

**MASTER**  
ECONOMICS

**STATE-AIDS AND CREDIT:  
EVIDENCE FROM PORTUGAL  
DURING COVID-19**

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COVID-19

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Master in Economics

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Supervised by

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## **Abstract**

During Covid-19, governments set several supports to stimulate economic recovery, in order to maintain employment and smooth the consequences in a firm's liquidity shortage. There is crescent literature on the impacts of COVID-19 on the economy and the contribution of this work is the first assessment of the impact of Portuguese state support measures on credit. Using Bank of Portugal's proprietary credit register data and the Fast and Exceptional Enterprise Survey (COVID-IREE) was launched by Statistics Portugal (INE), we apply a quasi-experimental approach, the difference-in-differences technique, to gauge the causal effect of government aids. Firm, Bank, Time, and Firm-Bank fixed effects are included to capture unobservable effects. The results show that after the pandemic shock the firms that benefited from at least one fiscal support increased more their credit than firms that did not benefit from any support given by the state. The average treatment effect of these policies was considerably high. Furthermore, the impact of state-aid varies with the characteristics of different supports. This work emphasizes two findings: the role of moratoria on existing credits in increasing the potential access to new credit and in reducing non-performing credit; and the key role of state guarantees and subsidized credit lines in increasing the credit that firms actually have and its total credit. To conclude, our results show that the government support introduced in the scope of the covid-19 pandemic contributed to the improvement of the economic situation and firms' liquidity and prevented greater consequences in the economy.

**JEL codes:** E51 E62 G01 G32 G38

**Keywords:** Covid-19, Portuguese fiscal measures, Credit, Shock

## **Resumo**

Durante a pandemia, o governo implementou diversos apoios para estimular a recuperação económica, para preservar emprego e aliviar as consequências na liquidez das empresas. Há uma crescente literatura sobre o impacto do Covid-19 na economia e a contribuição desta dissertação é a primeira avaliação do impacto das medidas de apoio em Portugal no crédito. Usando dados do registo de crédito do Banco de Portugal e do Inquérito Rápido e Excepcional às Empresas (COVID-IREE) criado pelo Instituto Nacional de Estatística (INE), aplicamos uma abordagem quasi-experimental (diferença-em-diferenças) para avaliar o efeito causal das ajudas do estado. Para capturar efeitos não observáveis são incluídos efeitos fixos ao nível da empresa, banco, e empresa-banco. Os resultados demonstram que, após o choque pandémico, as empresas que beneficiaram de pelo menos um apoio do estado aumentaram mais o seu crédito que as empresas que não beneficiaram de nenhum apoio. O efeito médio de tratamento estimado destes apoios é relativamente alto. Além de que os efeitos variam consoante as características de diferentes apoios do estado. Esta dissertação enfatiza duas conclusões: o papel das moratórias em créditos existentes no aumento do acesso a crédito potencial e na redução dos créditos vencidos; e o papel fundamental das garantias do estado e linhas de crédito bonificado no aumento do crédito regular e total das empresas. Para terminar, os resultados obtidos demonstram que o apoio do governo introduzido no contexto da pandemia contribuiu para o melhoramento da situação económica e preveniu consequências nefastas na economia.

**Códigos JEL:** E51 E62 G01 G32 G38

**Palavras-passe:** Covid-19; medidas fiscais portuguesas; Crédito; Choque

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## List of Acronyms

Initials	
<b>BdP</b>	Banco de Portugal – Central Bank of Portugal
<b>BES</b>	Banco Espírito Santo (Espírito Santo family bank)
<b>BLS</b>	Bank Lending Survey
<b>CAE Rev. 3</b>	Portuguese Classification of Economic Activities (revision 3)
<b>CB</b>	Central de Balanços - Central Balance Sheet Database
<b>CCR</b>	Central Credit Responsibility
<b>COVID-19</b>	Coronavirus disease
<b>COVID-IREE</b>	Inquérito Rápido e Excepcional às Empresas (IREE) - Fast and Exceptional Enterprise Survey
<b>DEI</b>	Daily Economic Indicator
<b>DiD</b>	Difference-in-differences method
<b>ELA</b>	Emergency Liquidity Assistance
<b>FCGM</b>	Fundo de Contragarantia Mútuo (Mutual Counter-guarantee Fund)
<b>FT</b>	Firm-Time
<b>GDP</b>	Gross Domestic Product
<b>GFC</b>	Global Financial Crisis (2007-2008 financial crisis)
<b>ISLT</b>	Industry-Size-Location-Time
<b>KM</b>	Khwaja and Mian
<b>LTRO</b>	Long-Term Refinancing Operations
<b>MFI</b>	Monetary Financial Institutions
<b>NFC</b>	Non-Financial Corporations
<b>NPL</b>	Non-Performing Loans
<b>p.p.</b>	Percentage point
<b>PELTRO</b>	Pandemic Emergency Longer-Term Refinancing Operations
<b>PEPP</b>	Pandemic Emergency Purchase Programme
<b>SME</b>	Small and Medium Enterprises
<b>TFEU</b>	Treaty on the Functioning of the European Union
<b>TLTRO</b>	Targeted Longer-Term Refinancing Operations
<b>YoY</b>	Year-on-year

## 1. Introduction

On March 11 of 2020, the actual coronavirus propagation was classified as a pandemic. The economic impact caused by the sanitary crisis, as well as by the prevention measures, was unexpected and unpredictable. Portugal started 2020 with optimistic perspectives for the economic evolution, but it suffered a severe downturn. However, so much is being done to stimulate the economy again and mitigating the consequences, many supports with an exceptional character have appeared. Due to the need for an immediate response to Covid-19, the European Commission (EC) and the Portuguese government acted and implemented a set of unprecedented measures (Banco de Portugal, 2021d; European Commission, 2020a). On March 22 of 2020, the EC approved a 3 billion euros package to serve as guarantees to Portuguese SME and midcaps in several sectors to manage, the better possible, the consequences of coronavirus (European Commission, 2020b).

