Loan Guarantees, Bank Lending and Credit Risk Reallocation

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Abstract

We investigate whether government credit guarantee schemes, extensively used after the onset of the Covid-19 pandemic, led to substitution of non-guaranteed with guaranteed credit rather than to increased supply of lending. We investigate this issue using 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 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 €0.10 to €0.14 reduction in pre-existing lending. For firms borrowing from multiple banks, the substitution arises from the lending behavior of the bank extending guaranteed loans, whose drop in lending is about 10 times larger than for other banks that lend to the same firm. Substitution was highest for funding granted to riskier and smaller firms in more affected sectors, 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.

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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). But, in the response to the COVID-19 shock, bank loan guarantees were used for the first time on a massive scale, as a macroeconomic stabilization tool, and in many countries have been the central pillar in the plethora of policies introduced soon after the onset of the pandemic.

The rationale for their wide deployment was the recognition that the pandemic had led to a sharp drop in revenue for most firms, due the recessionary impact of social distancing on both consumer demand and labor supply. The magnitude of the resulting liquidity shortfall was such that banks could hardly be expected to fill the gap on their own with increased credit provision, due to the sharp increase in credit risk induced by the pandemic and the resulting fears of a deterioration in their capital ratios.[1] Absent a large-scale emergency liquidity injection by governments, default waves would have propagated 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 their employees, suppliers and customers to be destroyed.

In this situation, massive loan guarantee programs appeared to provide the required response, as transferring default risk to the government would encourage banks to increase lending, even to hard-hit firms. At the same time, loan guarantees were seen as a faster and more efficient way to allocate public support to firms than direct funding by the government, considering that typically banks have better information than the government about the quality of each firm: by leveraging banks' knowledge, liquidity would more likely reach viable firms than if the government were to decide which firms should be saved and which ones should be liquidated (Philippon, 2021).

However, channeling liquidity to firms through banks may come at a cost: 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] There is evidence, at least for US banks, that the significant increase in firms' leverage in the period before the pandemic led banks to increase their provisioning against expected losses as the immediate response in the first two quarters of 2021. As a result, banks experienced weakening capitalization, leading to lower ability and willingness to provide lending to the real sector (Blank, Hanson, Stein, and Sunderam (2020)). Survey data in the U.S. also show that banks tightened lending standards in 2021 to levels that were not observed since the 2008-09 financial crisis.

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 lead to no increase in total lending to firms. 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." Indeed, aggregate net lending grew less than one-for-one with the expansion of guaranteed loans at the country level between April and August 2020, which is the period in which loan guarantee schemes were launched in the Euro area. Of course, such a macro-level correlation *per se* is no evidence that the "danger" of substitution materialized upon the introduction of loan guarantee schemes. The present paper aims precisely at testing this hypothesis on the basis of euro-area firm and bank-level data.

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

The quote by Blanchard et al. (2020) assumes that substitution may occur as a result of banks' credit supply policies: it refers to banks as those that "ask" firms to use the guaranteed debt to repay existing loans, so as to reduce their risk exposure to the firm. However, such renegotiation may alternatively be initiated by firms that "ask" their lenders 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 should not encounter significant challenges to obtain credit without the support of the guarantee program. Hence, substitution can be expected to be bank-driven for firms featuring higher credit risk and liquidity needs, and to be firm-driven in the case of solvent firms with lower 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 credit substitution should help disentangle whether substitution is largely a bank-induced or a firm-induced substitution: substitution that mostly involves credit flowing from strong banks to financially fragile firms is more consistent with a bank-induced behavior rather than firm-induced.

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 1, where firms are arranged on the basis of a combined index of credit quality, encompassing both their solvency and their liquidity. Excluding the riskiest firms from the loan guarantee program amount to cutting off the left tail of the distribution from the population of beneficiaries, and therefore should limit the extent of bank-driven substitution. Conversely, discriminating against firms that were

spared by the pandemic shock and therefore were still solvent and liquid should cut off the right tail of the distribution, and thus limit the extent of firm-driven substitution. Moreover, the extent of substitution should also be lower if loan guarantee programs required banks to maintain their existing exposure as a condition for making 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]

European regulators 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 in 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 that loan guarantee programs may 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

[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).

