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Working Paper

Loan guarantees, bank lending and credit risk reallocation

CFS Working Paper Series, No. 672

Provided in Cooperation with:
Center for Financial Studies (CFS), Goethe University Frankfurt

Suggested Citation: Altavilla, Carlo; Ellul, Andrew; Pagano, Marco; Polo, Andrea; Vlassopoulos, Thomas (2021) : Loan guarantees, bank lending and credit risk reallocation, CFS Working Paper Series, No. 672, Goethe University Frankfurt, Center for Financial Studies (CFS), Frankfurt a. M.

This Version is available at:
https://hdl.handle.net/10419/248407

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CENTER FOR FINANCIAL STUDIES

CFS Working Paper Series

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Loan Guarantees, Bank Lending and Credit Risk Reallocation

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Loan Guarantees, Bank Lending and Credit Risk Reallocation

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Abstract

We investigate whether government credit guarantee schemes, extensively used at the onset of the Covid-19 pandemic, led to substitution of non-guaranteed with guaranteed credit rather than fully adding to the supply of lending. We study this issue using a unique euro-area credit register data, matched with supervisory bank data, and establish two main findings. First, guaranteed loans were mostly extended to small but comparatively creditworthy firms in sectors severely affected by the pandemic, borrowing from large, liquid and well-capitalized banks. Second, guaranteed loans partially substitute pre-existing non-guaranteed debt. For firms borrowing from multiple banks, the substitution mainly arises from the lending behavior of the bank extending guaranteed loans. Substitution was highest for funding granted to riskier and smaller firms in sectors more affected by the pandemic, and borrowing from larger and stronger banks. Overall, the evidence indicates that government guarantees contributed to the continued extension of credit to relatively creditworthy firms hit by the pandemic, but also benefited banks' balance sheets to some extent.

Keywords: loan guarantees, bank lending, COVID-19 pandemic, substitution, credit risk.

JEL Codes: G18, G21, E63, H12, H81.

Acknowledgements. We thank for helpful comments Alex Guembel, Luigi Guiso, Uli Hege, Victoria Ivashina, Claudio Michelacci, Raghu Rajan, Fabiano Schivardi, Jeremy Stein, Adi Sunderam, Jonathan Wallen, participants to seminars at the University of Bonn, European Central Bank, Einaudi Institute for Economics and Finance, Harvard Business School, Indiana University and Toulouse School of Economics. Marco Pagano and Andrea Polo acknowledge financial support from the Einaudi Institute for Economics and Finance (EIEF). We thank Federica Mascolo and Maria Dimou for excellent research assistance. The opinions in this paper are those of the authors and do not necessarily reflect the views of the European Central Bank (ECB) or the Eurosystem.
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1. Introduction

Bank loan guarantees are standard policy tools: governments have often relied on them in the past to encourage bank lending by shouldering borrowers' default risk. Their typical rationale is to overcome frictions leading to the under-provision of credit to particular types of firms, such as small and medium enterprises (SMEs). Bank loan guarantees can be especially helpful to sustain bank lending during economic crises. In these situations, default waves may propagate across debt chains interconnecting firms (Glode and Opp, 2021), leading also otherwise viable firms to be liquidated (Antill and Clayton, 2021) and valuable matches between them and employees, suppliers and customers to be destroyed. Loan guarantee programs may provide the required backstop, insofar as transferring default risk to the government encourages banks to increase lending, even to hard-hit firms. They may also be a faster and more efficient way to allocate public support to firms than direct government funding, as typically banks have screening technologies and established relationships that endow them with better information than the government about the quality of each firm: by leveraging banks' knowledge, liquidity should more likely reach viable firms than if the government were to decide which firms should be saved and which ones liquidated (Philippon, 2021).

This explains why bank loan guarantees were massively used as a stabilization tool in response to the COVID-19 shock and the resulting dry-up in firms' liquidity, to the point that in many countries they have been the central pillar in the plethora of policy measures introduced after the onset of the pandemic. In this respect, the pandemic can be regarded as a laboratory to study the effects of bank loan guarantees in the midst of a major recession. The main question is whether channeling liquidity to firms through banks may not, in fact, entail an efficiency loss: banks extending the publicly guaranteed loans may simultaneously reduce their non-guaranteed loans or credit lines to the same debtors, so as to reduce their credit risk exposure towards them. Insofar as banks were to engage in such "credit substitution", they would reduce the loan guarantees' effectiveness in expanding credit.[1] In the limit, if banks were to decrease non-guaranteed lending one-for-one with the extension of guaranteed lending, the provision of loan guarantees would leave the total lending to firms unchanged, and merely enable banks to shift credit risk from their balance sheet to the government.

Indeed, Figure 1 shows that between April and August 2020, which is the period in which loan

[1] Blanchard, Philippon and Pisani-Ferry (2020) describe this possible problem as follows: "The main danger is the transfer of pre-existing exposures. A bank with an exposure to a firm could ask it to use the guaranteed debt to repay its existing loans. This would be a transfer of risk to the state."

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guarantee schemes were launched in the euro area during the Covid-19 crisis, aggregate net lending grew less than one-for-one with the expansion of guaranteed loans. Of course, such a macro-level correlation is *per se* no evidence that credit substitution occurred upon the introduction of loan guarantee schemes. The present paper aims precisely at bringing evidence based on granular firm-bank-level euro-area data to bear on this issue.

[Insert Figure 1: Guarantee loans and net lending: aggregate country-level data]

Credit substitution may originate from banks' credit supply policies: banks can require firms to use (at least partly) guaranteed debt to repay existing loans, so as to reduce their exposure towards them. Clearly, banks have the greatest incentive to engage in this type of behavior vis-à-vis their riskiest clients. But substitution may also be triggered by firms wishing to renegotiate pre-existing liabilities at lower interest rates, by replacing them with publicly guaranteed debt. This can be the case for viable and liquid firms, which would not encounter significant challenges to obtain credit without the support of the guarantee program. Hence, substitution can be expected to be bank-driven for risky firms with high liquidity needs, and to be firm-driven in the case of solvent firms with low liquidity needs: in the former case, substitution would reflect the stringency of banks' credit supply, while in the latter it would reflect firms' low demand for credit. So the characteristics of the firms involved in renegotiation of loan contracts should help disentangle whether substitution is largely bank-driven or firm-driven: substitution that mostly involves credit by strong banks to financially fragile firms is more likely to be induced by the former than by the latter.

This argument also suggests that the extent of substitution is likely to be affected by the eligibility rules that determine the allocation of credit guarantees across firms. This is illustrated by Figure 2, where firms are assumed to be distributed by their credit quality, that is, an index capturing both solvency and liquidity. Excluding the riskiest firms from the loan guarantee program amounts to cutting off the left tail of the distribution from the population of beneficiaries, and thus should limit the extent of bank-driven substitution. Conversely, discriminating against firms spared by the pandemic shock and therefore still solvent and liquid should cut off the right tail of the distribution, and thus limit the extent of firm-driven substitution. Moreover, substitution should also be lower if loan guarantee programs require banks to maintain their existing exposures as a condition for a guaranteed loan. In other words, the design of loan guarantee schemes is likely to affect the extent of substitution.

[Insert Figure 2: Publicly guaranteed loans: firm eligibility and credit substitution]

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European policy makers appear to have been aware of this issue in laying out eligibility guidelines for loan guarantee programs in the European Union (EU). The Communication of the EU Commission about State aid during the pandemic (2020/C 91 I/01) stated: "The guarantee may be granted to undertakings that were not in difficulty … on 31 December 2019", thus discriminating against firms in the lower tail of the distribution. At the same time, it required aid to be targeted to firms "that faced difficulties or entered in difficulty thereafter as a result of the COVID-19 outbreak", hence discriminating against firms in the upper tail, i.e., those unaffected by the pandemic or even benefiting from it. National regulators also appeared to tolerate at most a limited degree of substitution. For instance, French regulation subjected the guarantee to the bank evidencing that the loan granted led to an "increase in the bank's commitments to the borrower compared to commitments that existed as at 16 March 2020". In Italy, loans guaranteed by Fondo Nazionale di Garanzia and designed for refinancing of existing loans were required to involve at least 25% new lending. The media also appeared acutely aware of the risk that loan guarantee programs might benefit banks more than the firms hit by the pandemic.[2]

The foregoing argument suggests that the extent of substitution between such loans and changes in pre-existing credit should be related to the criteria governing the allocation of guaranteed loans across firms. Accordingly, in this paper we proceed in two steps: we start by investigating the characteristics of the firms that received and those that did not receive guaranteed loans after the inception of the pandemic, so as to assess whether the criteria used to allocate guaranteed loans discriminated against firms that could be expected to be associated with more substitution. Second, we focus on firms that did receive guaranteed loans and investigate whether the banks extending such loans reduced their pre-existing exposures towards them, to what extent they did so, and how the extent of substitution correlates with firm characteristics, as well as with the characteristics of the banks lending to them. In our analysis, we use bank-firm data drawn from a novel harmonized credit register dataset for the entire euro area, AnaCredit, matched with supervisory bank balance-sheet data, and focus on the four largest euro area countries (France, Germany, Italy and Spain). This also enables us to investigate whether the extent of substitution differed across countries and/or correlated differently

[2] For instance, the Financial Times drew attention to Greensill Bank AG using state-backed loans from three European governments to reduce its exposure to distressed companies owned by metal magnate Sanjeev Gupta (see "Greensill used taxpayer loans to cut exposure to Sanjeev Gupta", *Financial Times*, 4 July 2021); similarly, Italian and Spanish newspapers flagged the risk that loan guarantees may end up shielding banks more than firms hit by the pandemic shock (see "Lo scudo delle garanzie fiscali copre più le banche delle imprese", *La Repubblica*, 1 March 2021 and "Una parte de los créditos avalados por el ICO para rescatar a las pymes se queda en manos de la banca para cubrir deudas de los empresarios", *El Diario*, 13 May 2020).

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with firm and bank characteristics.

The granular nature of our data enables us to address several challenges. As the data are at bank-firm level, we can identify the lending flow within each bank-firm pair, exploiting the differences in the relationships that a firm may have with multiple banks. Within-firm variation enables us to address the identification challenge involved in assessing and characterizing credit substitution. The issue is the classical counterfactual problem: whether a firm that received a guaranteed loan and experienced substitution (i.e., reduction of its pre-existing loans), would have faced a cut in credit received anyway. This is an important concern, especially for firms that were already weak (e.g., featuring more arrears) before the pandemic and/or were severely hit by the shock (e.g., being in the hospitality and catering business): if they had not received guaranteed loans, presumably these firms would have been more likely than others to face a credit cut, and even loan foreclosure. Our data allow us to use a methodology similar to that of Khwaja and Mian (2008): we compare the change in pre-existing exposures between banks extending non-guaranteed loans and other banks lending to the *same* firm.

We find that guaranteed loans were overwhelmingly allocated to small firms and those in the most heavily affected industries, but not to firms that were already close to distress before the pandemic, in line with the EU Commission guidelines reported above: hence, the actual selection of program beneficiaries is likely to have contained the extent of substitution. Seen from this perspective, the guaranteed credit programs in the euro area were successful in bringing much needed credit to firms in the most severely hit industries, while leveraging on banks' information to screen out the worst risks. Firms were also more likely to receive guaranteed credit from the most solid banks, i.e., those with greater liquidity and capitalization, fewer non-performing loans (NPLs) and larger size, confirming the importance of healthy balance sheets as a crucial mechanism in the provision of liquidity at times of stress. These findings hold not only for the euro area as a whole but also at individual country level.

We then investigate whether the guaranteed loans constituted new lending, or instead substitution occurred. We measure credit substitution as the negative of the change in non-guaranteed credit in the pandemic period relative to the pre-pandemic level. At firm level, we find that guaranteed loans resulted in a moderate degree of substitution, with €1 of additional loan guarantees being associated, on average, with a drop in non-guaranteed lending ranging between €0.10 and €0.14. Substitution is higher in firms that are smaller, ex ante riskier (credit risk being measured by magnitude of pre-crisis arrears), and operating in sectors that experienced a larger drop in value-added during the pandemic. We also find substitution to be larger for firms borrowing from healthier banks: larger, more capitalized banks

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and those with lower NPLs are associated with higher substitution. On the whole, the evidence suggests that, to obtain new guaranteed credit, risky firms were required to re-negotiate some of their pre-existing loans.

These results are broadly consistent across the four euro-area countries, despite some differences in the design of national guarantee schemes. The correlation between substitution and the characteristics of firms and banks is remarkably similar across countries, though the extent of substitution differs across them, being largest in Spain and lowest in France, and intermediate in Italy and Germany.