It is in this context that the research question of this present work emerges. We want to measure the impact of the state-aids in the current pandemic on credit market. In other words, the study analyses if the measures applied to combat the coronavirus consequences stimulated bank lending in the Portuguese economy. The pandemic caused relevant consequences for Portuguese firms that these state aids try to smooth and alleviate, for example: by filling the lack of access to credit. Since the outbreak of the pandemic, there is a growing literature relative to the shock and its consequences on several matters, for example, the liquidity shock, the drawdown of credit lines and the role of cash holdings.<sup>1</sup> At the best of my knowledge, this work is the first to measure the impact of the government support measures in Covid-19 context in Portugal.

In the actual conditions, it is well-known the importance to verify the effect of the policies implemented.<sup>2</sup> To better manage the pandemic consequences, like credit constraints, it is required to have more comprehension about it. The motivation of this research is the lack of information about the state-aids potential impact on lending during this exceptional time of uncertainty and contribute to the improvement of decision making. Using a

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<sup>1</sup> Examples of such growing literature are as follow: Viral Acharya and Steffen (2020b); Almeida (2021); Bartik et al. (2020); Beck, Da-Rocha-Lopes, and Silva (2021); Bureau, Duquerroy, and Vinas (2021); Darmouni and Siani (2021); Ebeke, Jovanovic, Valderrama, and Zhou (2021); Famiglietti and Leibovici (2020); Ferrando and Ganoulis (2020); Garcia and Ho (2021); Greenwald, Krainer, and Paul (2020); O'Hara and Zhou (2021).

<sup>2</sup> The importance of checking the effectiveness of government supports during the current pandemic is emphasized particularly by Elenev, Landvoigt, and Nieuwerburgh (2020).

difference-in-differences method combined with fixed effects, the research aims to analyse the state support measures that were implemented during Covid-19 and to quantify their impact on boosting credit access. After the Covid-19 spread, the Banco de Portugal (BdP) launched a survey inquiring firms regarding the fiscal measures. Our analyses are based on this novel survey<sup>3</sup> data plus the credit responsibilities data.

The circumstances today are unprecedented, as well as the dimension of the measures implemented.<sup>3</sup> Being at the edge of a crisis outbreak, with all attention turned to the near economic future, it is of utmost importance to check the consistency, the functioning and the results of the policies set. The subject of the work is economically relevant due to the fact it is a recent event and a hot topic in scientific discussion.

In Portugal, there is some research related to coronavirus and the economic situation.<sup>4</sup> The contribution of this research consists in adding to recent literature a study that measures the impact of state aids on Portuguese lending. Using a novel dataset that has information about the pandemic support packages and the business response to the pandemic. The scientific area in which this work fit in has some papers dedicated to the credit market and bank lending during an adverse shock.

The present work is structured as follow. After this brief introduction, it will be presented the literature review (Section 2) with a description of COVID-19 consequences, the support measures, and its impact on credit. Next, Section 3 contains a concise description and analysis of the data and the methodologies which were implemented. Section 4 presents the application and the results from the model described in the previous section. Finally, Section 5 presents the main conclusions and further investigation of the topic.

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<sup>3</sup> On "The IMF's Response to COVID-19" (2020), it is highlighted the actions done to mitigate the pandemic crisis (retrieved from <https://www.imf.org/en/About/FAQ/imf-response-to-covid-19#Q2>)

<sup>4</sup> See Avezum, Oliveira, and Serra (2021); Gonçalves, Belo, and Pinheiro (2020); Mamede, Pereira, and Simões (2020); Zbigniew, Pawel, and Armando (2021)

## **2. Literature review: Covid-19, State-aids & Credit Market**

The literature review is organized as follows, Section 2.1 overviews the general economic shock which succeeded the virus spread and the consequent restrictions. Next, Section 2.2 reviews the support measures that the Portuguese government have implemented to mitigate the crisis consequences, including how the aids work and their effects. In Section 2.3 the dynamics of the credit market during 2020 are explained, considering the new roles which the support measures play in this market. The literature about the estimation of policy impact is presented in Section 2.4. Finally, literature about state aids, Covid-19 and credit market is explained in Section 2.5.

### **2.1 COVID-19 Impact**

In this section we first look at what kind of shock the coronavirus represents (Section 2.1.1). Second, Section 2.1.2 will briefly summarize the impact of Covid-19 in the Portuguese economy. Third, Section 2.1.3. presents the literature regarding previous pandemics.