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 correlate 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), enabling us to investigate whether the extent of substitution differed across countries and/or correlated differently 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. Exploiting 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., in the hospitality and catering business): if they had not received guaranteed loans, these firms would have been more likely than others to face a credit cut and possibly 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. This evidence 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) document that they targeted mostly firms with higher leverage, less cash and worse business prospects. The evidence instead 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. Seen from this perspective, the euro-wide guaranteed credit programs were successful in bringing much needed credit to firms in those

industries mostly hit, while leveraging on banks' information to screen out the worst risks. We also find that firms were 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 during market stress periods. These characteristics were systematically consistent not only in the euro area as a whole but also in the four individual countries we investigate.

We then turn to investigate whether the guaranteed loans constituted new lending or substitution occurred. We measure credit substitution as the negative of the change in non-guaranteed credit in the pandemic period compared 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, riskier (credit risk being measured by magnitude of arrears), and operating in sectors that experienced a larger drop in value-added during the pandemic. We also find that healthier banks engaged the most in credit substitution: larger, more capitalized banks and those with lower NPLs appear to have reduced more their non-guaranteed exposures when providing guaranteed ones. This evidence is more consistent with the hypothesis that riskier and weaker firms got new credit under the government guarantees schemes in exchange for some re-negotiation of pre-existing loans.

Interestingly, for firms borrowing from multiple banks, substitution arises from the behavior of the bank extending guaranteed loans, whose drop in lending is about 10 times as large as for other banks that lend to the same firm. Bank-firm data confirm that credit substitution is largest for guaranteed funding granted to riskier and smaller firms operating in more affected sectors, and borrowing from larger and stronger banks, but banking relationships attenuated credit substitution.

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

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 have 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 have used such schemes to de-risk (at least part of) 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 associated with the termination of loan guarantee schemes and other support programs. Thirdly, the fact that substitution moderated lending to the riskiest firms will lead these firms to exit the pandemic with lower leverage, hence less debt overhang problems, compared to a counterfactual world where no substitution occurred (Brunnermeier and Krishnamurthy (2020)).

Our paper provides a novel contribution to the nascent literature that investigates the benefits and costs of government guarantee schemes, an increasingly important component of fiscal policies around the world. Our finding that credit substitution is far from complete is consistent with pre-COVID-19 evidence by Bachas et al. (2020) regarding guarantees provided by the Small Business Agency in the U.S. were associated with an increase in credit supply, and with other evidence that loan guarantees correlate with more lending, and higher employment and firm survival rates (Schich et al., 2017; De Blasio et al, 2017; Ciani et al., 2020). Evidence regarding the real effects of the PPP scheme also indicates that it raised employment at eligible firms and increased firms survival (Autor et al., 2020; Bartik et al., 2020). 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.

This paper is organized as follows. Section 2 describes the institutional details of government guarantee programs across countries, the data used in the analysis and the empirical specifications that we estimate. Section 3 presents and discusses the results. Section 4 discusses the policy implications of the results in the context of the many policy interventions used by governments to respond to the slowdown caused by the pandemic. Section 5 concludes.

2. Institutional framework, data and methodology

2.1 Institutional framework

The design of the loan guarantee schemes in the EU shares many common features defined by the above-mentioned EU Commission Regulation No. 651/2014, but also some details determined by national rules. As already noted, the EU guidelines rules 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 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 where losses are sustained *pari passu* by the bank and the State, or 35 % of the loan principal, where the State is junior than the bank.

Yet, governments also 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 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 under the KfW-Schnellkredit program. But, as shown by the table, for most loans the guaranteed fraction ranges between 90% and 70%, 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 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 million.[3] 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, including overdrafts, revolving credit, credit lines, reverse repurchase agreements and other loans, including term loans.[4] Both the amount already drawn under a granted facility and the undrawn part are reported in AnaCredit: in our empirical 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

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

[4] 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.

types of protection considered and we concentrate on those provided by government entities.[5] 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.

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. 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 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 registry. This could be one reason why we see only about 23% of firms in AnaCredit obtaining guaranteed credit.

[Insert Table 1: Sample Structure]

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 scheme of all four countries were designed so as to channel funds preferentially to small and medium size firms. As shown by Figure 3, 95.6% of the credit went to SMEs in Italy, 89.5% in Spain, 81.2% in France and 64.1% in Germany. Figure 4 shows that the prevalence of small firms is even more extreme in terms of their number, especially in Italy. Figure 5 shows that in terms of average size of guaranteed loans, the ranking of the four countries is the opposite one: 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.