The granularity of our data enables us to also analyze substitution at within-firm level, focusing on the subsample of firms that received a guaranteed loan and had multiple bank relationships. Rather than looking at the overall firm-level change in non-guaranteed credit exposure, we distinguish between the bank-firm relationships with a guarantee and those without a guarantee. Descriptive statistics show that substitution arises from the behavior of the bank extending guaranteed loans, whose drop in non-guaranteed lending is about 9 times as large as for other banks that lend to the same firm. Regression analysis with firm fixed effects corroborates these results: banks providing the guaranteed loan cut pre-existing credit between 20% and 36% more than other banks, depending on the specification. The estimates also confirm that credit substitution was largest for guaranteed funding granted to riskier and smaller firms operating in more affected sectors, and borrowing from larger and stronger banks, while banking relationships attenuated credit substitution.

The result that the bank extending the guaranteed loan reduces the pre-existing exposure much more than other banks lending to the same firm is immune from any selection at firm level. Nonetheless, the result is still potentially subject to a different kind of selection bias since the bank issuing the guaranteed loan is not randomly assigned. To sign the bias that our estimates may suffer from, we analyze the within-firm selection of the bank granting guaranteed credit. Firm-level analysis already shows that firms borrowing from larger and stronger banks are more likely to receive guaranteed credit, but this result could be driven by pre-shock matching between firms and banks. For the subsample of firms with multiple banking relationships, we investigate the characteristics of the bank issuing a guaranteed loan relative to the other banks lending to the same firm. We confirm that the banks that provide guaranteed credit are larger and more capitalized, and those with stronger ex-ante relationships with the firm, consistently with U.S. evidence by Li and Strahan (2021). This evidence helps to sign the potential bias in the substitution estimates: “selected” banks are stronger, and with a

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tighter relationship with the firm: hence, they are precisely the type of bank that according to the literature (Bolton et al., 2016, and Jimenez et al., 2012) should be associated with a greater supply of credit at times of stress. This suggests that – if anything – our estimates under-estimate the extent of substitution by the banks issuing guaranteed credit.

Finally, a remaining potential concern with our results is that the finding that the bank providing the guaranteed loan reduces the pre-existing exposure is not due to an active bank decision to cut the pre-existing credit but simply to the fact that the credit was expiring in this period and the bank decided to roll it over with the guaranteed loan. To address this concern we include the residual maturity among the determinants of within-firm selection of the bank granting guaranteed credit, and find that its coefficient is positive and significant, indicating that the bank providing the guaranteed loan is the one whose credit toward the firm has a longer residual maturity than the other banks. Hence, results on substitution are not simply driven by roll-over of expiring credit.

The overall thrust of our results is that in the euro area government guarantees contributed to the continued extension of credit to relatively creditworthy firms hit by the pandemic, but also benefited the balance sheet of banks to some extent. Although loan guarantee programs were designed to mitigate it, a moderate amount of credit substitution did occur, and therefore some loan guarantees transferred pre-existing credit risk from banks to taxpayers. However, this does not necessarily indicate a failure of the public credit schemes, for three reasons. First, absent such schemes, banks could have reduced their pre-existing credit exposures even more, possibly generating default waves that might have crippled even otherwise viable firms. Second, to the extent that banks used such schemes to de-risk their balance sheets, they may have preserved their lending capacity to better face the post-pandemic recovery period: hence, this implicit bank recapitalization may reduce the risk of a cliff-effect credit crunch when loan guarantee schemes and other support programs are terminated. Thirdly, insofar as substitution moderated lending to the riskiest firms, these should exit the pandemic with lower leverage, hence less debt overhang, than in a counterfactual world where no substitution occurred (Brunnermeier and Krishnamurthy, 2020).

Our paper contributes to three recent strands of research. The first is the nascent literature on the effectiveness of government guarantee schemes, which is an increasingly important component of fiscal policies around the world. Bachas et al. (2020) investigate the effectiveness of such guarantees provided by the Small Business Agency in the U.S., using discontinuities in federal guarantee rules to test whether banks increase lending in response to more generous guarantees, and find significant

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bunching in the loan size distribution at thresholds where guarantee generosity decreases, showing that lenders prefer to issue loans when guarantee rates are higher. Using a bunching estimator, they infer that the elasticity of loan supply to the guarantee rate is equal to 5. Similarly, De Blasio et al. (2017) exploit eligibility rules for loan guarantees in Italy in 2005-12 and, using regression discontinuity techniques, find that at the threshold between eligible and non-eligible firms, the program had a positive impact on bank loans. Ciani et al. (2020) also exploit Italian pre-COVID eligibility rules to investigate whether loan guarantees generated additional loans and/or lower interest rates for SMEs, and find that guaranteed firms receive additional credit equal to 7-8 percent of their total banking exposure, and a 50-basis-points reduction in interest rates on term loans. Our contribution relative to these papers is to investigate the extent to which the expansion in lending triggered by loan guarantees is associated with a drop in pre-existing exposures.

Our paper contributes also to the literature on the different provision of bank liquidity across firm sizes at times of economic stress, using the Covid-19 episode as a testing ground as other recent papers. Most of the literature, including the first papers on the effects of the pandemic, focus on large firms, and documents that they raised liquidity by drawing down bank credit lines after the outbreak (Acharya and Steffen, 2020, and Li et al., 2020), which in turn led banks to restrict credit to SMEs (Greenwald et al, 2020; Minoiu and Kapan, 2021). One paper that specifically investigates the effects of financial frictions on small firms is Chodorow-Reich et al. (2021), who use loan-level data covering two-thirds of all corporate loans from U.S. banks and find that small firms obtained shorter maturity credit lines, provided more collateral to obtain credit lines and term loans, had higher utilization rates and paid higher spreads than large firms. Our paper adds to this literature by showing that small firms were the largest recipients of lending through the government guarantee programs, especially if they operated in the mostly affected sectors and were creditworthy, but the extension of guaranteed loans to them did not translate one-for-one into increased lending, insofar as it also entailed substitution for previous debt.

Finally, our paper is related to the literature on the effectiveness of the policies introduced to counteract a real shock. Our evidence on the allocation of the loan guarantees contrasts with that available for the United States, where Granja et al. (2020) find that the funds provided by the Paycheck Protection Program (PPP) were not channeled to the worst-hit sectors, and Cororaton and Rosen (2021)

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document that PPP targeted mostly firms with higher leverage, less cash and worse business prospects.[3] Instead, our evidence dovetails with that by Core and De Marco (2020) for Italy and Kozeniauskas, Moreira, and Santos (2020) for Portugal, who find that in both countries public loan guarantees were mostly allocated to firms that needed them the most. Our findings are also broadly in line with the evidence by Gourinchas et al. (2020) that in the OECD public bailout programs aimed at SMEs hit by the pandemic were effective in avoiding SME bankruptcies at moderate fiscal cost.

The paper is organized as follows. Section 2 describes government guarantee programs in the euro area, the data used in the analysis and the empirical specifications that we estimate. Section 3 presents and discusses the results. Section 4 concludes.

2. Institutional framework, data and methodology

2.1 Institutional framework

The design of the loan guarantee schemes in EU countries shares many common features defined by the above-mentioned EU Commission Regulation No. 651/2014, but some of their details are determined by national rules. As already noted, the EU guidelines rule out loan guarantees for firms that were already "in difficulty" before the pandemic. The Commission's definition of an "undertaking in difficulty" is one for which at least one of the following circumstances occurs:

(a) for limited liability companies (other than SME that existed for less than three years), where more than half of its subscribed share capital has disappeared as a result of accumulated losses,

(b) for companies where at least some members have unlimited liability for the debt of the company (other than an SME that existed for less than three years), where more than half of its capital as shown in the company accounts has disappeared as a result of accumulated losses,

(c) for firms subject to collective insolvency proceedings or fulfilling the criteria for being placed in collective insolvency proceedings at the request of its creditors,

(d) for firms that have received rescue aid and have not yet reimbursed the loan or terminated the guarantee, or have received restructuring aid and is still subject to a restructuring plan.

(e) for firms that are not SMEs, where, for the past 2 years, the firm's book debt to equity ratio has

[3] Nevertheless, there is evidence that the PPP scheme had significant real effects: Autor et al. (2020) and Bartik et al., (2020) document that it raised employment at eligible firms and increased firms' survival, consistently with pre-Covid 19 evidence regarding the real effects of loan guarantee schemes (Schich et al., 2017).

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been greater than 7.5 and EBITDA interest coverage ratio has been below 1.

Moreover, the Commission set minimum guarantee premia increasing in maturity and more stringent for large enterprises than for SMEs, and a ceiling of 6 years on the maturity for all loans. It also mandated limits to the overall size of guaranteed loans: these could not exceed twice the annual wage bill of the beneficiary for 2019, or 25 % of total turnover of the beneficiary in 2019. Interestingly, it designed the guarantees so as to leave banks with enough "skin in the game" to remain sensitive to firms' creditworthiness when granting guaranteed loans: the public guarantee could not exceed 90% of the loan principal if losses are sustained *pari passu* by the bank and the State, or 35 % of the loan principal if the State is junior to the bank.

Yet, governments introduced some differences in national programs: while they all designed schemes in which the guaranteed fraction of the loan decreases with firm size (hence, more generous with SMEs than with large firms), different governments chose different schedules for the relationship between guaranteed loan fraction and firm size, as shown in Table A1. The Italian and the German governments even provided 100% guaranteed loans: in the case of Italy, this applied to all loans up to €30,000 given to small firms, and in the case of Germany to firms whose loans were issued under the KfW-Schnellkredit program. But, as shown by the table, for most loans the guaranteed fraction ranges between 70% and 90%, with lower percentages applying to larger firms. The table also reveals that the Italian, German and Spanish schemes allowed public guarantees even for loans exceeding the 6-year maturity limit prescribed by the EU Commission's guidelines.

2.2 Data

We draw loan-level information obtained from *AnaCredit*, a proprietary and confidential database of the ECB and the national central banks of the countries that have adopted the euro (the Eurosystem). AnaCredit is a very granular (transaction-level) database that reports 94 loan-level attributes on a monthly frequency in a harmonised way across all euro area countries. The reporting threshold for loans to firms is fixed at €25,000 for all countries participating in the database. This database enhances the level of information obtained from national credit registers that were already collected at country-level by several euro area members. This is because the common threshold ensures that cross-country studies, like ours, are not affected by sample selection bias possibly emerging from the different reporting threshold of the national credit registers. For example, while there is no threshold for credit exposure in Spain (any credit exposure is reported), the German credit register has a threshold of euro 1

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million.[4] The results of a cross-country study based on national credit registers would be affected by the differences in the characteristics of the unit of observation.

AnaCredit covers a comprehensive set of credit instruments: overdrafts, revolving credit, credit lines, reverse repurchase agreements and other loans, including term loans.[5] Both the amount already drawn under a granted facility and the undrawn part are reported in AnaCredit: in our analysis we consider the sum of both, i.e. the total commitment of the bank to the debtor with respect to an instrument.

Importantly for our analysis, among the attributes collected for each loan, there is extensive information on the protection securing the bank's credit exposure. Financial guarantees are one of the types of protection considered and we concentrate on those provided by government entities.[6] While in some countries special identifiers were introduced to mark guarantees provided under specific COVID-19 related schemes, these are not consistently available for all four of the countries considered in our sample and therefore we use all guarantees provided by government entities. As a sanity check, we compare AnaCredit data for Italy with the publicly available list of government guaranteed loans from the Italian Fondo Nazionale di Garanzia (FNG). Applying the AnaCredit filter of loans above the 25,000 euro threshold to the FNG data, we find a very similar number of firms receiving guaranteed credit in both databases (around 358,000 firms).[7]

We supplement the data by drawing bank balance sheet information from the ECB supervisory data to measure, as of December 2019, the strength of the banks' capital position (i.e., their capital ratio and fraction of non-performing loans), liquidity (liquidity ratio), and size (total assets).

Our sample from AnaCredit contains a total of 2,639,651 firms: 1,143,966 from France, 427,535 from Germany, 641,921 from Italy and 426,229 from Spain. These firms borrow from 838 banks in Germany, 106 in Spain, 104 in France and 158 in Italy. The number of firms that are recorded to have received guaranteed credit between March and August 2020 was a subset of the entire sample and stood at 601,952 firms. Recall that, while guaranteed credit can be of any euro size, AnaCredit records

[4] The reporting thresholds for the national credit register in France and Italy are €25,000 and €30,000, respectively.

[5] The complete list of instruments also includes credit card debt, trade receivables, financial leases as well as well as deposits other than reverse repurchase agreements.

[6] The database also registers the guarantees provided by special entities including Instituto de Crédito Oficial in Spain, Kreditanstalt für Wiederaufbau in Germany, Ministere de l'Action et des Comptes Publics in France.

[7] The number of firms that obtain a loan guarantee is smaller in our tables since we only consider firms which are included in the AnaCredit database in December 2019.