#### **2.1.1 Pandemic Shock**

The current pandemic crisis is an unseen event also due to its dual impact. The COVID-19 caused simultaneously a demand shock and a supply shock, weakening both sides. The disease was firstly identified in Wuhan in December 2019<sup>5</sup>, turning China the epicentre of this sanitary crisis and impacting its exportations for the rest of the world. There was a supply chain break that affected the normal production in several countries (Baldwin & Mauro, 2020). On other hand, the labour supply was also affected by the pandemic. The restrictive measures may increase the costs incurred by the firms or reduce their productivity, due to the telework not being a perfect substitute for the presential work<sup>6</sup> or caused by the social distance imposed, by the lockdowns (by illness or by prophylactic isolation) (Balduzzi, Brancati, Brianti, & Schiantarelli, 2020; Baldwin & Mauro, 2020; Baqaee & Farhi, 2020).

On the other side, the pandemic situation also means a negative shock in the aggregate demand. Consumers avoid contact with each other's and unnecessary movements,

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<sup>5</sup> See "Timeline: WHO's COVID-19 response" (2020) for a general perspective of the covid-19 pandemic, retrieved from: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/interactive-timeline#event-0>.

<sup>6</sup> See, for example, the work of Papanikolaou and Schmidt (2020) which demonstrates that activities that had less capacity to adapt to telework were those that most reduced jobs, that have higher expectations of bankruptcy likelihood and lower expectations of profit growth.

to reduce the risk of contagion, which means a reduction in (social) consumption (Baldwin & Mauro, 2020; Banco de Portugal, 2021f). Due to the lockdowns or other restrictive measures, the consumers may be unable to spend as they were used to (Baldwin & Mauro, 2020; Boissay & Rungcharoenkitkul, 2020) or they may change their expenditure dispersion across sectors (Baqae & Farhi, 2020). Given the uncertainty generated by the novel coronavirus, the economic agents, such as individuals and firms, increase precautionary savings (Banco de Portugal, 2021d; Falagiarda, Prapiestis, & Rancoita, 2020; Jordà, Singh, & Taylor, 2020) and postpone (or forgone) their consumption or investments (Balduzzi et al., 2020; OECD, 2020). Note that the negative relationship between investment and uncertainty is much greater for smaller firms (Ghosal & Loungani, 2000).

### **2.1.2 Impact on Portuguese Economy**

According to BPstat (2021), the crash on Portuguese GDP in 2020 was the most expressive since the series beginning (1996), with around a 7,6% drop. In April 2020, Portugal set new records, registering the largest drop in exports of goods<sup>7</sup> (42,2%) and on import of goods (38,18%) in each series (BPstat, 2021). During 2020, the unemployment rate increased from 6,5% to 7,2% and employment fell by 2 pp. Considering the expectations, it was a small decrease, given the relation observed between economic activity and employment in previous recessions (Banco de Portugal, 2020d). Regarding the growth of non-financial sector debt, it peaked in July with a growth of 2,87%, which value reports to November of 2011 (BPstat, 2021). As explained earlier, households and firms increase their precautionary savings<sup>8</sup>, which increased deposits. During 2020, households' deposits rose 8,1%, while it was more significant for firms' deposits which grew 18% (BPstat, 2021).

Proposed by Lourenço and Rua (2021), the Daily Economic Activity Indicator (DEI)<sup>9</sup> measures the Portuguese economic activity using high-frequency data during the lockdowns (see Annex 1). Considering variables such as card-based payments and electricity and gas consumption, the DEI clearly shows the break in activity during the lockdowns and, in the following months, the recovery/response of the economy. The sharpest fall of this indicator occurred between March and April 2020 when the percentage y-o-y growth rate

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<sup>7</sup> Regarding the interval 2019Q4 - 2020Q4, Portugal suffered a 37,7 percentage fall on the export of services after the pandemic (comparison between pre- and post-pandemic period) (OECD, 2021).

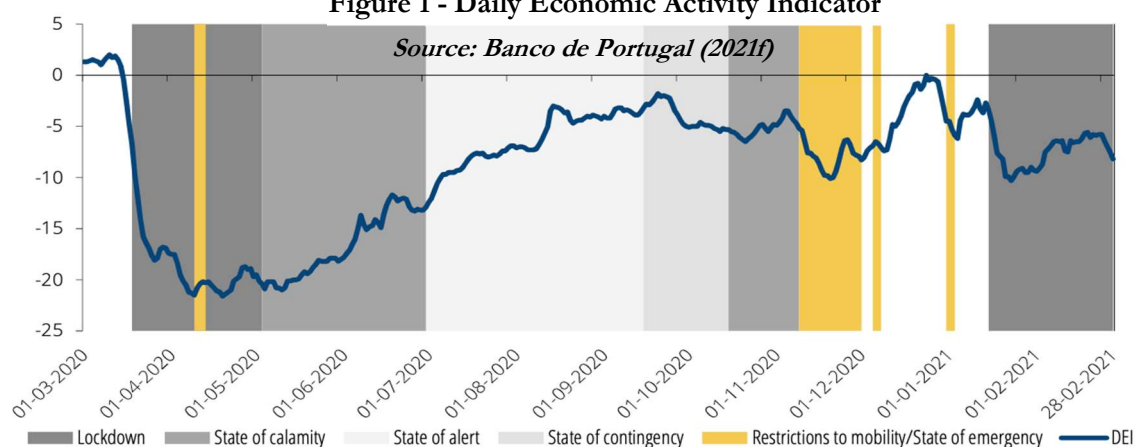
<sup>8</sup> By higher holding cash, it means a better cushion for lenders, which in turn imply less risk and lower credit spreads (V. Acharya, Davydenko, & Strebulaev, 2012).