[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)]

[5] 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.

2.3 Empirical methodology

Our methodology centers on the two main questions of this paper. The first part of our analysis focuses on which type 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, first on the whole sample of 2,639,651 firms pooling data for all four countries, and then 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 otherwise. We use the following firm-level characteristics: (a) ΔVA measures the change of the value added in firm *i*'s industry during the sample period, (b) *Size* is defined as the log of the total amount of outstanding loans on firm *i*'s balance sheet as of December 2019, and (c) *Risk* is measured as the firm's fraction of credit in arrears as of December 2019. These characteristics are meant to capture the firm characteristics that should determine, on one hand, the eligibility of firms to apply for such 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 hit hard by the onset of the pandemic. To reduce endogeneity concerns, we use the industry's change of value added rather than of the firm itself. Finally, the *Size* variable is included to test whether indeed the regulatory favor towards SMEs present in both the EU guidelines and national regulations translated into a preferential targeting of loan guarantees towards 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 firms were borrowing from before the pandemic, in order to investigate whether bank size and balance sheet strength mattered in the granting of guaranteed credit. Bank size, which we measure by their total assets as of December 2019, can be of particular interest in the context of granting a massive amount of guaranteed

credit: large banks' geographical span is likely to confer them a screening and monitoring advantage (Diamond, 1984), and they 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 could suspect that by virtue of the government backing such credit, balance sheet strength may not matter in a significant way. However, it is very likely that banks will consider their financial health because they are fractionally using their own funds even for most guaranteed loans, and in extending such credit they may be missing out on other more lucrative opportunities in a post-Covid recovery. We have three measures of the average balance sheet strength of banks lending to firm *i*: their liquidity (LIQ_i), their capitalization (CAP_i), and their non-performing loans as a fraction of their total loans (NPL_i). The bank-related variables are calculated as weighted averages of the corresponding variables for the banks lending to the relevant firm, with weights equal to their shares in the firm's total bank exposure as of December 2019. At the end of the paper, we will investigate the role that bank balance sheet characteristics play in determining the banks granting guaranteed loans in the subsample of firms with multiple bank relationships. In that setting, we will disentangle the role of banks' characteristics in the allocation of guaranteed credit from any pre-existing assortative bank-firm matches, by including firm fixed effects.

Next, we turn to assessing the extent of credit substitution and how it correlates with firm and bank characteristics, focusing only on firms that received such guarantees to minimize the impact of the selection issue. Initially we carry out the analysis at firm level, estimating the incremental substitution associated with the size of guaranteed loans, 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 the sample of firms with multiple bank relationships, using bank-firm data, and assess the extent to which substitution differs for banks that issue guaranteed loans compared to those 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 when non-guaranteed credit drops upon the firm being granted a guaranteed loan, i.e., when $y_i < 0$, hence dampening the growth in

total credit by $-y_i$. Hence, in the following analysis we shall measure credit substitution by the negative of y_i, henceforth 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 being 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:

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

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 (1) above. 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 lending by other banks lending to firm *i*. The other coefficients measure how firm and bank characteristics affect differently the magnitude of bank *j*'s substitution. 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 sample of firms with multiple bank relationships.

3. Results

We start by presenting 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?

We start by investigating the questions related to the selection issue: which types of firms received government guarantees, and which type of banks provided guaranteed credit to them? Results are shown in Table 2 (for the entire euro area) and Table 3 (for Germany, Spain, France and Italy, separately). 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 of interest 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 the firm size variable 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 the worst credit risks. These results hold irrespective of whether one excludes bank characteristics from the specification (column 1) or includes them (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 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 so as to leave banks with some "skin in the game", not being 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 firms borrowed from before the pandemic. We use three different bank-level variables to measure the strength of their balance sheet: (a) their liquidity coverage ratio, (b) their capital ratio (as measured by their Tier-1 capital ratio), (c) their non-performing loans ratio (NPL relative to total loans). The results show that firms were more likely to receive a guaranteed loan if they were associated with banks with higher liquidity and capitalization, and with lower NPLs. This is not an obvious finding, as 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 were associated with larger banks, probably because larger banks are likely to be 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 results show that there was an important selection dimension that ought to be considered as a first step of the analysis. The type of selection is also important: although this lending was government-backed, the rules of these programs led to the avoidance of the riskiest firms from receiving credit. Indeed, 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 the riskiest.