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loans of at least €25,000. This means that many micro firms that likely obtained credit for less than the threshold will not appear in the credit register. This could be one reason why we see only about 23% of firms in AnaCredit obtaining guaranteed credit.

As shown in Figures 3 and 4, the largest amount of guaranteed credit was granted in Spain and Italy, with France in third place and the smallest amount in Germany. The two figures also confirm that, as seen above, the loan guarantee schemes of all four countries were designed so as to channel funds preferentially to small and medium size firms: around 85% of the credit went to SMEs in each of the four countries (Figure 3), and the prevalence of small firms is even more extreme in terms of their number, especially in Italy (Figure 4). In terms of average size of guaranteed loans, German firms received the largest loans, and Italian firms received the smallest, the size of guaranteed loans in France and Spain being in the middle, as shown by Figure 5.

[Insert Figure 3. Guaranteed loans by firm size (million euro)]

[Insert Figure 4. Guaranteed loans by number of firms]

[Insert Figure 5. Amount of guaranteed loans (million euro)]

2.3 Empirical methodology

Our methodology centers on the two main questions of this paper. The first part of our analysis focuses on which types of firms received guaranteed credit from banks, while the second part investigates whether firms that received the guaranteed credit experienced substitution of existing credit.

Hence, we start by estimating a firm-level regression to investigate the characteristics of the firms receiving guaranteed credit on the whole sample of 2,639,651 firms pooling data for all four countries. We also estimate it separately for each country, to investigate whether the allocation of loan guarantees differed significantly across them. When using the pooled sample, we estimate the following specification with country-level fixed effects:

$$G_i = \alpha + \beta_1 \Delta VA_i + \beta_2 Size_i + \beta_3 Risk_i + \beta_4 BSize_i + \beta_5 Liq_i + \beta_6 Cap_i + \beta_7 NPL_i + \gamma_c + \varepsilon_i, \quad (1)$$

where the subscript *i* refer to firms and *c* to countries. The dependent variable, G_i, is a dummy variable that equals 1 if the firm received any government guarantees between March and August 2020, and 0

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otherwise. The regressors include the following firm characteristics: (a) the change of the value added in firm *i*'s industry during the sample period (ΔVA), (b) the log of the firm *i*'s total outstanding bank loans as of December 2019 (*Size*),[8] and (c) the firm's fraction of credit in arrears as of December 2019 (*Risk*). These characteristics are meant to capture, on the one hand, the eligibility of firms for guaranteed credit and on the other the willingness of banks to grant such credit: recalling the EU Commission's guidelines, one would expect the coefficient of *Risk* to be negative and that of ΔVA to be positive, as guarantees were aimed at firms that were viable but whose cash flows were severely hit by the onset of the pandemic. To reduce endogeneity concerns, the change of value added is measured at industry rather than at firm level. Finally, the *Size* variable is included to test whether the regulatory favor towards SMEs present in both the EU guidelines and national regulations actually translated into a preferential targeting of loan guarantees to these firms, which are typically subject to tighter financial constraints (Beck et al., 2005), especially at times of economic stress.

We also include four variables related to the characteristics of the banks from which firms borrowed before the pandemic, in order to investigate whether bank size and balance sheet strength mattered in the granting of guaranteed credit. Size, measured by bank total assets as of December 2019, can play an important role in the context of granting a massive amount of guaranteed credit: geographical span can confer a screening and monitoring advantage to large banks (Diamond, 1984); moreover, these banks are likely to be better equipped with the human capital and technical infrastructure required to process a large flow of new loans. Measures of banks' balance sheet strength will be used to capture how the financial health of banks may facilitate the banks' ability to extend risk-free credit. One may expect that by virtue of the government backing, balance sheet strength may not matter significantly in granting guaranteed loans. However, banks' financial health may still matter insofar as they are called to fractionally use their own funds even for most guaranteed loans.[9] Our specification includes three measures of the balance sheet strength of banks lending to firm *i*: liquidity (LIQ_i), capitalization (CAP_i), and non-performing loans as a fraction of total loans (NPL_i). These variables are calculated as weighted averages of the corresponding variables for the banks lending to firm *i*, with weights equal to their shares in the firm's total bank exposure as of December 2019. At the end of the paper, we investigate the role that these characteristics play in determining which banks

[8] Owing to incomplete reporting of other metrics of firm size in the Anacredit database (such as total assets or number of employees), we use total banks loans as a proxy.

[9] The non-guaranteed fraction of guaranteed exposures counts for the calculation of the leverage ratio, which may be constraining for some banks.

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grant guaranteed loans in the subsample of firms with multiple bank relationships, controlling for pre-existing assortative bank-firm matches via the inclusion of firm fixed effects.

The second issue addressed in this paper is the extent of credit substitution and its correlation with firm and bank characteristics. Here the analysis is carried out focusing only on firms that received such guarantees, to minimize the impact of the selection issue. Initially, we estimate at firm level the substitution associated with an increase in guaranteed lending, i.e., how much pre-existing loans to a given firm drop for an extra euro of guaranteed loans. Then we turn to a within-firm analysis exploiting bank-firm data for the sample of firms with multiple bank relationships, and assess the extent to which substitution differs between banks issuing guaranteed loans and banks that do not. To measure the credit substitution faced by firm i, we consider the change in non-guaranteed credit (NGC_i) extended to that firm, scaled by its initial total credit (TC_i):

$$y_i = \frac{NGC_{i,t} - NGC_{i,t-1}}{TC_{i,t-1}}$$

where t is August 2020 and t–1 is February 2020. Substitution occurs if non-guaranteed credit declines upon the firm being granted a guaranteed loan, i.e., if $y_i < 0$, dampening the growth in total credit by $-y_i$. Hence, we measure credit substitution by the negative of y_i, denoted by $s_i \equiv -y_i$. However, in principle non-guaranteed credit may increase, i.e., $y_i > 0$, in which case our measure of substitution s_i turns negative. Figure 6 shows how the variable y_i is distributed across firms for each of the four countries: interestingly, it is negative for most firms, its median value being negative in all countries, and smaller in Italy and Spain than in France and Germany. In Italy and Spain, almost the whole distribution is in negative territory, the 84th percentile being below zero. In contrast, in France and Germany y_i is positive for over a quarter of the firms in the sample. Hence, this simple unconditional statistic suggests substitution to have been larger in Italy and Spain than in France and Germany. But this result may reflect cross-country differences in firm characteristics, as well as in the magnitude of the liquidity shock hitting them.

[Insert Figure 6. Distribution of the change in non-guaranteed credit scaled by total initial credit]

To take these characteristics into account, we investigate how substitution is related to the size of the guarantee scaled by total initial credit, g_i, and to its interactions with firm and bank characteristics:

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$$s_i = \alpha + \beta_1 g_i + \beta_2 g_i \times \Delta VA_i + \beta_3 g_i \times Size_i + \beta_4 g_i \times Risk_i + \beta_5 g_i \times BSize_i + \beta_6 g_i \times Liq_i + \beta_7 g_i \times Cap_i + \beta_8 g_i \times NPL_i + \gamma_c + \varepsilon_i, \quad (2)$$

where $g_i \equiv GC_i/TC_i$ is the guaranteed credit received by firm *i* as a fraction of its total initial credit, and other variables are defined in the same way as in equation (1). In estimating this specification, errors are clustered at the level of the main bank of the relevant firm. While specification (2) is at firm level, we also estimate a similar specification at bank-firm level, where variables vary across lending relationships between firm *i* and bank *j*:

$$s_{ij} = \beta_1 G_{ij} + \beta_2 G_{ij} \times \Delta VA_i + \beta_3 G_{ij} \times Size_i + \beta_4 G_{ij} \times Risk_i + \beta_5 G_{ij} \times BSize_{ij} + \beta_6 G_{ij} \times Liq_{ij} + \beta_7 G_{ij} \times Cap_{ij} + \beta_8 G_{ij} \times NPL_{ij} + \gamma_j + \varepsilon_{ij}, \quad (3)$$

The dependent variable in this equation is the reduction in non-guaranteed credit (scaled by total initial credit) granted by bank *j* to firm *i*, s_{ij}, which for banks that do not grant guaranteed credit to firm *i* coincides with the reduction in their total credit to the firm. Hence, if bank *j* grants guaranteed credit to firm *i*, s_{ij} measures bank *j*'s substitution, while for other banks it measures the change in their total credit to firm *i*. The variable G_{ij} is a dummy variable that equals 1 if bank *j* grants guaranteed credit to firm *i*, and 0 otherwise. Hence, the coefficient β_2 measures the magnitude of bank *j*'s substitution, benchmarked against the change in credit by other banks lending to firm *i*. The other coefficients measure whether the magnitude of bank *j*'s substitution differs depending on bank and firm characteristics. The regression includes a firm-level fixed effect γ_i to control for unobserved firm heterogeneity, and standard errors are estimated clustering at the bank-firm level. Hence, this specification overcomes the problem that the size of loan guarantees does not vary randomly across firms, which is present in specification (2), since it compares the behavior of banks assisted by a guarantee with that of other banks lending to the same firm. A limitation of this approach is that of course it can be applied only to the subsample of firms with multiple bank relationships.

Table 1 reports the descriptive statistics for the variables used in our analysis. Panel A shows firm-level statistics for the full sample, Panel B shows those for the sample of firms that received a guaranteed loan, and Panel C presents bank-firm-level statistics for the subsample of firms that featured multiple bank relationships and received a guaranteed loan. The Appendix reports descriptive statistics separately for each country (A3, A4, A5 and A6).

[Insert Table 1: Descriptive Statistics]

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3. Results

In this section we first present the results about the characteristics of firms receiving guaranteed credit, and the banks granting it, and then turn to assessing the extent of credit substitution and how it correlates with these characteristics.

3.1 Which firms received guaranteed credit?

Table 2 provides evidence about the types of firms that received government guarantees, and the type of banks that provided guaranteed credit to them, presenting estimates of specification (1) for the entire euro area. The dependent variable in these regressions is a dummy variable that equals 1 when a firm is classified as having received a loan through the guarantee program, and 0 otherwise. All specifications include country-level effects to absorb unobserved heterogeneity across countries. Finally, all explanatory variables are measured as of December 2019 to reduce endogeneity concerns, especially related to the measurement of firms' riskiness.

[Insert Table 2. Which firms received guaranteed loans?]

The results in Table 2 show that, in line with the EU Commission guidelines, banks did screen firms when granting them publicly guaranteed loans. First, the change of the value added of the firm's industry between January and August 2020, i.e. immediately after the inception of the pandemic, enters with a negative coefficient, indicating that guaranteed loans were targeted preferentially to firms whose cash flows were more severely hit by the economic fallout of the outbreak. Second, the negative coefficient of firm size confirms that guaranteed loans were especially targeted towards SMEs, for which credit provision is more likely to be hampered by financial frictions than for large firms, especially in recessions. Thirdly, the negative coefficient of credit risk (measured by the ratio of loans in arrears to total firm loans as of December 2019) indicates that banks were less likely to grant guaranteed loans to firms already featuring high credit risk before the crisis. These results hold irrespective of whether bank characteristics are excluded (column 1) or included in the specification (columns 2, 3 and 4).

These results speak to the effectiveness of these programs: guarantees went mostly to firms that needed them the most according to several metrics, namely, the extent to which their industry was affected by the pandemic shock and their ability to raise funding independently of such programs. At

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the same time, riskier firms were less likely to benefit from the loan guarantee program, not only because firms already non-viable before the pandemic were not eligible for guaranteed credit, but also because the programs were designed to leave banks with some "skin in the game", being less than fully protected against insolvency by the government guarantee: hence, governments were able to leverage on the screening ability of banks (Philippon, 2021). On both accounts, the evidence for the euro area appears to differ substantially from that regarding the allocation of the PPP in the United States, where Granja et al. (2020) find no evidence that the PPP funds in the U.S. flowed to the areas that were most adversely hit by the pandemic, and Cororaton and Rosen (2021) document that they targeted mostly firms with weaker balance sheets and worse business prospects.

The regressions shown in columns 2, 3 and 4 of Table 2 investigate the characteristics of banks from which firms borrowed before the pandemic. The results show that firms were more likely to receive a guaranteed loan if they borrowed with banks with higher liquidity (as measured by the liquidity coverage ratio) and capitalization (as measured by their Tier-1 capital ratio), and with lower NPLs relative to total loans. This is not an obvious finding, considering that government guaranteed loans are not very demanding in terms of regulatory capital requirements (as these apply only to the portion of the loans unprotected by the guarantee), so that banks' balance sheet strength should not be a first-order characteristic for the provision of guaranteed lending. We also control for bank size (as measured by total assets): firms were more likely to obtain a guaranteed loan if they borrowed from larger banks, probably because these are better equipped to grant a large mass of guaranteed loans owing to their wider branch network, superior information technology infrastructure and/or specialized human capital. Below we shall see that these results are confirmed for the subsample of firms with multiple bank relationships.