<sup>9</sup> For more information relative to DEI, check Banco de Portugal (2021a) where the latest update is released.



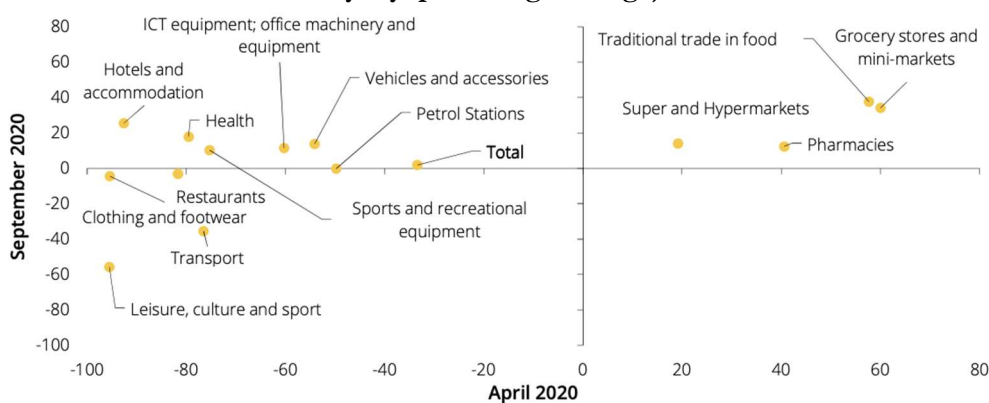
almost achieved -25%. However, the DEI never returned to the pre-coronavirus situation. The recovery from the first lockdown took months but the next coronavirus waves pushed the growth rate down again. As the end of March (2020) approached, and the lockdown start to be lifted, the economic activity starts to improve. In Figure 1 one can see the relation between the restrictions and the lockdowns, the fall on economic activity and public health. The better the pandemic situation (public health) in Portugal the more freedom the economic agents have (fewer restrictions of movement), thus it is expected to have more economic flows (Banco de Portugal, 2021f). From here, the importance of proper management by policymakers of the trade-off between restrictions and economic activity can be highlighted.

**Figure 1 - Daily Economic Activity Indicator**



Through the card payments analysis, Figure 2 indicates which sectors were most affected and their evolution during (part of) the pandemic first year. This figure clearly shows how heterogenous the consequences of the pandemic shock were across the economic sectors and how the recovery developed from April to September 2020. As shown, accommodation and restaurants are good examples of the first lockdown consequences, but the former showed signs of improvement afterwards (with the withdrawal of the

**Figure 2 - Portuguese card payments by type of good/service (Apr & Sep 2020 y.o.y. percentage change)**



Source: SIBS (Banco de Portugal calculations), Banco de Portugal (2020d)

restrictions). However, this recovery from April to September was not within reach of all sectors, such as leisure, culture and sport or transports. On the other side, both super and mini-markets and grocery stores as pharmacies benefited from the pandemic.

### 2.1.3 Previous Pandemics

When exploring the economic impact of COVID-19 can be useful to have as references the previous pandemics<sup>10</sup> (Boissay & Rungcharoenkitkul, 2020). The global development, the transactions and the movement of people and goods quickly made the world suffer from this disease. The quasi-simultaneous containment measures (global lockdown) and the sudden stop may have generated consequences never imagined. The Covid-19 pandemic will likely represent a huge short-term shock that no other pandemic has ever caused (Boissay & Rungcharoenkitkul, 2020). Regarding the financial conditions, it was verified immediately a tightening trend.

The Influenza pandemic “was considered as the costliest epidemic in modern history” (Boissay & Rungcharoenkitkul, 2020) with 50 million deaths in 1918. According to Barro, Ursúa, and Weng (2020), for a death rate of 2,1%, the Spanish Flu led to a 6% and 8% decline in GDP and consumer growth, respectively (in the typical country). While Correia, Luck, and Verner (2020) predicted an 18% fall in manufacturing activity and underline the fact that restrictive measures soften the impact. This 1918 pandemic typically victimized the youngest, causing a shortage of labour force at a time when manufacturing accounted for a large part of the GDP of advanced economies. In the various jurisdictions, the measures of containment varied, with some social distancing occurring. This pandemic has had very limited amplification in financial and macroeconomic terms.

Another recent example is the SARS epidemic in 2003 (SARS - Severe Acute Respiratory Syndrome) which had 774 mortal victims. The estimates of the SARS epidemic impact were a drop of 0,1% on global GDP in 2003 (Lee & McKibbin, 2004). Using surveys, targeted estimates for China indicate a 1 to 2 p.p. reduction in its growth (Hai, Zhao, Wang, & Hou, 2004). Financially speaking, this epidemic represented limited amplification. It was

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<sup>10</sup> Since the ‘Spanish Influenza’ (in 1918), the world witnessed several epidemics: the Asian Flu (H2N2) in 1957, the Hong Kong flu (H3N2) in 1968, the 2009 Bird Flu (N1H1), the Severe Acute Respiratory Syndrome (SARS) in 2002, the Middle East Respiratory Syndrome (MERS) in 2012 and the Ebola Virus Disease (EVD) in 1976 (but with a second outbreak in 2014-2016) (Baldwin & Mauro, 2020; Boissay & Rungcharoenkitkul, 2020).

imposed some social distancing mainly on China, which at the time had a rapid growth (Boissay & Rungcharoenkitkul, 2020).

