and Udell, G. (2006). A more complete conceptual framework for SME finance. Journal of Banking & Finance, 30 (11), pp. 2945–2966.

Berger, A., Klapper, L., Martinez Peria, M., and Zaidi, R. (2008). Bank ownership type and banking relationships. Journal of Financial Intermediation, 17 (1), 37–62.

Bertay, A., Demirgu¨c-Kunt, A., and Huizinga, H. (2015). Bank ownership and credit over the business cycle: Is lending by state banks less procyclical? Journal of Banking & Finance, 50, pp. 326–339.

Bertoni, F., Brault, J., Colombo, M. G., Quas, A., and Signore, S. (2019). Econometric study on the impact of EU loan guarantee financial instruments on growth and jobs of SMEs. EIF Working Paper Series 2019/54, European Investment Fund (EIF).

Bertoni, F., Colombo, M. G., and Quas, A. (2018a). The effects of EU-funded guarantee instruments on the performance of small and medium enterprises: Evidence from France. EIF Working Paper Series 2018/52, European Investment Fund (EIF).

Bertoni, F. and Colombo, M. G. and Quas, A. (2018b). Econometric study on the impact of EU loan guarantee financial instruments on growth and jobs of SMEs. Report in fulfilment of the Direct Service Contract for technical assistance services between the European Commission and the European Investment Fund (EIF).

Besley, T. & Stern, N. (2020). Could a National Investment Bank support recovery from the Covid19 crisis? Economics Observatory, October 2020.

Brei, M. and Schclarek, A. (2013.) Public bank lending in crisis times. Journal of Financial Stability, 9, pp. 820–830.

Briozzo, A. and Cardone-Riportella, C. (2016). Spanish SMEs' Subsidized and Guaranteed Credit during Economic Crisis: A Regional Perspective. Regional Studies, 50 (3), 496–512.

Bronzini, R. & Iachini, E. (2014). Are Incentives for R&D Effective? Evidence from a Regression Discontinuity Approach. American Economic Journal: Economic Policy, 6 (4).

Brown, J. and Earle, J. (2017). Finance and Growth at the Firm Level: Evidence from SBA Loans. Journal of Finance, 72 (3), pp. 1039-1080.

Callaway, B., and Sant'Anna, P. (2021). Difference-in-Differences with multiple time periods. Journal of Econometrics, 225 (2), pp. 200-230.

Cassano, F., Joeveer, K., and Svejnar, J. (2013). Cash flow vs. collateral-based credit. The Economics of Transition, 21 (2), pp. 269-300.

Cozzi, G. and Griffith-Jones, S. (2016). Investment-led growth: a solution to the European crisis. In: Mazzucato, M. and Jackobs, M. (eds.), Rethinking Capitalism: Economic Policy for Sustainable and Equitable Growth. London: Wiley-Blackwell.

Degryse, H., De Jonghe, O., Jakovljevi´c, S., Mulier, K. and Schepens, G. (2019). Identifying credit supply shocks with bank-firm data: Methods and applications. Journal of Financial Intermediation, 40.

Demiroglu, C. and James, c. (2010). The Information Content of Bank Loan Covenants. Review of Financial Studies, 23, pp. 3700-3737.

Diamond, D. and R. Rajan. (2001). Liquidity Risk, Liquidity Creation, and Financial Fragility: A Theory of Banking. Journal of Political Economy, 109.

Dick, C., Schmeling, M. and Schrimpf, A. (2013). Macro-expectations, aggregate uncertainty, and expected term premia. European Economic Review, 58, pp. 58–80.

Din¸c, I. (2005). Politicians and banks: Political influences on government-owned banks in emerging markets. Journal of Financial Economics, 77 (2), pp. 453–479.

Duchin, R., Ozbas, O. and Sensoy, B. (2010). Costly external financing, corporate investment, and the subprime mortgage credit crisis. Journal of Financial Economics, 97, pp. 418–435.

Endresz, M., Harasztosi, P., and Lieli, R. (2015). The Impact of the Magyar Nemzeti Bank's Funding for Growth Scheme on Firm Level Investment. MNB Working Paper 2.

European Investment Bank (EIB) (2021). Evaluation of the European Fund for Strategic Investments 2021 – Thematic Report.