Table 3 shows that these results broadly apply to all the 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, the different composition of the national firm populations, and the different banking structures operating in the different countries. 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 the effects may differ 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 of interest is quite consistent throughout. The same can be said regarding bank characteristics, although in this case there is somewhat less consistency across countries. Stronger and larger banks are behind such 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 the case of Germany 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, to what extent guaranteed loans constituted additional lending to firms, or resulted in credit substitution, the provision of guaranteed debt 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. As a result, 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, including firm fixed effects and using banks granting only 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 for the subsample of firms receiving guaranteed loans 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 three main firm-level variables, i.e the growth in value added of its industry, firm size, and firm risk, with the size of the guarantee itself we find that the larger substitution associated with larger guarantees is especially present in the case of firms in more affected sectors, smaller firms and riskier ones. These results, shown in column (1) obtained from a specification without bank-level variables, are all precisely estimated at the 1% confidence interval (with the exception of the interacted variable between guarantee size and the industry's value added growth which is statistically significant at the 10% confidence level). Third, we find greater substitution for firms borrowing from banks that (a) are

larger, (b) have higher capital, and (c) have lower NPLs. All these three variables are statistically and economically significant at the 1% confidence level whereas we find no robust result emerging from the banks' liquidity level.

[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.

In Table 5 we estimate the most complete specification of Table 4 (shown in column 4) separately for each of the four countries. We find that in all four countries larger guarantees are associated with a larger reduction in the pre-existing credit exposure. However, the size of the reduction varies across countries, being the largest in Spain (0.24) and the smallest in France (0.07). Notwithstanding these differences, also in this case firm and bank characteristics appear to play a similar role in moderating the extent of substitution: this appears to be larger for weaker firms (more affected sectors, smaller and riskier) borrowing from stronger banks (larger, better capitalized, more liquid and with fewer NPLs). In some countries the relevant coefficients are less 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 analyze substitution also 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 date 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 enables us to analyze the role of firm and bank heterogeneity also in this within-firm setting. The results are similar to those obtained in the firm-level analysis of Table 4. The bank providing the guaranteed loan substitutes more when firms are in more affected sector, smaller and riskier. Moreover, the bank providing the guaranteed loan substitutes more if it is larger and stronger (i.e., featuring fewer NPLs). The bank-firm level analysis allows also to explore additional dimensions of heterogeneity: the substitution is stronger 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 started, had less undrawn amount of credit lines with that bank. In Table A2 we report estimates from the specification of column 4 of Table 7 for each country and, again, results are broadly similar for the four 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, in Table 8 we investigate which are the characteristics of the bank granting guaranteed credit. The dependent variable is a dummy variable equal to 1 for banks granting guaranteed credit and zero otherwise.

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

We find two important results. First, we confirm that the banks that provide guaranteed credit to firms with multiple bank relationship 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). Second, these banks are more likely to be the relevant firms' main banks, as they feature a significantly larger Share of Granted credit. Thus bank relationship appear 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.