## 2.2 State-aids

The actual economic situation, described in Section 2.1, triggered a need for support due to the imperfections of the credit market. The market has frictions and failures that during the current state can lead to an extraordinary difficulty in accessing credit: a low-cash-flow business environment where the cash-flow indicator become “less informative” about the future viability of an firm (Hanson, Stein, Sunderam, & Zwick, 2020). The pandemic raised uncertainty and firm credit risk, making banks less willing to lend. To compensate for this high risk-perception, banks increase prices (interest rate) and restrict the conditions of corporate credit (Banco de Portugal, 2021c). Therefore, preventing a credit crunch<sup>11</sup> and easing access to funds, mainly for SMEs, are the main goals of the state aids.

The shortage of liquidity in the short term led to a deterioration of the firms’ financial positions and a lower ability to fulfil the collateral or other requirements that lenders may request. Regarding the credit risk rise, banks are less willing to lend to the most affected firms due to their weaker financial position and to the higher solvency risk (Albertazzi, Bijsterbosch, Grodzicki, Metzler, & Marques, 2020; Falagiarda et al., 2020). Or if banks lend to those firms, it will be done at such prices that can become truly expensive or unaffordable (Financial Stability Board, 2021). Concerning the lenders-borrower relationship, SME and micro firms usually are the ones that struggle the most to access funds. For example, they experience more asymmetric information in the market (Cerqueiro, Ongena, & Roszbach, 2020), that is, when borrowing money, lenders have less information relative to borrowers (Cuciniello & Iasio, 2020). On other words, according to European Investment Bank (2014):

*“For the banks, it is costly to obtain sufficient information on the true risk and profitability of the projects behind loan applications. On one hand, this results in an adverse selection of projects: for any given lending rate, inherently riskier projects will be over-represented in the loan application pool. On the other hand, in the presence of limited liability of the borrowers in the event of default, it also creates moral hazard by giving borrowers an incentive to shift towards riskier projects than the ones announced to the lender.” (p. 9-10)*

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<sup>11</sup> According to Bernanke and Lown (1991), a bank credit crunch can be defined “as a significant leftward shift in the supply curve for bank loans, holding constant both the safe real interest rate and the quality of potential borrowers” (p. 207).

Banks have less information about small firms (Berger & Udell, 2006). Regarding SMEs, banks have higher asymmetric information and monitoring costs (larger firms have rules and report requirements that they to follow) (European Investment Bank, 2014). Then, in these particular and pandemic times, smaller firms may have much lower access to credit/bank loans than larger firms. Small firms tend to have less ability to replace bank lending with other sources of funds (Khwaja & Mian, 2008). In light of problems like these, during the pandemic the government set some state-aids that will be further described. First, we will look into what is a state aid and the legal context which allowed the Portuguese government to act promptly and fast will be explained (Section 2.2.1). Second, Section 2.2.2 presents the kinds of measures implemented and respectively conditions. Third, Section 2.2.3 contains the analysis of the COVID-IREE survey. Finally, the impact of these fiscal policies on the credit market and the withdrawal consequences are discussed in Section 2.2.4.

### **2.2.1 Definition and Institutional Context**

During the pandemic, policymakers face a trade-off between contagion prevention through transmission lines' contention measures and the economic recession in the short term (Eichenbaum, Rebelo, & Trabandt, 2020). The coordinate answer to Covid-19 indicates some state aids which the EU Member States can implement without notifying the European Commission, measures that do not fit into art. 107 TFEU, which is an European competition law (TFEU, 2008). The measures aim to prevent credit constraints in the economy and liquidity needs caused by the pandemic. According to the European Commission, state aid "is defined as an advantage in any form whatsoever conferred on a selective basis to undertakings by national public authorities"<sup>12</sup> (European Commission, n.d.). To be considered state aid, the measure must have the following features: it gives certain advantages to the beneficiaries; the competition has or may be contorted; it may affect intra-EU trade; and the state intervention can take several forms (Ayadi, De Groen, & Thyri, 2015).

### **2.2.2 Portuguese aids during Pandemic**

Since March of 2020, the Portuguese government implemented a set of diversified aids, with a short- and medium-term character, to sustain firms' liquidity, to stimulate a faster

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<sup>12</sup> For example, the case of Sweden in the combat to the novel coronavirus demonstrates high adversity to economic depressions, not implementing so many restrictions as other countries (at least until December 2020), see European Commission (n.d.).

recovery and to maintain the employment rate. The support for the economy and employment can be aggregated into four different categories: treasury, investment<sup>13</sup> and non-refundable grants to non-salary fixed costs, and job maintenance (Governo, 2020a).