Overall, these findings indicate that loan guarantees were allocated selectively: credit was channeled to firms with larger exposures to the most affected sectors and to the smallest firms, thus the most financially constrained, but not to the riskiest ones.

Table 3 shows that these results broadly apply to all four countries included in our analysis. This is not an obvious result, in light of the different design of the programs, the different magnitude of the pandemic shocks, and the cross-country differences in the composition of the firm populations and banking structures. Overall, there is a striking similarity in the estimates of the coefficients of the main regressors across the four countries. In all four countries, smaller, less risky firms and those operating in the most affected industries were more likely to receive guaranteed lending. While the magnitude of

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the effects differs across countries (for example, firm risk is much more important in the case of Spain than in the other three countries), the statistical and economic importance of these firm variables is quite consistent throughout. The same broadly applies to bank characteristics, though with lower consistency across countries: stronger and larger banks tend to be associated with guaranteed lending in France, Italy and Spain, whereas for Germany results are less clear on this front (the only variable with a statistically significant coefficient in this case being the NPL variable).

[Insert Table 3. Did selection differ across countries?]

3.2 Substitution of non-guaranteed with guaranteed credit

We now turn to the main issue of the paper, namely, assessing to what extent guaranteed loans were additional lending, or resulted in credit substitution, being partly or wholly offset by a contraction in non-guaranteed debt.

The evidence so far indicates that government guarantees were not blanketed across firms in the euro area but rather given preferentially to small, creditworthy firms operating in the most severely hit sectors. *A priori* this selection of guarantee recipients should be associated with less substitution than a less discriminating policy: insofar as creditworthy firms were more likely to receive guaranteed credit, banks should have been less keen to reduce their pre-existing exposures towards them. Moreover, since firms operating in the most severely hit industries were more likely to receive guaranteed credit, they should have been in need of additional liquidity, hence not inclined to renegotiate their pre-existing debt simply to get lower interest rates.

However, by the same token, the results discussed in Section 3.1 indicate that recipients of loan guarantees are far from being a random sample, as there are systematic differences between firms that received, and those that did not receive, government guaranteed credit. Hence, we carry out the analysis of substitution conditional on firms being recipients of guaranteed loans, rather than by including also non-recipients, to help attenuate the selection issue. As explained in Section 2.3, we first explore how our measure of substitution correlates with the amount of guaranteed lending across firms that were granted such loans; but since this analysis leaves open the possibility of a selection bias because the differences in the amount of guaranteed lending may correlate with firm characteristics, we also carry out a within-firm analysis for the subsample of firms with multiple bank relationships,

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including firm fixed effects and using banks only granting non-guaranteed loans as a benchmark for those granting guaranteed loans.

The firm-level analysis is shown in Table 4 for the pooled sample of firms receiving guaranteed loans in all four countries, and in Table 5 separately in each country. Three important results emerge from Table 4. First, the amount of credit substitution is positively associated with the size of the firm-level guarantee. The coefficient of the *Guarantee* variable indicates that on average an increase of €1 in firm-level guaranteed lending is associated with a credit substitution ranging between €0.10 and €0.14 depending on the specification, hence, with an average increase in total lending ranging between €0.90 and €0.86. Second, when we interact the amount of the guaranteed loan with the three main firm-level variables, i.e industry-level growth in value added, size and risk, we find that the response of substitution to guarantees to be larger for firms in more affected sectors, smaller firms and riskier ones. These results, shown in column (1) for a specification without bank-level variables, are all precisely estimated at the 1% confidence interval (except for the interaction between guarantee size and value-added growth, which is statistically significant at the 10% confidence level). Third, substitution is significantly greater for firms borrowing from banks that are larger, more liquid and capitalized, and featuring less NPLs.

[Insert Table 4. Substitution: firm level analysis]

These results start shedding light on whether substitution is resulting from the demand side (i.e. firms' borrowing choices) or the supply side (i.e. banks' lending policies) of the credit market. Recall that, in principle, substitution may be either bank-driven or firm-driven. We may expect firm-driven substitution in the case of the strongest firms, i.e., those still viable and liquid after the pandemic shock, which may want to substitute pre-existing debt with cheaper guaranteed debt. The results shown in Table 4 suggest that the push for credit substitution is unlikely to originate from this mechanism, as substitution is larger when the recipients are smaller and riskier firms operating in sectors severely affected by the pandemic.

Table 5 presents the estimates for the most complete specification (shown in column 4 of Table 4) separately for each of the four countries. Larger guarantees are associated with a larger reduction in the pre-existing credit exposure in all four countries, but the magnitude of the reduction varies across countries, being largest in Spain (0.24) and smallest in France (0.07). Notwithstanding these differences, also in this case firm and bank characteristics appear to play a similar role in moderating

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the extent of substitution: this appears to be larger for weaker firms (i.e., smaller and riskier firms in more affected sectors) borrowing from stronger banks (i.e., larger, more capitalized and liquid banks with fewer NPLs). In some cases the relevant coefficients are not statistically significant but their signs are consistent across countries.

[Insert Table 5. Substitution: firm level analysis, by country]

The granularity of our data enables us to repeat the analysis at within-firm level, focusing on the subsample of firms that received a guaranteed loan and had multiple bank relationships. Rather than looking at the overall firm-level change in the pre-existing credit exposure, in Table 6 we distinguish between the bank-firm relationships with a guarantee and those without a guarantee. The table shows that, in the euro area, banks that did not provide guaranteed loans on average reduced their exposure by 4% during the period under analysis, while banks that granted guaranteed loans reduced their non-guaranteed credit by 36%. In all four countries the banks granting guaranteed loans on average reduced their non-guaranteed exposure more than other banks lending to the same firm.

[Insert Table 6. Substitution: firm-bank level descriptive statistics]

Table 7 reports within-firm estimates of substitution based on specification (3) presented in Section 2.3, using data for the subsample of firms that received guaranteed credit and had multiple bank relationships. We control for firm-level unobserved heterogeneity by including firm fixed effects, and analyze whether banks which offer a guaranteed loan cut their pre-existing exposures more than other banks lending to the same firms. The results confirm the evidence provided by the descriptive statistics shown in Table 6: banks providing the guaranteed loan cut pre-existing credit between 20% and 36% more than other banks, depending on the specification.

The specification allows for firm and bank heterogeneity to play a role also in this within-firm setting. The results are similar to those obtained from the firm-level analysis of Table 4. The bank providing the guaranteed loan substitutes more when firms are in more affected sectors, smaller and riskier. Moreover, the bank providing the guaranteed loan substitutes more if it is larger and stronger (i.e., featuring fewer NPLs). Bank-firm level data allow to explore additional dimensions of heterogeneity: substitution is greater if the bank granting guaranteed credit has a stronger relationship with the firm (larger share of total bank credit exposure) and if the firm, before the pandemic, had less undrawn amount of credit lines with that bank. In Table A2 we report estimates of the specification

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shown in column 4 of Table 7 for each country and, again, the results are broadly similar across countries.

[Insert Table 7. Substitution: firm-bank level analysis]

While the within-firm estimates shown in Table 7 have the advantage of avoiding selection on firms, they are not immune from selection bias, as the bank issuing the guaranteed loan is not randomly assigned. To sign the bias that our estimates may suffer from, we analyze the within-firm selection of the bank granting guaranteed credit: for the subsample of firms with multiple banking relationship, Table 8 investigates the characteristics of the bank granting guaranteed credit. The dependent variable is a dummy variable equal to 1 for banks granting guaranteed credit, and 0 otherwise.

[Insert Table 8. Within-firm selection of banks granting guaranteed credit]

The estimates in Table 8 confirm that the banks that provide guaranteed credit to firms with multiple bank relationships are larger (the coefficient estimate of their size being statistically significant at the 1% level in columns 1-3), and more capitalized (coefficient estimate statistically significant at the 1% level in columns 1 and 3). Moreover, these banks are more likely to be the relevant firms' main banks, as they feature a significantly larger Share of Granted credit. Thus, relationship lending appears to have made it easier for firms to access government guaranteed credit. The latter result is consistent with the evidence by Li and Strahan (2021) that the bank supply of credit under the Paycheck Protection Program (PPP) was mostly done in the framework of relationship lending.

The results in Table 8 help us to infer the sign of the potential bias in the substitution estimates of Table 6 arising from selection of the banks providing guaranteed credit: these "selected" banks are stronger, and more likely to engage in relationship lending with the relevant firms: hence, they are precisely the type of banks that according to the literature (Bolton et al., 2016, and Jimenez et al., 2012) should be associated with a greater supply of credit during economic shocks. By extension, these banks should also be associated with lower credit substitution. Instead, our results indicate the opposite, so that – if anything – our estimates in Table 6 under-estimate the extent of substitution by the banks providing guaranteed credit.

Finally, Table 8 addresses a further potential concern with our results. The finding that the bank

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providing the guaranteed loan reduces its pre-existing exposure may not due to its active decision to cut pre-existing credit but simply to the fact that the credit was expiring in this period and the bank decides to roll it over by issuing of a guaranteed loan. To address this concern, we augment the specification in Table 8 with the variable Residual Maturity, defined as the remaining time until the expiration or the repayment of the credit. We want to verify whether the bank providing the guaranteed loan tends to be the one whose credit toward the firm has a shorter residual maturity (negative coefficient of Residual Maturity). The estimates from columns 4-6 shows that this is not the case: the coefficient of the variable is positive and significant, which suggests that our findings regarding substitution are not simply driven by expiring credit not being rolled over.

4. Conclusions

This paper investigates whether government credit guarantee schemes, used extensively after the onset of the Covid-19 pandemic to support bank lending by shifting default risk to governments, led to substitution of non-guaranteed with guaranteed credit, without fully adding to the supply of lending as intended by the policymakers. In principle, such substitution may be driven by banks exploiting public guarantees as an opportunity to reduce their pre-existing credit risk exposure, or by viable and liquid firms exploiting them as a chance to restructure their debt at lower rates – or a combination of the two.

We investigate this issue using a novel harmonized credit register dataset for the entire euro area, AnaCredit, matched with supervisory bank balance-sheet data, and focus on the four largest euro area countries. We establish two main findings.

First, guaranteed loans were mostly extended to small but comparatively creditworthy firms operating in sectors severely affected by the pandemic, and borrowing from large, liquid and well-capitalized banks. This selection of guarantee recipients should have reduced bank-driven substitution, by discriminating against the riskiest firms, as well as firm-driven substitution, by discriminating against firms in resilient sectors.

Our second finding concerns the existence and extent of substitution as well as its variation across firms and lenders. At firm level, guaranteed loans resulted in some substitution of pre-existing non-guaranteed debt with guaranteed loans, with €1 of additional loan guarantees being associated, on average, with a reduction in pre-existing lending ranging between €0.10 and €0.14. The value of this response varies across countries, being lowest in France and highest in Spain. For firms borrowing from multiple banks, the substitution arises from the lending behavior of the bank extending guaranteed

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loans, whose drop in non-guaranteed lending is significantly than for other banks lending to the same firm. Credit substitution was highest in the case of funding granted to riskier and smaller firms operating in the more affected sectors, and borrowing from larger and stronger banks. Banking relationships attenuated credit substitution. Similar estimates, though varying in magnitude, are obtained for all countries analyzed.

Overall, the evidence indicates that in the euro area government guarantees contributed to the continued extension of credit to relatively creditworthy firms hit by the pandemic, but also benefited the balance sheet of banks to some extent.