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 leading to an increased 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 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 loans, whose drop in lending is about 10 times as large as 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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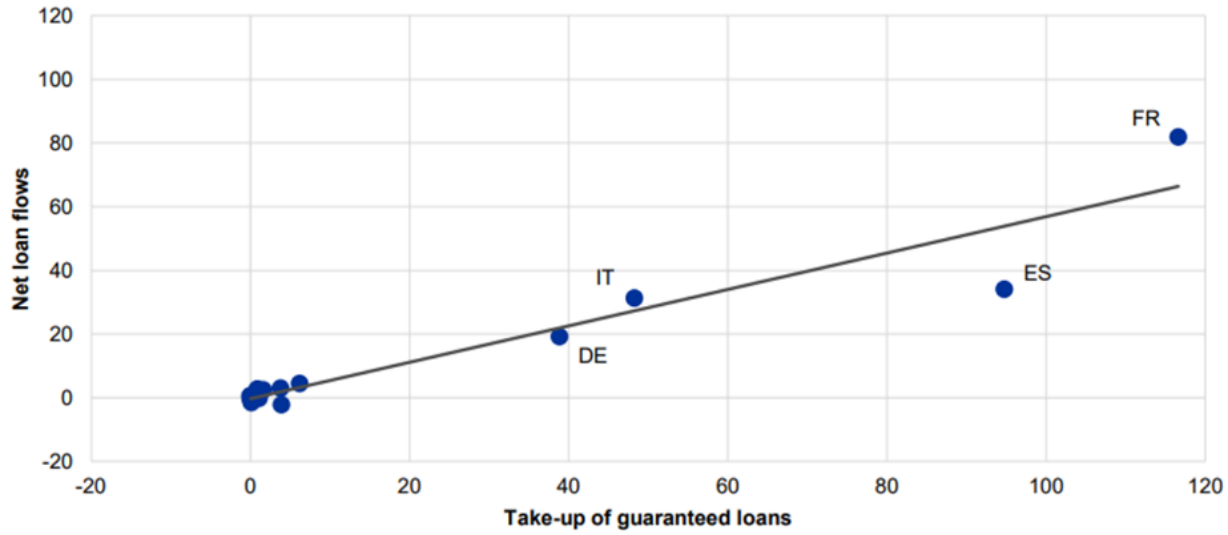
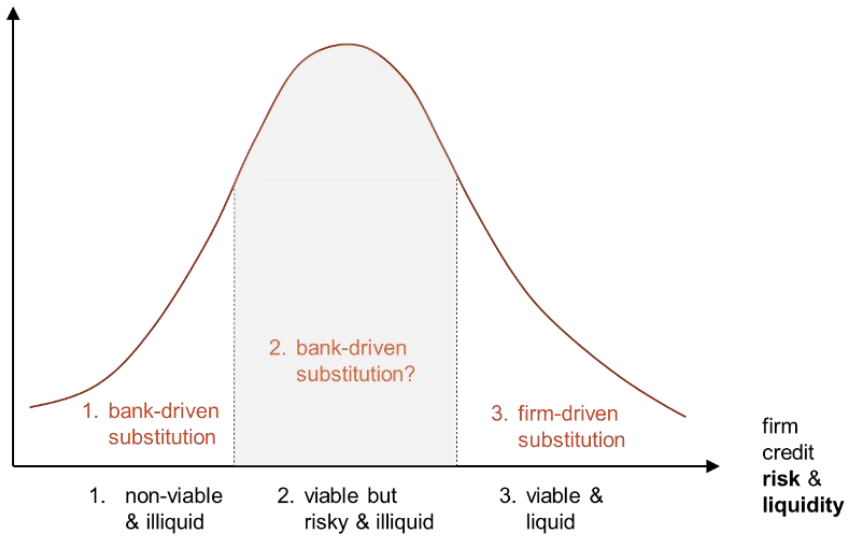
Figure 1. Guarantee loans and net lending: aggregate country-level data



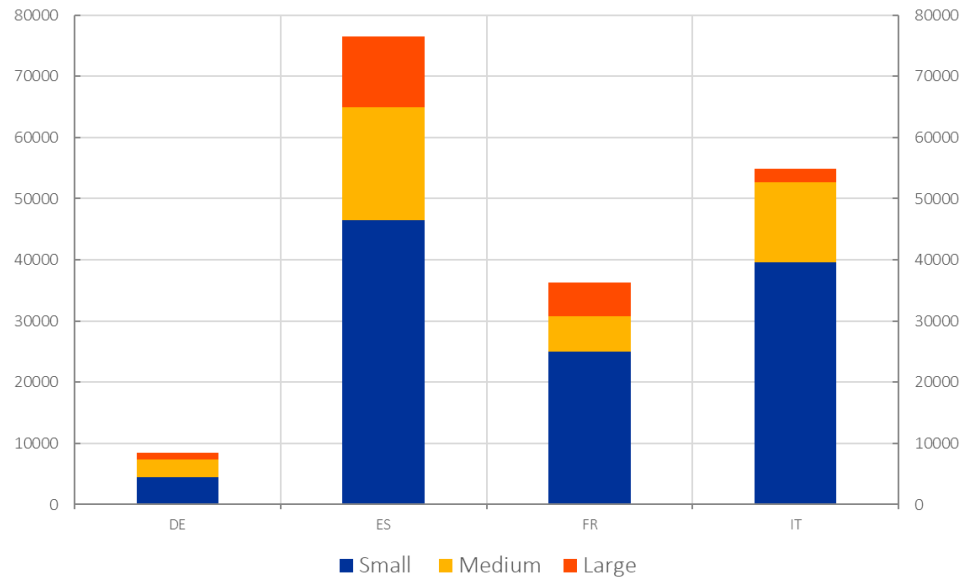
Notes: This figure report the relation between the amount of take-up of guaranteed loans and the net loan flows at a country level, over the period April-August 2020. Each blue dots refers to a country in the Euro area. Data sources: Kreditanstalt für Wiederaufbau for Germany, Instituto de Crédito Oficial 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