### *Treasury*

The treasury measures include payment suspension of taxes and contributory obligations (€ 3900 million), bank moratorium (€ 6100 million), PT2020 deferrals and payments<sup>14</sup> (€ 800 million) and credit lines (€ 8400 million) (Governo, 2020a, 2020b). Relative to the credit lines, in March 2020 the government concede guaranteed credit lines to SME and micro firms in most affected sectors. The support to SMEs is particularly crucial to the economy since they “are the backbone of European economy” (Ayadi et al., 2015).

In November 2020, it was announced additional measures. For example, it was announced credit lines with a state guarantee, up to € 800 million, for SME and Midcaps for event supports (e.g., cultural, sporting or corporative events) and for industrial firms (with high export of goods) with a maximum amount of € 50 and € 750 million, respectively (Governo, 2020a, 2020b). In both, if the employment is kept 20% of the credit is transformed into a non-repayable subsidy.<sup>15</sup> As will be further explained, through the benefit of state guarantee schemes, firms will be able to access cheaper additional funding that may be needed to face immediate liquidity needs.

By force of Decree-law no 10-J/2020, the government set extra protection for families and firms. As protection and support for liquidity, individuals and the SME and micro firms with no overdue payments and headquarters in Portugal (and without any indebtedness to the state) have the right to postpone the capital and interest payments until September 30, 2020. Through the prolongation of this measure until December 31, it was also added a new clause: to benefit from this moratorium the firms are prohibited from distributing dividends.<sup>16</sup> Under the moratorium, firms can postpone debt and interest payments (short-term payments) and alleviate the pressure on their liquidity management.

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<sup>13</sup> The investment measures include three major programs (ADAPTAR, COVID I&D and COVID Inovação Produtiva), these measures will not be discussed here.

<sup>14</sup> PT2020 refers to the agreement between Portugal and the European Commission that formalizes the application of the European Structural and Investment Funds.

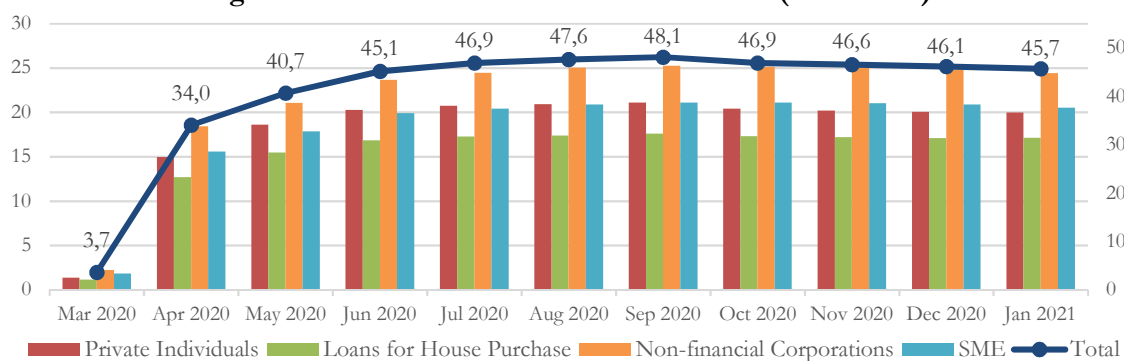
<sup>15</sup> See presentation of the new support on November 5, 2020, in <https://www.portugal.gov.pt/pt/gc22/comunicacao/documento?i=apresentacao-das-novas-medidas-de-apoio-a-economia>

<sup>16</sup> The extension of this measure is legislated by Decree-Law no. 78-A/2020.

Figure 3 shows the credit amount under the moratorium during 2020 and the beginning of 2021. After one month of the implementation of the moratorium, the total amount of credit under the moratorium increased rapidly and significantly, from € 3,4 billion in March to € 34 billion in April. Through May, June, and July the rise deaccelerated, and it achieved its maximum in September 2020 at € 48,1 billion. But since then, there is a slight tendency to decrease “due to the end of some private moratoriums” (Banco de Portugal, 2021b). Regarding the SME access to this support, it represents more than 80% of the total amount of loans under the moratorium to non-financial corporations in each period<sup>17</sup>. However, it diverges accordingly sectors, the accommodation and restaurant activities were one of the most affected by the pandemic and that is reflected by the percentage of loans granted under the moratorium. More than 50% of the loans granted to this sector were under a moratorium, reaching its maximum of 57,5% in August (Banco de Portugal, 2021b).

In April 2020, insurance with a state guarantee for trade credit was announced for exporting firms (more particularly firms in the metallurgical, construction and other supplies sector; and short-term exports) and it was raised the amount available for existing lines with state guarantee.<sup>18 19</sup> These measures total €250 million divided into €100 million to metallurgical exporters, €100 million for construction and others (Conselho Nacional de Supervisores Financeiros [CNSF], 2020).

**Figure 3 - Amount of loans under moratorium (in billion €)**



Note: this graph presents the total amount of loans under the moratorium for Private individuals and Non-financial Corporations. Both red and green bars refer to households' credit, while the orange and the blue ones to corporate loans. The orange bar is the credit for firms and the blue bar represents the credit specifically for SMEs (the orange bar includes

<sup>17</sup> Other literature found similar numbers for other European countries. Falagiarda et al. (2020) show that a major part of loans under state guarantee is held by SMEs (see Chart B) for Spain, France, Germany, and Italy. This holds for the number of operations but for the amount of loans (in euros) in Germany the large firms represent the majority.