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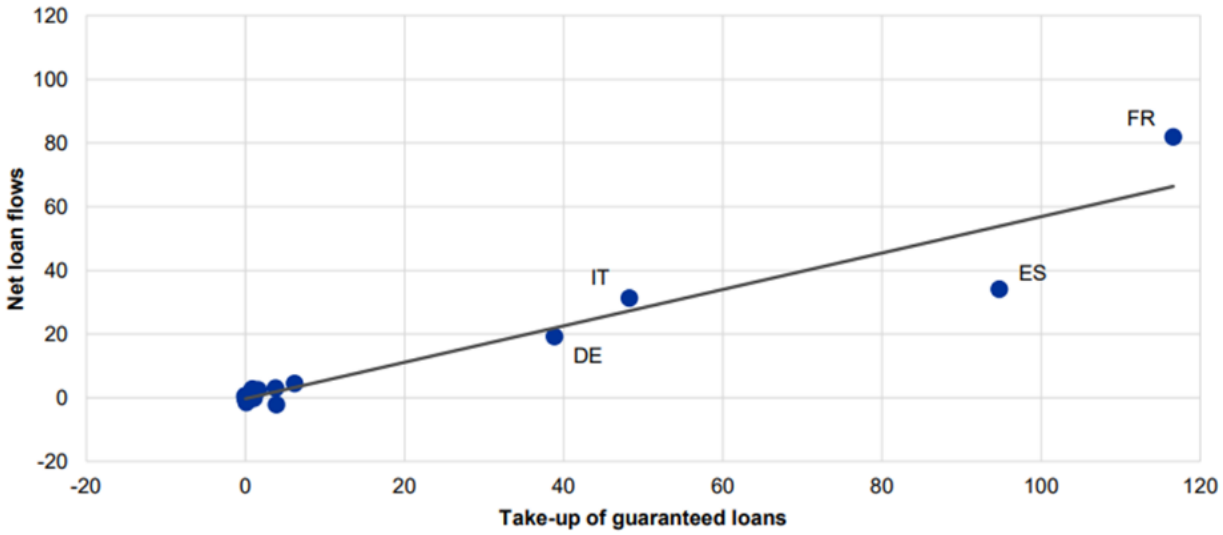
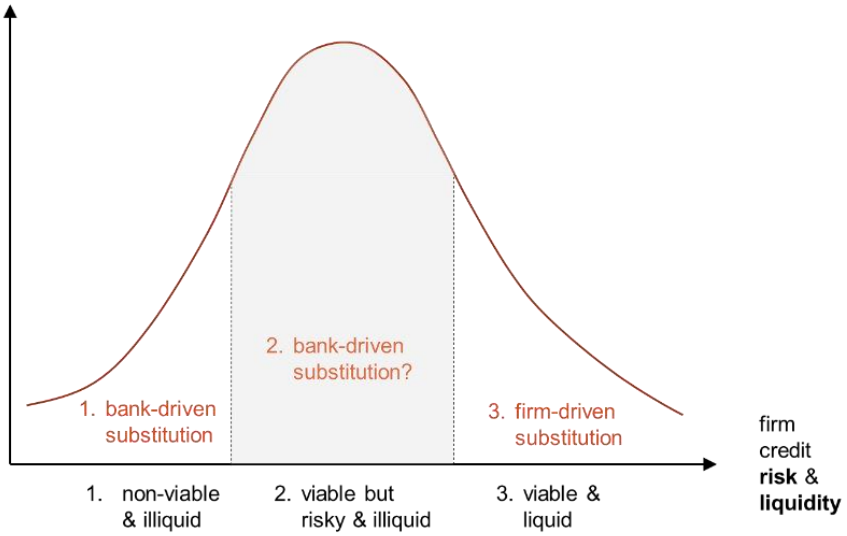
Figure 1. Guarantee loans and net lending: aggregate country-level data



Notes: This figure reports the relation between the amount of take-up of guaranteed loans and the net loan flows at a country level, over the period April-August 2020. Each blue dots refers to a country in the euro area. Data sources: Kreditanstalt für Wiederaufbau for Germany, Instituto de Crédito Oficial for Spain, Ministère de l'Économie etdes Finances for France, Ministero dell'Economia e delle Finanze and Banca d'Italia for Italy, various national authorities for other euro area countries, news sources, ECB and ECB calculations. A similar figure with data for the period April-July 2020 appears in the *ECB Economic Bulletin*, Issue 6/2020.

Figure 2. Publicly guaranteed loans: firm eligibility and credit substitution



Notes: This figure shows how selection of firms receiving guaranteed loans may affect the substitution of non-guaranteed credit with guaranteed credit. Firms are ranked by increasing solvency and liquidity. For non-viable and illiquid firms (group 1) substitution is likely to be bank-driven, while for viable and liquid firms (group 3) it is likely to be firm-driven. Making these two groups not eligible for guaranteed loans lowers substitution. In group 2, substitution may still occur, especially for riskier firms.

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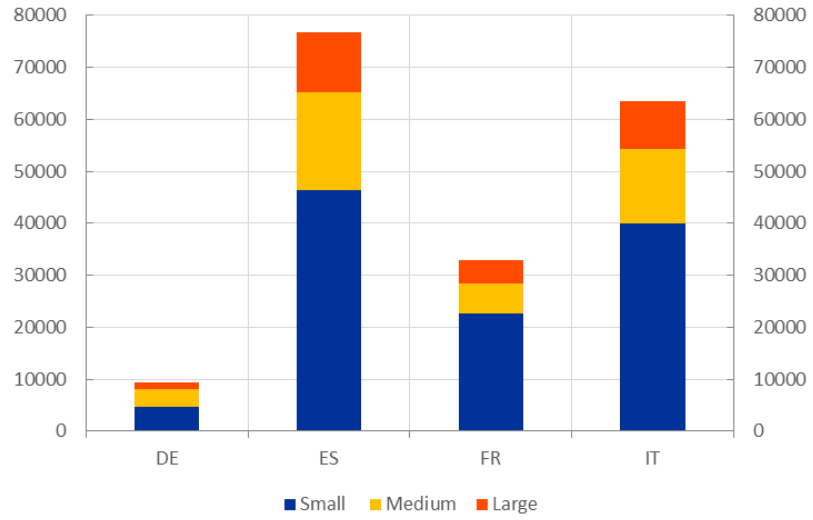
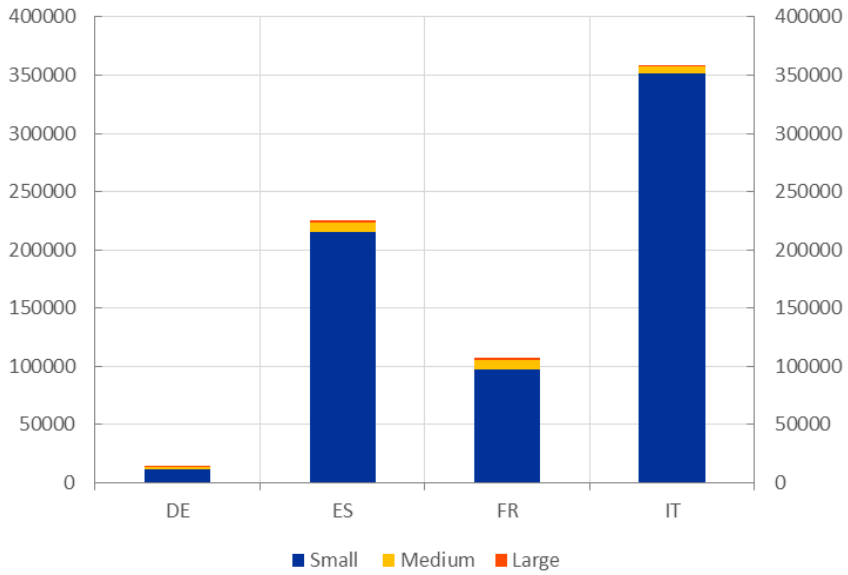
Figure 3. Guaranteed loans by firm size (million Euro)



Notes: The figure shows the amount of guaranteed loans in million euro issued to firms in different size classes based on their employment (small firms being those with less than 50 employees, medium firms those with 50 to 250 employees, large firms as those with more than 250 employees). The sample includes firms present in the AnaCredit database as of December 2019 and considers guaranteed loans issued between March and August 2020.

Figure 4. Guaranteed loans by number of firms



Notes: The figure shows the number of guaranteed loans issued firms in different size classes to their employment size (small firms being those with less than 50 employees, medium firms those with 50 to 250 employees, large firms as those with more than 250 employees). The sample includes firms present in the AnaCredit database as of December 2019 and considers guaranteed loans issued between March and August 2020.

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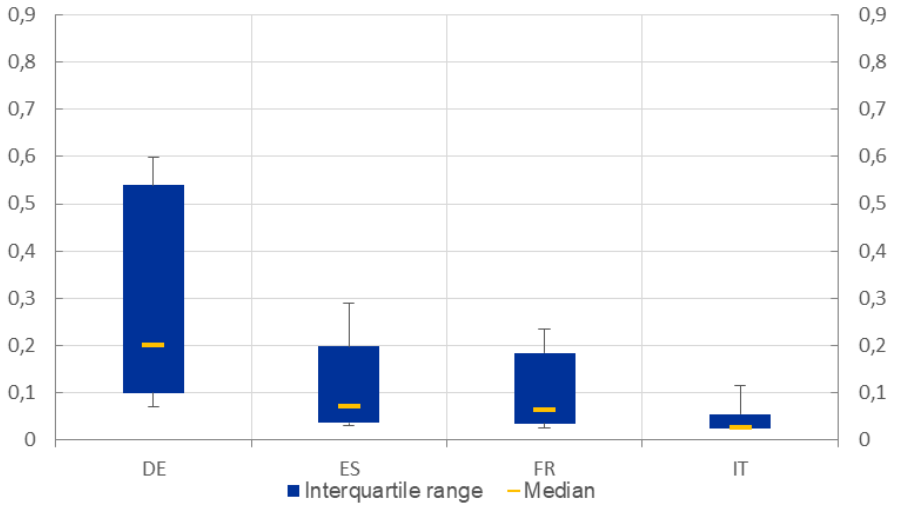
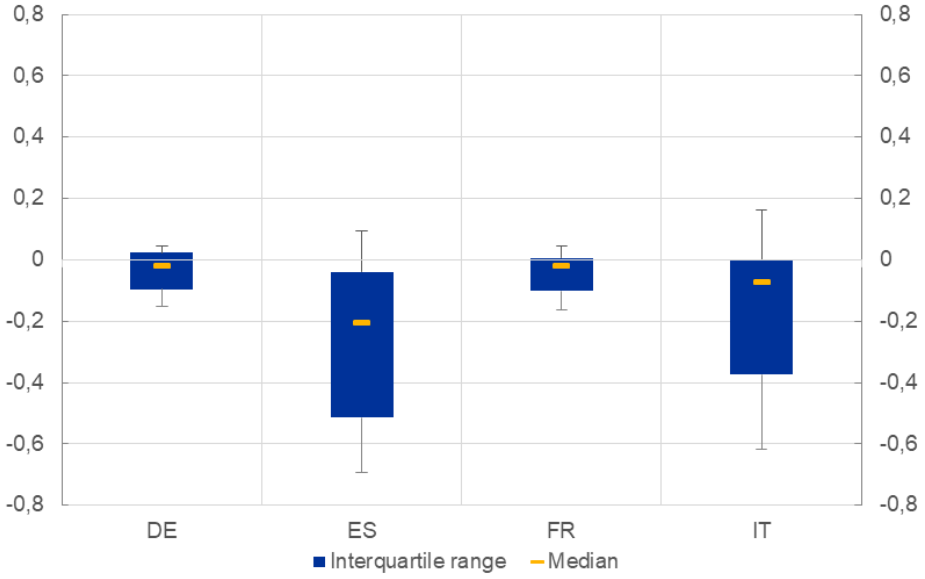
Figure 5. Amount of guaranteed loans (million euro)



Notes: The figure reports the distribution of the size of guaranteed loans in million euro issued in different countries. We report the median, the interquartile range and the 16th and 84th percentile. The sample includes firms present in the Anacredit database as of December 2019 and considers guaranteed loans issued between March and August 2020.

Figure 6. Distribution of the change in non-guaranteed credit scaled by total initial credit (y_i)



Notes: The figure shows the country-level distribution of the firm-level change in non-guaranteed credit between February 2020 and August 2020, divided by total credit in February 2020 (y_i for firm i). Each box plot displays the median, the interquartile range and the 16th and 84th percentile. The sample includes firms present in the AnaCredit database as of December 2019 and that receive a guaranteed loan between March and August 2020.

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Table 1. Descriptive Statistics

This table reports the descriptive statistics for the variables used in our analysis. We report the statistics at firm-level for the full sample in Panel A and for the sample of firms receiving a guaranteed loan in Panel B. In Panel C we report bank-firm-level statistics for the sample of firms with multiple bank relationships receiving a guaranteed loan. The dummy G_i equal to 1 if firm *i* receives a government guaranteed loan between March 2020 and August 2020, and 0 otherwise (the dummy G_{ij} is equal to 1 if bank j offers a government guaranteed loan to firm *i* between March 2020 and August 2020, and 0 otherwise); Industry VA Growth is defined as the percentage change in Valued Added in the relevant industrial sector between February 2020 and August 2020; Firm Size is proxied by the log of firm total debt; Firm Risk is proxied by the share of loans in arrears out of total loans; Bank Assets is defined as the log of total bank assets; Bank Liquidity is defined as the bank Liquidity Coverage Ratio; Bank Capital is defined as the Core Tier 1 Ratio; Bank NPL is defined as the share of NPL loans out of its total loans; y_i is defined as the change in non-guaranteed credit received by firm *i* between February 2020 and August 2020, divided by its total credit as of February 2020 (y_{ij} is the change in non-guaranteed credit granted by bank *j* to firm *i* between February 2020 and August 2020, divided by total initial credit granted by bank *j* to firm *i* in February 2020); Guarantee is defined as the amount of the government guaranteed loan received by the firm, divided by total credit in February 2020; Share of granted is defined as the share of the bank *j* out of the total bank exposure of the firm i; Drawn/Granted is defined as the amount of credit drawn by firm *i* divided by the amount granted by bank j to firm i; Residual Maturity is defined as the remaining time until the expiration or the repayment of the credit by bank *j* to firm *i*. In Panel A and B the bank related variables are calculated as a weighted average of the bank variable, where the weights are the shares of the bank exposure toward the firm out of total bank exposure of the firm at December 2019. All the regressors, apart from Guarantee and Industry VA Growth are calculated as of December 2019.