European Investment Bank (EIB) (2024) Financial Report 2023.

Fazzari, S., Hubbard, R. and Petersen, B. (1988). Financing Constraints and Corporate Investment. Brookings Papers on Economic Activity, pp. 141–195.

Frayman, D. (2025). [Forthcoming]. Maturity Rationing: Explaining Financial Constraints on Firm Innovation.

Gatti, M., Schich, S., van der Wielen, W., & Sinnott, E. (2022). Impact assessment of EIB venture debt. European Investment Bank Impact study.

Gereben, A., Rop, A., Petricek, M., and Winkler, A. (2019). Do IFIs make a difference? The impact of EIB lending support for SMEs in Central and Eastern Europe during the global financial crisis. EIB Working Paper 2019/09, European Investment Bank.

Griffith-Jones, S. & Naqvi, N. (2021). Leveraging Policy Steer? Industrial Policy, Risk-sharing, and the European Investment Bank. In: Mertens, D., Thiemann, M. and Volberding, P. (Eds.), The Reinvention of Development Banking in the European Union: Industrial Policy in the Single Market and the Emergence of a Field. Oxford: Oxford University Press

Gropp, R., Mosk, T., Ongena, S., and Wix, C. (2019). Banks Response to Higher Capital Requirements: Evidence from a Quasi-Natural Experiment. The Review of Financial Studies, 31 (1), pp. 266–299.

Hadlock, C. & Pierce, J. (2010). New evidence on measuring financial constraints: Moving beyond the kz index. The Review of Financial Studies, 23 (5), pp. 1909–1940.

Hall, B. and Lerner, J. (2010). The financing of R&D and innovation. In Hall, B. and Rosenberg, N. (eds), Handbook of the Economics of Innovation, Vol. 1. Elsevier.

Heckman J., Ichimura, H. and Todd, P. (1997). Matching as an Econometric Evaluation Estimator: Evidence from Evaluating a Job Training Programme. Review of Economic Studies, 64 (4), pp. 605-654.

Howell, S. (2017). Financing Innovation: Evidence from R&D Grants. American Economic Review, 107 (4), pp. 1136–64.

Imbens, G., and Rubin, D. (2015). Causal Inference for Statistics, Social, and Biomedical Sciences. Cambridge University Press.

Imbens, G., and Wooldridge, J. (2009). Recent Developments in the Econometrics of Program Evaluation. Journal of Economic Literature, 47 (1), 99. 5-86.

James, C. (1987). Some Evidence on the Uniqueness of Bank Loans. Journal of Financial Economics, 19, 217–35.

Kahn-Lang, A. and Lang, K. (2020). The Promise and Pitfalls of Differences-in-Differences: Reflections on '16 and Pregnant' and Other Applications. Journal of Business and Economic Statistics, 38 (3), pp. 613–20.

Kapp, D. and Kristiansen, K. (2021). Euro Area Equity Risk Premia and Monetary Policy: A Longer-Term Perspective. ECB Working Paper No. 2021/2535.

Kraemer-Eis, H., Lang, F., Torfs, W., and Gvetadze, S. (2015). European Small Business Finance Outlook. EIF Working Paper 2015/32, European Investment Fund.

Lahr, H., and Mina, A. (2021). Endogenous financial constraints and innovation. Industrial and Corporate Change, 30 (3), pp. 587–621

Levine, R. (2005). Finance and growth: Theory and evidence. In Aghion, P. and Durlauf, S. (eds.), Handbook of Economic Growth, 1 (12), pp. 865–834.

Lokshin, B. and Mohnen, P. (2012). How effective are level-based R&D tax credits? Evidence from the Netherlands. Applied Economics, 44 (12), pp. 1527–1538.

LSE Growth Commission (2017). UK Growth: A New Chapter.

Martin, R., Unsworth, S., Valero, A., & Verhoeven, D. (2020). Innovation for a strong and sustainable recovery. CEP COVID-19 Analysis, December 2020.

Mazzucato, M. and Penna, C. (2016). Beyond market failures: the market creating and shaping roles of state investment banks. Journal of Economic Policy Reform, 19(4), pp. 305-326.

Mazzucato, M. and Semieniuk, G. (2017). Public financing of innovation: New questions. Oxford Review of Economic Policy, 33 (1), pp. 24-48.