<sup>18</sup> According to the law in force: Law no. 13/2020 from May 7.

<sup>19</sup> For more information regarding the guarantees scheme in other European countries and the differences between them (e.g., size, price and eligibility criteria) check Table A of Albertazzi et al. (2020).

the amount considered also on the blue bar). The leftward axis count in billions the total amount of loans regarding each category of households and firms, while the rightward axis presents the total credit under moratorium, i.e., the Total line equals the sum of households and non-financial corporations' credit.

*Source: Own elaboration – Data source: Banco de Portugal (2021b)*

Conceding trade credit allows the flow<sup>20</sup> of funds through the supply chain, replacing other forms of short-term funding by credit from other firms. The trade credit is at the base of short-term liquidity management, and it is relevant during hard times (Bureau et al., 2021). The firms underwrite insurance to receive compensation in case the buyer does not pay, providing some protection in case of commercial default.

### ***Non-Refundable Grants to Non-Salary Fixed Costs***

The non-refundable grants to non-salary fixed costs reflect the APOIAR program, which in total accounts for €750 million non-refundable, was initially directed to micro and small firms from the sectors most affected (e.g., accommodation, food services and cultural activities) with 25% of sales drop in the first 9 months of 2020, with positive equity at the end of 2019 and with a regularized financial situation before the state and the banking system (Governo, 2020a, 2020b). Obligated to keep jobs and prohibited to distribute dividends, the micro and small firms under APOIAR access to financial support up 7500€ and 40000€, respectively (Governo, 2020b). In December 2020, this aid was extended to medium-size firms and firms with more than 250 employees and a turnover lesser than €50 million, and individual entrepreneurs with dependent workers. To these firms, the aid upper limit is 100000€ and 3000€, respectively (Governo, 2020b). The criterium was also extended to include firms with debt to the state (with the obligation to regularize it) and the restrictions related to equity were also smooth.

### ***Job Maintenance***

The measures set by the government for job maintenance, with a total of €1700 million, includes, for example, the simplified layoff and the extraordinary incentive to normalize economic activity (Governo, 2020b). To be eligible<sup>21</sup> to these aids the firm must be in a business crisis, which is defined, by the Decree-Law no. 10-G/2020, of March 26, as

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<sup>20</sup> When unconstrained firms extend the payment date of customer debt, it is not only alleviating the pressure on financially constrained customers but also on its customers' customers with whom the original firm has no business relationship (Boissay & Gropp, 2013).

<sup>21</sup> Additionally, the firms cannot have a debt to any state department, neither do any dismissal during the program or until 30 days after the end of the measure adopted. Also, it is not accepted the distribution of dividends or other funds to the company owners.

a situation of total or partial activity interruption, total or partial closure of the company/establishment<sup>22</sup>, or facing a drop of 40% in sales. The layoff is financial support given to the firm by each employer with the only purpose to pay salaries during periods of working hours reduction or job contracts suspension.<sup>23</sup> In the situation of employment contract suspensions, the employer is entitled to social security support corresponding to 70% of the two-thirds of the normal gross salary by each employee. However, some limits are imposed relative to the (gross) remuneration received by each worker: the minimum amount is 635€ (the minimal guaranteed remuneration is equal to the legal minimum wage in Portugal, in 2020) and the maximum is 1905€, equivalent to three times the lower limit. In the situation of reduction of the normal working period, the layoff function in a similar way. Rather than target 70% of the 2/3 of the normal (gross) remuneration, in this situation the measure targets 70% of the difference between the 2/3 of the normal (gross) remuneration and the payment of the hours worked.<sup>24</sup> The simplified layoff, being extraordinary support to preserve jobs, lasts for one month, but can be extended up to 3 months. The extraordinary incentive to normalize economic activity, as the name indicates, is a financial stimulus for those firms which finished the layoff program to help in the restart of their activity. It has two modalities, the first one is paid in a single tranche equal to the lower bound of the simplified layoff (635€) in a proportion of the days of the month which was in the layoff program. Alternatively, the second modality is calculated in the same method, but the value paid is a proportion of 1270€ (two times the lower bound) and it is split into two tranches.

#### **2.2.4 How state aids work and the withdrawal effect**

The main purpose of support measures is to fill immediate liquidity needs and help firms to overcome this disturbing period. State aids such as grants, tax advantages and moratoriums represent direct support to firms. Concerning these measures, the state has a major role in improving firms' liquidity by suspending payments and making contributions to wage expenses, for example. But how do the state support measures affect the credit

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<sup>22</sup> The closure of firms or establishments due to the obligation to close facilities by force of Decree no. 2-A/2020, of March 20, or under legislative imposition (Decree-Law no. 10-A/2020, of March 13), or application of the Civil Protection Law (Law no. 27/2006, of July 3) or through the Health Bases Law (Law no. 95/2019, of September 4).

<sup>23</sup> For more information please check Direção Geral do Emprego e das Relações de Trabalho (2020).

<sup>24</sup> To better understand the functioning of this measure, Annexes 2 and 3 will present some examples.



market? According to the credit line channel, banks require more restrictive terms and conditions to grant credit when facing a negative macroeconomic shock (Greenwald et al., 2020). Thus, the state aims to prevent this restrictive path for funding, and ultimately prevent a credit crunch, when setting these credit lines with favourable conditions. For example, “firms with the ability to draw on credit lines are able to sidestep the deterioration in lending conditions in bad times, dampening the impact of negative shocks” (Greenwald et al., 2020).