Variable	Observations	Mean	Std. Dev.	p25	p50	p75
Panel A: Firm-Level Statistics for Full Sample						
G_i	2534649	.201231	.4009204	0	0	0
Industry VA Growth	2534649	-.1446758	.0932137	-.256024	-.1782221	-.0297979
Firm Size	2534649	.4556356	1.032835	.06	.1394943	.355784
Firm Size (ln)	2534649	-1.841103	1.385576	-2.813411	-1.969731	-1.033432
Firm Risk	2534649	.0511766	.2035104	0	0	0
Bank Assets (ln)	2499952	10.96647	1.850156	9.752056	10.64261	12.60875
Bank Liquidity	1909643	1.609331	.4499768	1.374791	1.468671	1.656271
Bank Capital	2467193	.164408	.0373446	.1376	.1622	.1872
Bank NPL	2484676	.036722	.0251427	.0190742	.0295823	.0459807
Panel B: Firm-Level Statistics for Sample of Firms Receiving a Guaranteed Loan						
y_i	472206	-.1651976	.4351072	-.3588249	-.0884875	-6.61e-08
Guarantee	472206	.6610703	.6126491	.2130464	.4778608	.9133081
Industry VA Growth	472206	-.1994805	.0684331	-.256024	-.192973	-.1782221
Firm risk	472206	.009838	.0727509	0	0	0
Firm Size (ln)	472206	-1.825618	1.403241	-2.864704	-1.999964	-.9586785
Bank Assets (ln)	466779	11.78363	1.606472	10.93654	12.19957	12.93476
Bank Liquidity	429584	1.629307	.4063831	1.369273	1.524408	1.715151
Bank Capital	462361	.1580418	.0315707	.1376	.1538016	.17379
Bank NPL	465304	.0499914	.0251201	.0324722	.0389781	.0628809

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Panel C: Bank-Firm-Level Statistics for Sample of Firms with Multiple Bank Relationships Receiving a Guaranteed Loan

y_{ij}	463378	-.1934169	.4223604	-.4221086	-.0783115	0
G_{ij}	463378	.4813953	.4996543	0	0	1
Industry VA Growth	463378	-.1995637	.061841	-.256024	-.192973	-.1782221
Firm Size	463378	2.442876	5.221862	.256848	.671932	2.067729
Firm Size (ln)	463378	-.2574106	1.474238	-1.359271	-.3975981	.7264507
Firm Risk	463378	.0106374	.0699585	0	0	.0000731
Bank Assets (ln)	463378	11.78151	1.55693	11.14689	12.09178	12.93476
Bank Liquidity	463378	1.714639	.4939096	1.324652	1.563804	1.79208
Bank Capital	463378	.1513137	.0310854	.12991	.14158	.16791
Bank NPL	455992	.0511682	.0245063	.0376693	.0395396	.0628809
Share of Granted$_{ij}$	463378	.3060326	.233435	.1158215	.2474143	.4525441
Drawn/Granted$_{ij}$	462308	.7910086	.2734942	.6614148	.9237205	1
Residual Maturity$_{ij}$ (ln)	423102	2.994799	1.502414	2.495956	3.476427	3.885073

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Table 2. Which firms received guaranteed loans?

This table reports firm-level estimates of an equation in which the dependent variable is a dummy G_i equal to 1 if firm *i* receives a government guaranteed loan between March 2020 and August 2020, and 0 otherwise. The regressors are: Industry VA Growth, defined as the percentage change in Valued Added in the relevant industrial sector between February 2020 and August 2020; Firm Size, proxied by the log of firm total debt; Firm Risk, proxied by the share of loans in arrears out of total loans; Bank Assets, defined as the log of total bank assets; Bank Liquidity, defined as the bank Liquidity Coverage Ratio; Bank Capital, defined as the Core Tier 1 Ratio and Bank NPL, defined as the share of NPL loans out of its total loans. The bank related variables are calculated as a weighted average of the bank variable, where the weights are the shares of the bank exposure toward the firm out of total bank exposure of the firm at December 2019. All the regressors, apart from Industry VA Growth are calculated as of December 2019. Standard errors, clustered at the main bank level, are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Dependent Variable:	G_i			
	(1)	(2)	(3)	(4)
Industry VA Growth	-4.673***	-5.018***	-4.975***	-5.019***
	(0.302)	(0.363)	(0.360)	(0.365)
Firm Size	-0.0232***	-0.0962***	-0.0264***	-0.0203***
	(0.00985)	(0.0118)	(0.00957)	(0.00966)
Firm Risk	-1.998***	-2.139***	-2.139***	-2.151***
	(0.138)	(0.155)	(0.153)	(0.155)
Bank Assets		0.0916***	0.0734***	0.0925***
		(0.0194)	(0.0165)	(0.0191)
Bank Liquidity		0.220***	0.673***	0.339***
		(0.0738)	(0.0695)	(0.0723)
Bank Capital		0.0247***		0.0252***
		(0.00873)		(0.00888)
Bank NPL			-0.223***	-0.237***
			(0.0171)	(0.0172)
Country FE	Yes	Yes	Yes	Yes
R^2	0.255	0.248	0.248	0.248
N	2534649	1874289	1883572	1853664

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Table 3. Did selection differ across countries?

The table reports firm-level estimates of an equation in which the dependent variable is a dummy equal to 1 if the firm receives a government guaranteed loan between March 2020 and August 2020, and 0 otherwise (G_i). The regressors are: Industry VA Growth, defined as the industrial sector change in Valued Added between February 2020 and August 2020; Firm Size, proxied by the log of firm total debt; Firm Risk, proxied by the share of loans in arrears out of total loans; Bank Assets, defined as the log of total bank assets; Bank Liquidity, defined as the bank Liquidity Coverage Ratio; Bank Capital, defined as the Core Tier 1 Ratio and Bank NPL, defined as the share of NPL loans out of its total loans. The bank related variables are calculated as a weighted average of the bank variable, where the weights are the shares of the bank exposure toward the firm out of total bank exposure of the firm at December 2019. All the regressors, apart from Industry VA Growth are calculated as of December 2019. Standard errors clustered at the main bank level, are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Dependent Variable:	G_i			
	Germany	Spain	France	Italy
	(1)	(2)	(3)	(4)
Industry VA Growth	-3.155***	-3.605***	-7.195***	-3.582***
	(0.0916)	(0.172)	(0.201)	(0.128)
Firm Size	-0.0974***	-0.0785***	-0.0574***	-0.0297**
	(0.0140)	(0.0205)	(0.0136)	(0.0121)
Firm Risk	-0.793***	-3.269***	-1.195***	-1.920***
	(0.0775)	(0.164)	(0.243)	(0.161)
Bank Assets	0.00752	0.102	0.0861***	0.157***
	(0.0197)	(0.0684)	(0.0296)	(0.0282)
Bank Liquidity	0.0146	0.157***	0.542**	0.343***
	(0.0304)	(0.0179)	(0.0333)	(0.0726)
Bank Capital	0.00317	0.0617**	0.00880	0.0352***
	(0.00923)	(0.0305)	(0.0168)	(0.0110)
Bank NPL	-0.338***	-0.152***	-0.549***	-0.163***
	(0.0279)	(0.0105)	(0.0389)	(0.0107)
R^2	0.0377	0.142	0.232	0.118
N	252763	375621	684494	540786

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Table 4. Substitution: firm-level analysis

The table reports firm-level estimates of a regression whose dependent variable is the credit substitution s_i, defined as the negative of the change in non-guaranteed credit received by firm *i* between February 2020 and August 2020, divided by its total credit as of February 2020. The variable Guarantee is defined as the amount of the government guaranteed loan received by the firm, divided by total credit in February 2020. Other regressors are: Industry VA Growth, defined as the industrial sector change in Valued Added between February 2020 and August 2020; Firm Size, proxied by the log of firm total debt; Firm Risk, proxied by the share of loans in arrears out of total loans; Bank Assets, defined as the log of total bank assets; Bank Liquidity, defined as the bank Liquidity Coverage Ratio; Bank Capital, defined as the Core Tier 1 Ratio and Bank NPL, defined as the share of NPL loans out of its total loans. Each of the bank related variables is calculated as a weighted average of the corresponding bank-level variable, where the weights are the shares of the banks' exposure toward the firm out of total bank exposure of the firm at December 2019. All the regressors, apart from Guarantee and Industry VA Growth are calculated as of December 2019. Standard errors clustered at the main bank level, are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Dependent Variable:	Substitution (s_i)			
	(1)	(2)	(3)	(4)
Guarantee	0.108***	0.137***	0.102***	0.128**
	(0.0241)	(0.0149)	(0.0153)	(0.0150)
Guarantee × Industry VA Growth	-0.0659***	-0.0901***	-0.0908***	-0.0910***
	(0.0263)	(0.0227)	(0.0222)	(0.0212)
Guarantee × Firm Size	-0.0611***	-0.0981***	-0.0768***	-0.0651***
	(0.00514)	(0.00635)	(0.00580)	(0.00626)
Guarantee × Firm Risk	0.171***	0.180***	0.189***	0.163***
	(0.0306)	(0.0312)	(0.0309)	(0.0312)
Guarantee × Bank Assets		0.0355***	0.0192*	0.0354***
		(0.00956)	(0.00996)	(0.00923)
Guarantee × Bank Liquidity		0.0730**	0.0946**	0.0588*
		(0.0325)	(0.0436)	(0.0330)
Guarantee × Bank Capital		0.161***		0173***
		(0.0577)		(0.0549)
Guarantee × Bank NPL			-0.141*	-0.166**
			(0.0778)	(0.0645)
Country FE	Yes	Yes	Yes	Yes
Non interacted variables	Yes	Yes	Yes	Yes
R^2	0.0661	0.0864	0.0737	0.0885
N	472206	427911	427691	426636

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Table 5. Substitution: firm-level analysis, by country

The table reports firm-level estimates of a regression whose dependent variable is the credit substitution s_i, defined as the negative of the change in non-guaranteed credit received by firm *i* between February 2020 and August 2020, divided by its total credit as of February 2020. The variable Guarantee is defined as the amount of the government guaranteed loan received by the firm, divided by total credit in February 2020. Other regressors are: Industry VA Growth, defined as the industrial sector change in Valued Added between February 2020 and August 2020; Firm Size, proxied by the log of firm total debt; Firm Risk, proxied by the share of loans in arrears out of total loans; Bank Assets, defined as the log of total bank assets; Bank Liquidity, defined as the bank Liquidity Coverage Ratio; Bank Capital, defined as the Core Tier 1 Ratio and Bank NPL, defined as the share of NPL loans out of its total loans. Each of the bank related variables is calculated as a weighted average of the corresponding bank-level variable, where the weights are the shares of the banks' exposure toward the firm out of total bank exposure of the firm at December 2019. All the regressors, apart from Guarantee and Industry VA Growth are calculated as of December 2019. Standard errors clustered at the main bank level, are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Dependent Variable:	Substitution (s_i)			
	Germany	Spain	France	Italy
	(1)	(2)	(3)	(4)
Guarantee	0.196***	0.238***	0.0753***	0.109***
	(0.0674)	(0.0497)	(0.0146)	(0.0405)
Guarantee × Industry VA Growth	-0.103	-0.196***	-0.225***	-0.192***
	(0.145)	(0.0499)	(0.0538)	(0.0429)
Guarantee × Firm Size	-0.00452	-0.0125*	-0.0380***	-0.0258***
	(0.00772)	(0.00712)	(0.00807)	(0.00492)
Guarantee × Firm Risk	0.163	0.288***	0.0962***	0.107*
	(0.246)	(0.0319)	(0.0346)	(0.0585)
Guarantee × Bank Assets	0.0195***	0.0408	0.00836***	0.0586***
	(0.00459)	(0.0293)	(0.00303)	(0.0152)
Guarantee × Bank Liquidity	0.0559***	0.0716	0.0417	0.246***
	(0.0155)	(0.0571)	(0.0278)	(0.0474)
Guarantee × Bank Capital	0.463	0.304***	0.0793	0.262***
	(0.417)	(0.0963)	(0.164)	(0.0758)
Guarantee × Bank NPL	-0.349*	-0.0697*	-0.514	-0.868***
	(0.181)	(0.0370)	(0.659)	(0.0780)
Non interacted variables	Yes	Yes	Yes	Yes
R^2	0.0298	0.0918	0.0336	0.0514
N	7569	156629	70057	192381

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Table 6. Substitution: firm-bank descriptive statistics

This table reports bank-firm level descriptive statistics of the variable $y_{i,j}$, defined as the change in non-guaranteed credit granted by bank j to firm i between February 2020 and August 2020, divided by total initial credit granted by bank *j* to firm *i* in February 2020. We report the average value of $y_{i,j}$ for different values of the dummy G_{ij} which is equal to 1 if bank *j* offers a government guaranteed loan to firm *i* between March 2020 and August 2020, and 0 otherwise. We consider only firms which receive a government guaranteed loan and that have multiple bank relationships.