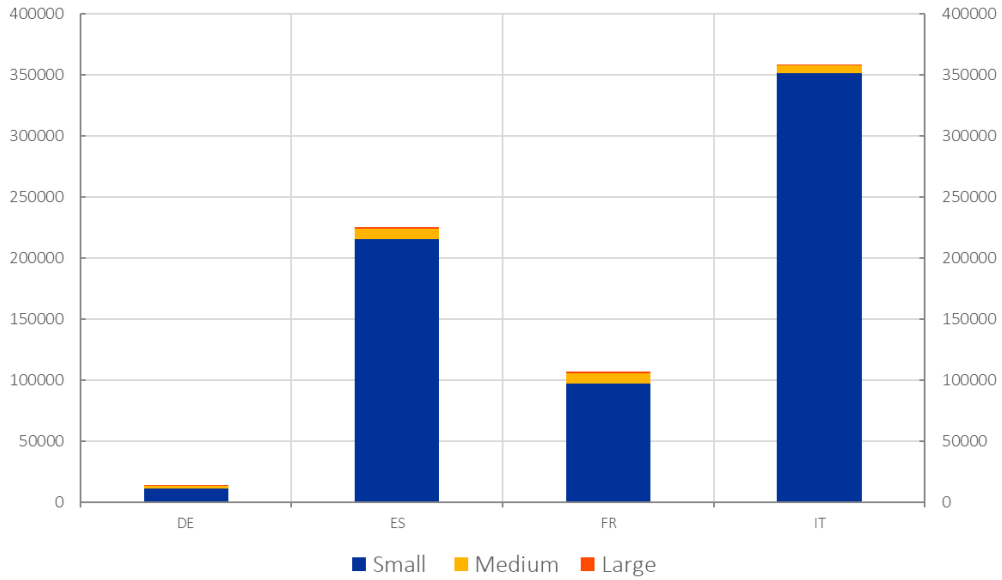
Notes: This figure shows how selection of firms receiving guaranteed loans may affect the substitution of non-guaranteed credit with guaranteed credit. Firms are ranked by increasing solvency and liquidity. For non-viable and illiquid firms (group 1) substitution is likely to be bank-driven, while for 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.

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



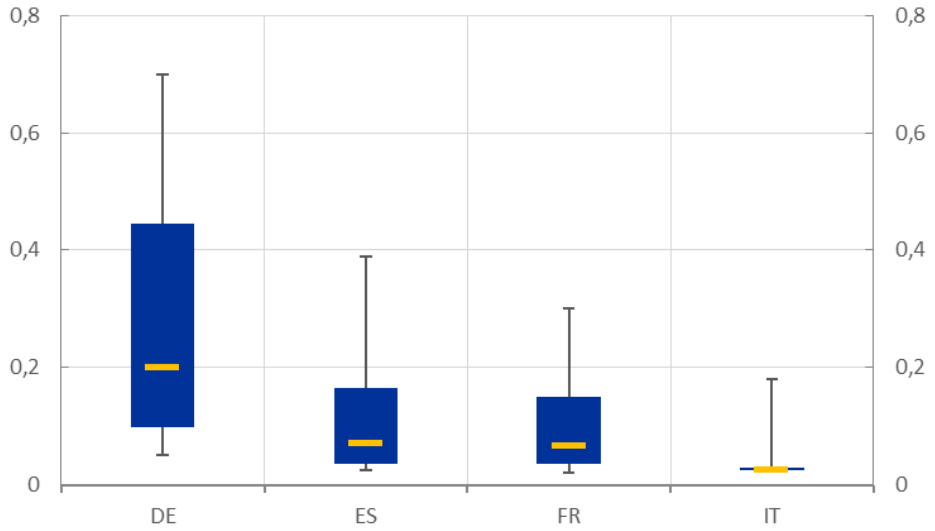
Notes: The figure shows the amount of guaranteed loans in million Euro issued to firms in different size classes based on their employment (small firms being those with less than 50 employees, medium firms those with 50 to 250 employees, large firms as those with more than 250 employees). The sample 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