Mazzucato, M. and Semieniuk, G. (2018). Financing renewable energy: Who is financing what and why it matters. Technological Forecasting and Social Change, 127, pp. 8–22.

Milbradt, K. and Oehmke, M. (2014). Maturity rationing and collective short-termism. NBER Working Paper 19946

Myers, S. and Majluf, N. (1984). Corporate Financing and Investment Decisions When Firms Have Information that Investors Do Not Have. Journal of Financial Economics, 13 (2), pp. 187–221.

Nanda, R., Younge, K. and Fleming, L. (2015). Innovation and Entrepreneurship in Renewable Energy Innovation and Entrepreneurship in Renewable Energy. Policy Publication.

Nini, G., Smith, D. and Sufi, A. (2009). Creditor Control Rights and Firm Investment Policy. Journal of Financial Economics, 92, pp. 400–420.

O'Sullivan, M. (2004). Finance and Innovation. In Fagerberg, J., Mowery, D. & Nelson, R. (Eds.), The Oxford Handbook of Innovation. New York: Oxford University Press

Palm´en, O. (2020). Sovereign default risk and credit supply: Evidence from the euro area. Journal of International Money and Finance, 109 (12).

Polzin, F. (2017). Mobilizing private finance for low-carbon innovation A systematic review of barriers and solutions. Renewable and Sustainable Energy Reviews, 77, pp. 525–535.

Popov, A., and van Horen, N. (2015). Exporting Sovereign Stress: Evidence from Syndicated Bank Lending during the Euro Area Sovereign Debt Crisis. Review of Finance, 19, pp. 1825–1866. https://doi.org/10.1093/rof/rfu046

Rajan, R. (1992). Insiders and Outsiders: The Choice Between Informed and Arm's-length Debt. Journal of Finance, 4, pp. 1367–400.

Rajan, R. G., & Zingales, L. (1995). What do we know about capital structure? Some evidence from international data. The Journal of Finance, 50 (5), 1421-1460.

Revest, V. & Sapio, S. (2012). Financing technology-based small firms in Europe: what do we know? Small Business Economics, 39, pp. 179–205.

Rosenbaum, P., & Rubin, D. (1983). The central role of the propensity score in observational studies for causal effects. Biometrika, 70 (1), pp. 41-55.

Santoleri, P., Mina, A., Di Minin, A., and Martelli, I. (2021). The causal effects of R&D grants: evidence for a regression discontinuity. The Review of Economics and Statistics (forthcoming, available online: https://doi.org/10.1162/rest a 01233)

Sapienza, P. (2004). The effects of government ownership on bank lending. Journal of Financial Economics, 72 (2), pp. 357–384.

Savignac, F. (2008). Impact of Financial Constraints on Innovation: What Can Be Learned from a Direct Measure? Economics of Innovation and New Technology, 17 (6), pp. 553–569.

Stuart, E. & Rubin, D. (2008). Matching with Multiple Control Groups with Adjustment for Group Differences. Journal of Educational and Behavioral Statistics, 33 (3), pp. 279-306.

Stiglitz, J., and Weiss, A. (1981). Credit Rationing in Markets with Imperfect Information. American Economic Review, 71, pp. 393–410.

Tirole, J. (2006). The theory of corporate finance. Princeton: Princeton University Press.

van der Veer, K. and Hoeberichts, M. (2016). The level effect of bank lending standards on business lending. Journal of Banking & Finance, 66, pp. 79–88.

Vermoesen, V., Deloof, M. and Laveren, E. (2013). Long-term debt maturity and financing constraints of SMEs during the global financial crisis. Small Business Economics, 41, pp. 433–448

Whited, T. and Wu, G. (2006). Financial constraints risk. Review of Financial Studies, 19 (2), pp. 531–559.

Winker, P. (1999). Causes and Effects of Financing Constraints at the Firm Level. Small Business Economics, 12 (2).

Xu, J., Marodon, R., Ru, X., Ren, X. & Wu, X. (2023). The PBD and DFI Database July 2023.

Peking University and Agence Fran¸caise de D´eveloppement. Retrieved from https://www.nse.pku.edu.cn/ dfidatabase/datadownloading/index.htm

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