	G_{ij}	$\mathbf{y_{i,j}}$	Number of observations
Euro Area	0	-0.038	240,310
	1	-0.361	223,068
Germany	0	-0.020	4,967
	1	-0.080	2,213
Spain	0	-0.002	98,006
	1	-0.448	127,234
France	0	-0.005	5,914
	1	-0.089	7,891
Italy	0	-0.068	131,423
	1	-0.266	85,730

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Table 7. Substitution: firm-bank level analysis

This table reports bank-firm level estimates of an equation whose dependent variable is the credit substitution s_{ij}, defined as the negative of the change in non-guaranteed credit granted by bank *j* to firm *i* between February 2020 and August 2020, divided by total initial credit granted by bank *j* to firm *i* in February 2020. The main regressor is a dummy G_{ij} equal to 1 if bank j offers a government guaranteed loan to firm *i* between March 2020 and August 2020, and 0 otherwise. Other regressors are: Industry VA Growth, defined as the industrial sector change in Valued Added between February 2020 and August 2020; Firm Size, proxied by the log of firm total debt; Firm Risk, proxied by the share of loans in arrears out of total loans; Bank Assets, defined as the log of total bank assets; Bank Liquidity, defined as the bank Liquidity Coverage Ratio; Bank Capital, defined as the Core Tier 1 Ratio and Bank NPL, defined as the share of NPL loans out of its total loans; Share of granted, defined as the share of the bank j out of the total bank exposure of the firm *i*; Drawn/Granted, defined as the amount of credit drawn by firm *i* divided by the amount granted by bank *j* to firm *i*. All the regressors, apart from I(Guarantee) and Industry VA Growth are calculated as of December 2019. Standard errors clustered at the bank level, are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Dependent Variable:	Substitution ($s_{i,j}$)			
	(1)	(2)	(3)	(4)
G_{ij}	0.210***	0.314***	0.281***	0.360***
	(0.0396)	(0.0509)	(0.0479)	(0.0340)
G_{ij} × Industry VA Growth	-0.168**	-0.157*	-0.172**	-0.185***
	(0.0708)	(0.0811)	(0.0725)	(0.0585)
G_{ij} × Firm Size	-0.00370	-0.00429	-0.00487	-0.0271***
	(0.00593)	(0.00585)	(0.00570)	(0.00689)
G_{ij} × Firm Risk	0.184***	0.132***	0.130***	0.130***
	(0.0486)	(0.0300)	(0.0336)	(0.0459)
G_{ij} × Bank Assets	0.0496***	0.0180	0.0266	0.0257*
	(0.0142)	(0.0177)	(0.0175)	(0.0140)
G_{ij} × Bank Liquidity	0.109	0.0269	0.0774	0.0670
	(0.0794)	(0.0751)	(0.0748)	(0.0490)
G_{ij} × Bank Capital	0.215		0.431	0.586
	(0.974)		(0.735)	(0.660)
G_{ij} × Bank NPL		-1.505***	-1.073***	-1.644***
		(0.272)	(0.113)	(0.209)
G_{ij} × Share of Granted				-0.124**
				(0.0507)
G_{ij} × Drawn/Granted				-0.128***
				(0.0283)
Firm FE	Yes	Yes	Yes	Yes
Non interacted variables	Yes	Yes	Yes	Yes
R^2	0.473	0.471	0.480	0.535
N	463378	460084	453694	452065

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Table 8. Within-firm selection of banks granting guaranteed credit

The table reports bank-firm level estimates of a regression whose dependent variable is a dummy G_{ij} equal to 1 if bank j offers a government guaranteed loan to firm *i* between March 2020 and August 2020, and 0 otherwise. The regressors are bank and firm characteristics. The bank variables are: Bank Assets, defined as the log of total bank assets; Bank Liquidity, defined as the bank Liquidity Coverage Ratio; Bank Capital, defined as the Core Tier 1 Ratio and Bank NPL, defined as the share of NPL loans out of total loans. The bank-firm variables are: Share of granted, defined as the share of the bank *j* out of the total bank exposure of the firm *i*; Drawn/Granted, defined as the amount of credit drawn by firm *i* divided by the amount granted by bank *j* to firm *i*; Residual Maturity is defined as the remaining time until the expiration or the repayment of the credit by bank *j* to firm *i*. All the regressors, are calculated as of December 2019. Standard errors clustered at the bank level, are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Dependent Variable:	$G_{i,j}$					
	(1)	(2)	(3)			
Bank Assets	0.0686***	0.0779**	0.0695***	0.0805***	0.0925***	0.0806***
	(0.0206)	(0.0307)	(0.0214)	(0.0204)	(0.0328)	(0.0212)
Bank Liquidity	0.0559	0.0371	0.0536	0.0742	0.0534	0.0739
	(0.0753)	(0.0885)	(0.0720)	(0.0701)	(0.0870)	(0.0677)
Bank Capital	0.331***		0.332***	0.407***		0.407***
	(0.0654)		(0.0640)	(0.0798)		(0.0780)
Bank NPL		-0.868	-0.616		-0.612	-0.0616
		(1.752)	(1.271)		(2.156)	(1.525)
Share of Granted	0.887***	0.914***	0.883***	0.636***	0.684***	0.635***
	(0.0460)	(0.0508)	(0.0473)	(0.0432)	(0.0496)	(0.0434)
Drawn/Granted	0.151*	0.121*	0.153**	0.151**	0.173***	0.151**
	(0.0800)	(0.0663)	(0.0780)	(0.0610)	(0.0540)	(0.0593)
Residual Maturity				0.114***	0.107***	0.114***
				(0.0185)	(0.0231)	(0.0184)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.447	0.418	0.447	0.493	0.453	0.493
N	452065	452065	452065	399002	399002	399002

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Appendix

Table A1. Institutional details about loan guarantee programs in the euro area

	Size of the programme	Beneficiaries	Share of loan guaranteed	Maximum amount per borrower	Maturity	End of programme	*Fees*	*Lending rates*
Germany	€365 bn (Kreditanstalt für Wiederaufbau – "KfW")	Firms and sole proprietors	• **100%** for firms with more than 10 employees under the KfW-Schnellkredit programme • **90%** for SMEs and sole proprietors • **80%** for large firms	€1 bn, and in any case not above: (i) 25% of revenues in 2019 or (ii) twice the wage bill in 2019; or €0.5 (0.8) bn for firms with more than 10(50) employees under the KfW-Schnellkredit programme	up to 10 years	31 December 2020		> 1% and <1.46% for SMEs > 2% and <2.12% for large firms. Uniform 3% of interest margin for Schnellkredit programme
	€400 bn (Wirtschaftsstabilisierungs fonds "WSF" - Economic Stabilisation Fund)	Firms with at least two of the following conditions: turnover above €43 million, sales above €50 million, more than 249 employees	Scheme approved by the EC (individual Lufthansa plan approved by the EC on 25 June 2020, including €3 bn guaranteed loan provided by KfW)		up to 5 years	31 December 2020	Companies must pay a guarantee fee in line with market conditions	
France	€300 bn (Ministry of Economy and Finance, via Bpifrance Financement SA)	Firms and sole proprietors	• **90%** of the loan to firms with less than 5,000 employees and EUR 1.5 billion turnover; • **80%** of the loan to firms with more than 5,000 employees and less than EUR 5.0 billion turnover; • **70%** of the loan to firms with more than 5,000 employees and more than EUR 5.0 billion turnover;	The maximum guaranteed amount for each SME is €5 million. Not above 25% of revenues in 2019	up to 5 years	31 December 2020	between 0.25% and 0.50% during the first year between 0.50% and 2.00% during the amortization period	Banks have to grant guaranteed loans "at cost". The rate for the borrower is the so-called resource rate of the bank, currently close to 0% for the first year, plus the guarantee premium.
Italy	€100 bn (Central Guarantee Fund)	Firms with < 500 employees and sole proprietors	• 100% for loans up to €30000 • 90% for loans > €30000 and < €5 million • up to 100% for loans between €30000 and €800000 requested by firms with turnover up to €3.2 million	Not above: (i) 25% of revenues in 2019 or (ii) twice the wage bill in 2019	up to 10 years	31 December 2020	1st year SMEs 25 bps other 50bps; 2nd and 3rd year: SMEs 50 bps, other 100bps; 4th to 6th year SMEs 100 bps, other 200bps	For loans <€30000: The interest rate cannot exceed the Rendistato index plus 20 bps For loans >€30000: bank-client agreement
	€200 bn (SACE Guarantee)	Firms with more than 499 employees, but also smaller firms and sole proprietors that have already fully benefitted from Fondo di Garanzia	• 90% for firms with < 5000 employees and €1.5 bn turnover • 80% for firms with > 5000 employees or turnover between €1.5 bn and €5 bn • 70% for firms with turnover above €5 bn	Not above: (i) 25% of revenues in 2019 or (ii) twice the wage bill in 2019	up to 6 years	31 December 2020		Must be lower than the cost requested with the same characteristics but without the guarantee.
Spain	€140 bn (Instituto de Crédito Oficial - ICO)	Firms and sole proprietors	• **80%** of new loans and *renewals* of transactions requested by the self-employed and SMEs. • For other companies, the guarantee will cover **70%** of the new loan granted • and **60%** of the *renewals*	Not above: (i) 25% of revenues in 2019 or (ii) twice the wage bill in 2019	up to 8 years	1 December 2020	between 20 and 120 basis points,	Banks have to ensure that the cost for the borrower is in line with that charged before the COVID-19 crisis.

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A2. Substitution: firm-bank level analysis, by country

Notes: This table reports bank-firm level estimates of an equation in which the dependent variable is the change in non-guaranteed credit between February 2020 and August 2020 from bank *j* to firm *i*, divided by total credit from bank *j* to firm *i* in February 2020 (multiplied by −1), as a function of a dummy equal to 1 if bank *j* offers a government guaranteed loan to firm *i* between March 2020 and August 2020. Other regressors are: Industry VA Growth, defined as the industrial sector change in Valued Added between February 2020 and August 2020; Firm Size, proxied by the log of firm total debt; Firm Risk, proxied by the share of loans in arrears out of total loans; Bank Assets, defined as the log of total bank assets; Bank Liquidity, defined as the bank Liquidity Coverage Ratio; Bank Capital, defined as the Core Tier 1 Ratio and Bank NPL, defined as the share of NPL loans out of total loans; Share of granted, defined as the share of the bank *j* out of the total bank exposure of firm *i*; Drawn/Granted, defined as the amount of credit drawn by firm *i* divided by the amount granted by bank *j* to firm *i*. All the regressors (except G_{ij} and Industry VA Growth) are calculated as of December 2019. Standard errors clustered at the bank level, are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Dependent Variable:	Substitution (s_{ij})			
	Germany	Spain	France	Italy
	(1)	(3)	(5)	(7)
G_{ij}	0.291***	0.567***	0.145**	0.287***
	(0.0597)	(0.0616)	(0.0571)	(0.0267)
G_{ij}*Industry VA Growth	-0.200	-0.286***	-0.323***	-0.0106
	(0.172)	(0.0312)	(0.0802)	(0.0801)
G_{ij} *Firm Size	-0.0128*	-0.0443***	-0.0231***	0.00151
	(0.00661)	(0.00593)	(0.00839)	(0.00269)
G_{ij} *Firm Risk	0.0484	0.332***	0.0520	0.250***
	(0.304)	(0.0712)	(0.176)	(0.0179)
G_{ij} *Bank Assets	0.00459	0.0228	0.0231**	0.0270
	(0.00657)	(0.0312)	(0.00929)	(0.0188)
G_{ij} *Bank Liquidity	0.0352**	0.0261	0.447*	0.122*
	(0.0169)	(0.0521)	(0.230)	(0.0618)
G_{ij} *Bank Capital	0.174	1.351	2.005***	1.770***
	(0.290)	(1.233)	(0.585)	(0.237)
G_{ij} *Bank NPL	-0.720	-1.087***	-1.197***	-1.115***
	(1.263)	(0.213)	(0271)	(0.189)
G_{ij} *Share of gran.	-0.361***	-0.0393	-0.229*	-0.0788*
	(0.0659)	(0.0492)	(0.122)	(0.0403)
G_{ij} *Drawn/Granted	-0.0219	-0.436***	-0.408***	-0.476***
	(0.0457)	(0.0460)	(0.0503)	(0.0149)
Firm FE	Yes	Yes	Yes	Yes
Non interacted variables	Yes	Yes	Yes	Yes
R^2	0.460	0.577	0.543	0.536
N	6590	224733	13790	206952