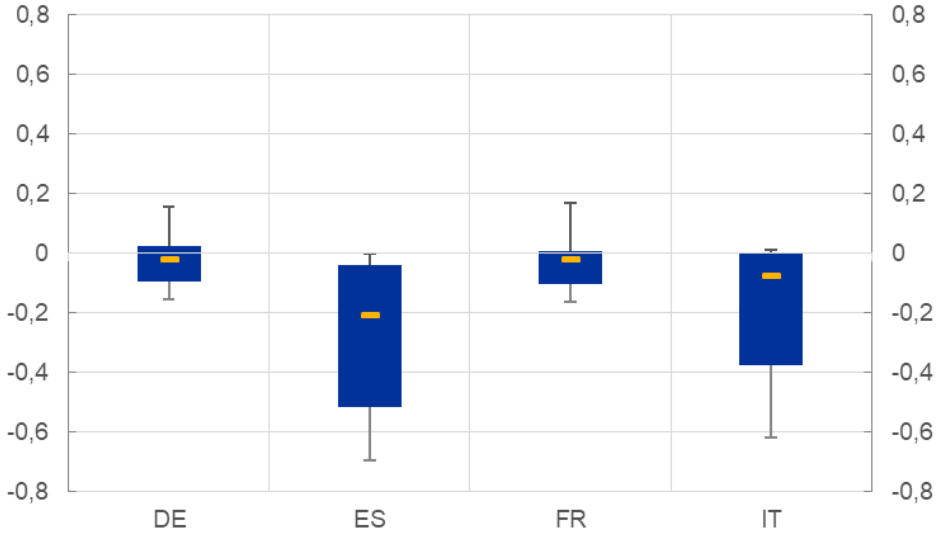
Notes: The figure shows the number of guaranteed loans issued firms in different size classes to their employment size (small firms being those with less than 50 employees, medium firms those with 50 to 250 employees, large firms as those with more than 250 employees). The sample includes firms present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

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.

Table 1. Sample Structure

This figure reports the number of firms and banks which compose our sample. To be included in the sample the firm needs to be in the Anacredit database in December 2019. Banks are unconsolidated.

	Number of firms	Number of banks
Germany	427,535	838
Spain	426,229	106
France	1,143,966	104
Italy	641,921	158
Tot.	2,639,651	1,206

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 XXX. 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
R2	0.255	0.248	0.248	0.248
N	2534649	1874289	1883572	1853664

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)
R2	0.0377	0.142	0.232	0.118
N	252763	375621	684494	540786

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

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
R2	0.0298	0.0918	0.0336	0.0514
N	7569	156629	70057	192381

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

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 gran.				-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
r2	0.473	0.471	0.480	0.535
N	463378	460084	453694	452065

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. 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	0.0817***	0.0869***	0.0796***
	(0.0210)	(0.0283)	(0.0218)
Bank Liquidity	0.0768	0.0472	0.0635
	(0.0793)	(0.0868)	(0.0751)
Bank Capital	0.316***		0.322***
	(0.0679)		(0.0654)
Bank NPL		-1.63	-1.36
		(1.158)	(1.281)
Share of granted	0.673***	0.704***	0.677***
	(0.0365)	(0.0450)	(0.0381)
Drawn/Granted	0.196**	0.179**	0.209**
	(0.0846)	(0.0744)	(0.0854)
Firm FE	Yes	Yes	Yes
r2	0.396	0.373	0.400
N	601952	598247	589723

Appendix

Table A1. Institutional details about Loan guarantees in programmes in the Euro Area

	Size of the programme	Beneficiaries	Share of loan guaranteed	Maximum amount per borrower	Maturity	End of programme	*Fees*	*Lending rates*	*Take-up*
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	43.9bn
	€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.	115.1bn
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	29bn
	€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.	11.6bn
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.	89.7bn

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 b to firm f, divided by total credit from bank b to firm f in February 2020 (multiplied by -1), as a function of a dummy equal to 1 if bank b offers a government guaranteed loan to firm f 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 b out of the total bank exposure of the firm f; Drawn/Granted, defined as the amount of credit drawn by firm f divided by the amount granted by bank b to firm f. 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_{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
r2	0.460	0.577	0.543	0.536
N	6590	224733	13790	206952