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Table A3. Descriptive Statistics - Germany

Variable	Obs	Mean	Std. Dev.	p25	p50	p75
Panel A: Firm level Statistics for Full Sample						
G_i	252763	.0334938	.1799225	0	0	0
Industry VA Growth	252763	-.1724049	.0760591	-.256024	-.1782221	-.155582
Firm Size	252763	.8775824	1.643657	.0681629	.2021068	.8025328
Firm Size (ln)	252763	-1.388775	1.59761	-2.685854	-1.598959	-.2199826
Firm Risk	252763	.0213029	.1296524	0	0	0
Bank Assets (ln)	252763	9.443304	1.787251	8.135693	8.907613	10.40325
Bank Liquidity	252763	1.856293	.6667611	1.422	1.640416	1.98
Bank Capital	252763	.158222	.036538	.13405	.1487321	.1702026
Bank NPL	252763	.0152443	.0084284	.0096545	.0132664	.0188115
Panel B: Firm level Statistics for Sample of Firms Receiving a Guaranteed Loan						
yi	7569	.0294492	.3780803	-.0978405	-.0262189	.0287692
Guarantee	7569	.8268862	.7054036	.3033639	.5978996	1.142409
Industry VA Growth	7569	-.2030581	.0589413	-.256024	-.192973	-.1782221
Firm risk	7569	.0062343	.0465336	0	0	0
Firm Size (ln)	7569	-.7729988	1.421277	-1.82136	-.8665873	.2922885
Bank Assets (ln)	7569	9.608208	1.728739	8.260328	9.112977	10.74894
Bank Liquidity	7569	1.831977	.5921204	1.450858	1.65606	1.96
Bank Capital	7569	.1571572	.0307537	.1366	.1509183	.1716056
Bank NPL	7569	.0151103	.007928	.009443	.0135438	.0186106
Panel C: Bank- Firm level Statistics for Sample of Firms with Multiple Bank Relationships Receiving a Guaranteed Loan						
yij	7180	-.0546116	.3026088	-.1257962	-.0371246	.0000536
G_{ij}	7180	.3082173	.461789	0	0	1
Industry VA Growth	7180	-.2016543	.0556801	-.256024	-.192973	-.1782221
Firm Size	7180	4.438901	7.466265	.4552568	1.44547	4.725804
Firm Size (ln)	7180	.3975731	1.550213	-.7868945	.3684348	1.553038
Firm Risk	7180	.0066486	.0429471	0	0	0
Bank Assets (ln)	7180	9.835563	2.039088	8.22227	9.239208	10.74894
Bank Liquidity	7180	1.858152	.8052462	1.3842	1.56	1.854
Bank Capital	7180	.1581544	.0458491	.13405	.1443	.1653
Bank NPL	6870	.0152644	.0101312	.0082218	.0120831	.0192994
Share of Grantedij	7180	.3155976	.2941007	.0699746	.2050615	.5192737
Drawn/Grantedij	7104	.739222	.3292369	.5811453	.8893858	1
Residual Maturity (ln)	5828	3.341155	1.236191	2.968	3.614558	4.044233

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Table A4. Descriptive Statistics - Spain

Variable	Obs	Mean	Std. Dev.	p25	p50	p75
Panel A: Firm level Statistics for Full Sample						
G_i	375621	.4418177	.4966039	0	0	1
Industry VA Growth	375621	-.1804534	.0791887	-.256024	-.192973	-.155582
Firm Size	375621	.4586029	1.04863	.058948	.131419	.353341
Firm Size (ln)	375621	-1.83766	1.343044	-2.8311	-2.029365	-1.040322
Firm Risk	375621	.0809921	.2491405	0	0	0
Bank Assets (ln)	375621	12.30366	.9762803	12.09178	12.60875	12.92058
Bank Liquidity	375621	1.75237	.4387194	1.468671	1.715151	1.79208
Bank Capital	375621	.150723	.0189058	.1376	.1465739	.1642
Bank NPL	375621	.0355724	.0061506	.032242	.0376693	.0385449
Panel B: Firm level Statistics for Sample of Firms Receiving a Guaranteed Loan						
yi	156629	-.2466819	.4467807	-.5034692	-.210755	-.0444445
Guarantee	156629	.8387386	.6296211	.3636584	.6846501	1.139307
Industry VA Growth	156629	-.1974441	.0700842	-.256024	-.192973	-.155582
Firm risk	156629	.0060816	.0374007	0	0	0
Firm Size (ln)	156629	-1.650195	1.334841	-2.697099	-1.825848	-.787814
Bank Assets (ln)	156629	12.45248	.8059398	12.09178	12.60875	12.92058
Bank Liquidity	156629	1.694113	.3661199	1.468671	1.655102	1.79208
Bank Capital	156629	.1533933	.0164927	.1408	.1528847	.1642
Bank NPL	156629	.0363205	.0053262	.0337309	.0376693	.0385449
Panel C: Bank- Firm level Statistics for Sample of Firms with Multiple Bank Relationships Receiving a Guaranteed Loan						
yij	225240	-.2523438	.46773	-.5872993	-.1731535	-.0049942
G_{ij}	225240	.5648819	.4957736	0	1	1
Industry VA Growth	225240	-.2002979	.0654056	-.256024	-.192973	-.1782221
Firm Size	225240	2.191604	4.936068	.255182	.635966	1.807278
Firm Size (ln)	225240	-.316911	1.404574	-1.365778	-.4526102	.5918216
Firm Risk	225240	.006571	.032135	0	0	.0000686
Bank Assets (ln)	225240	12.17307	1.133703	11.31643	12.60875	12.92058
Bank Liquidity	225240	1.755414	.476793	1.468671	1.715151	1.79208
Bank Capital	225240	.1477338	.0217962	.1376	.1408	.1642
Bank NPL	224823	.0353647	.0069246	.032242	.0378145	.0385449
Share of Grantedij	225240	.2904998	.2216841	.1098441	.2320705	.4279795
Drawn/Grantedij	225225	.8061504	.2752201	.7066761	.9487358	1
Residual Maturity (ln)	220844	3.346354	1.093645	3.162481	3.652388	3.936499

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Table A5. Descriptive Statistics - France

Variable	Obs	Mean	Std. Dev.	p25	p50	p75
Panel A: Firm level Statistics for Full Sample						
G_i	684494	.1161267	.320377	0	0	0
Industry VA Growth	684494	-.0971021	.0909324	-.1782221	-.0398476	-.0297979
Firm Size	684494	.3349425	.7107675	.0714347	.1494142	.3147322
Firm Size (ln)	684494	-1.844603	1.15251	-2.638971	-1.901033	-1.156033
Firm Risk	684494	.0185658	.1160795	0	0	0
Bank Assets (ln)	684494	11.28889	1.924782	9.846801	10.24894	13.30939
Bank Liquidity	684494	1.380974	.0894697	1.374791	1.374791	1.374791
Bank Capital	684494	.1823708	.0410711	.1611	.1817674	.213
Bank NPL	684494	.0233848	.0071877	.0190077	.0228226	.0278255
Panel B: Firm level Statistics for Sample of Firms Receiving a Guaranteed Loan						
yi	70057	.0166524	.3779251	-.0983517	-.0219887	.0001161
Guarantee	70057	.8515676	.7060015	.3124042	.628859	1.190626
Industry VA Growth	70057	-.199555	.0742399	-.256024	-.256024	-.155582
Firm risk	70057	.007501	.056014	0	0	0
Firm Size (ln)	70057	-1.983821	1.17061	-2.892727	-2.162197	-1.285001
Bank Assets (ln)	70057	11.72877	2.05215	9.953729	10.64365	13.7904
Bank Liquidity	70057	1.368989	.0915093	1.252571	1.374791	1.374791
Bank Capital	70057	.1753219	.040206	.1282192	.1728	.2058538
Bank NPL	70057	.024303	.0069923	.019403	.024107	.0324722
Panel C: Bank- Firm level Statistics for Sample of Firms with Multiple Bank Relationships Receiving a Guaranteed Loan						
yij	13805	-.0528667	.3597715	-.1342179	-.0214879	0.000000
G_{ij}	13805	.5716045	.4948642	0	1	1
Industry VA Growth	13805	-.1915527	.0749784	-.256024	-.192973	-.155582
Firm Size	13805	2.289138	5.526091	.2065514	.516942	1.624874
Firm Size (ln)	13805	-.4528852	1.494116	-1.577206	-.6598246	.4854306
Firm Risk	13805	.0153264	.0709034	0	0	0
Bank Assets (ln)	13805	11.7303	2.068436	9.972784	11.02524	14.46817
Bank Liquidity	13805	1.373128	.1064993	1.252571	1.374791	1.374791
Bank Capital	13805	.1593656	.0460885	.1223	.1649	.1949
Bank NPL	13805	.026805	.0106861	.0194926	.024107	.0324722
Share of Grantedij	13805	.3885271	.2728432	.1563274	.3440479	.5884315
Drawn/Grantedij	13797	.857278	.2434742	.8039736	1	1
Residual Maturity (ln)	13228	2.863787	1.086195	2.22282	2.926998	3.630618

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Table A6. Descriptive Statistics - Italy

Variable	Obs	Mean	Std. Dev.	p25	p50	p75
Panel A: Firm level Statistics for Full Sample						
G_i	540786	.3744032	.4839689	0	0	1
Industry VA Growth	540786	-.1811467	.0777233	-.256024	-.1782221	-.155582
Firm Size	540786	.5462619	1.157741	.054727	.147751	.46073
Firm Size (ln)	540786	-1.8341	1.657658	-2.905398	-1.912227	-.7749431
Firm Risk	540786	.1191722	.3041008	0	0	.0002384
Bank Assets (ln)	540786	11.67339	1.591469	11.14689	12.00496	12.93476
Bank Liquidity	540786	1.663658	.4699299	1.324652	1.524408	1.656271
Bank Capital	540786	.1522374	.0351854	.12093	.14192	.16791
Bank NPL	540786	.07239	.0210451	.0611005	.0643629	.084597
Panel B: Firm level Statistics for Sample of Firms Receiving a Guaranteed Loan						
yi	192381	-.179156	.408887	-.3506369	-.0737196	0
Guarantee	192381	.421235	.4469445	.120829	.2818322	.5758379
Industry VA Growth	192381	-.2006224	.0646788	-.256024	-.192973	-.1782221
Firm risk	192381	.0138388	.0954151	0	0	0
Firm Size (ln)	192381	-1.82296	1.532356	-2.899641	-1.965085	-.865928
Bank Assets (ln)	192381	11.77314	1.465838	11.24238	12.00496	12.93476
Bank Liquidity	192381	1.656124	.4491092	1.324652	1.524408	1.656271
Bank Capital	192381	.1562764	.0342632	.132	.1471	.1735922
Bank NPL	192381	.0713465	.0190964	.0611005	.065682	.0823266
Panel C: Bank- Firm level Statistics for Sample of Firms with Multiple Bank Relationships Receiving a Guaranteed Loan						
yij	217153	-.1458202	.36705	-.2499992	-.0152744	0.000000
G_{ij}	217153	.3947908	.4888068	0	0	1
Industry VA Growth	217153	-.1992424	.0570849	-.256024	-.1782221	-.1782221
Firm Size	217153	2.647283	5.374904	.259999	.711619	2.353162
Firm Size (ln)	217153	-.2049241	1.532004	-1.347077	-.3402126	.85576
Firm Risk	217153	.0146889	.0946387	0	0	.000094
Bank Assets (ln)	217153	11.44297	1.74098	10.57639	11.74067	12.93476
Bank Liquidity	217153	1.689311	.5021324	1.324652	1.563804	1.656271
Bank Capital	217153	.1542888	.0365633	.11874	.14192	.16791
Bank NPL	210494	.0708171	.0224744	.0546911	.0628809	.084597
Share of Grantedij	217153	.3165832	.2385714	.1228859	.2599145	.467759
Drawn/Grantedij	216182	.7727057	.2697362	.6148636	.8830958	1
Residual Maturity (ln)	183202	2.569453	1.817286	1.955389	3.067037	3.748751

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