By setting loans with a subsidized interest rate, the state can grant credit at favourable rates to firms, but with upper limits on the loan amount. This measure replaces more expensive credits available on the market into cheaper loans to firms, allowing them to access funds for operating needs, such as investment and working capital needs (Falagiarda et al., 2020; Financial Stability Board, 2021). Regarding the state guarantees, we can describe the credit guarantees and the trade credit insurance. State guaranteeing credit means that the it is responsible for a percentage of the total loan in case of a firm’s default. The guarantee results in easier access to external finance (mainly to smaller firms), which in turn improves the liquidity needs and reduces the default risk. Like credit with subsidized interest, the state guarantees withdrawal may limit access to credit from most affected firms, and consequently, it may intensify insolvencies (Falagiarda et al., 2020; Gobbi, Palazzo, & Segura, 2020).

The state also provided guarantees on trade credit insurance. First, let’s explain better the concept of trade credit insurance and only then describe the state guarantee on it. The trade credit insurers provide a refund to the selling firm in the event of non-payment by the buying firm in return for a commission (Financial Stability Board, 2021). Concerning the credit trade insurance under state guarantee, the insurer still must be responsible for a share of the loss. The withdrawal of this measure can make the credit insurance much expensive, by charging higher commissions or make it even inaccessible to some firms (Financial Stability Board, 2021). The lack of insurance in turn may mean an interruption of flows through the supply chain when facing a constrained firm defaulting payments. Therefore, this measure actively contributes to the maintenance of firms’ liquidity conditions.

Both tax deferral and moratoria alleviate pressure on firms' liquidity by postponing debt payments and contributions to the state. By means of moratoria withdraw and the resumption of debt payment, the risk of firms not being able to fulfil their obligations and defaulting emerges. Hence, the share of non-performing credit on banks’ balance sheets might rise, affecting the banking solvency (Financial Stability Board, 2021).

The state-aids may affect the economy through transmission mechanisms such as the bank lending channel and the balance sheet channels for example. First, bank lending effects may operate via the bank lending channel and the firm borrowing channel. The former refers to the bank's incapacity "to cushion borrowing firms against bank-specific liquidity shocks" (Khwaja & Mian, 2008). The latter denotes the firm's incapacity to replace the bank lending with other financing sources and protect themselves from the consequences of the bank lending channel (Khwaja & Mian, 2008). According to Bernanke and Gertler (1995):

*"The balance sheet channel is based on the theoretical prediction that the external finance premium facing a borrower should depend on borrower's financial position. In particular, the greater is the borrower's net worth – defined operationally as the sum of her liquid assets and marketable collateral – the lower the external finance premium should be. Intuitively, a stronger financial position (greater net worth) enables a borrower to reduce her potential conflict of interest with the lender, either by self-financing a greater share of her investment project or purchase or by offering more collateral to guarantee the liabilities she does issue." (p. 35)*

Thus, following this reasoning, we can say that the state support measures, by improving firms' financial position, facilitate their access to bank lending.

Fiscal measures also play a role in raising funds through capital markets and the economy in general. The regulatory, monetary, and fiscal policies fuelled investor confidence and risk perception (CNSF, 2020). The combination of these measures may smooth the financial frictions, stimulate investment decisions and the real economy by easing credit and decreasing its price. In general, the cliff effects withdrawals influence the policymaker's decision on continuing or not the support given to businesses (CNSF, 2020). The trade-off between the possibility of a sudden rise of non-performing loans and the firms' bankruptcy versus the expenses of these measures and the continuing support to non-viable firms.<sup>25</sup>

### **2.3 Credit Market**

The coronavirus, as explained earlier, affected the willingness for/opportunities of investment, and created a need for liquidity in the short run, causing disturbances both in supply and demand for credit during 2020. When analysing the credit market, it is important to understand what happened both in credit with a state guarantee and without it. For this

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<sup>25</sup> For more information on how the support measures (from the government) can be distortive see for example Schweiger (2011).

purpose, one may be used the information given by the Bank Lending Survey (BLS)<sup>26</sup> for Portugal credit market. Next, Section 2.3.1 describes the supply and demand for guaranteed and non-guaranteed credit markets separately, using BLS results.<sup>27</sup> In Section 2.3.2. the BdP' statistics of the credit market will be presented for 2020.

### **2.3.1 Supply and Demand for Guaranteed and Non-Guaranteed Credit**

Since the release of state support measures, the dynamics of the credit market behave differently. The terms and conditions, the expectations for the future may diverge according to the existence of guarantees. Thus, we will analyse the credit market segregated into a credit with state guarantee and without it considering the BLS results for Portugal.

#### ***Credit with a government guarantee***

According to Banco de Portugal (2021d), during the 1<sup>st</sup> half of 2020, the terms and conditions and the standards of loans with state guarantees were less restrictive comparing with credit without it in the previous semester. In the 2<sup>nd</sup> semester of 2020, the standards and terms became even less restrictive. Regarding the demand for loans with a state guarantee, it had a strong increase in the 1<sup>st</sup> semester, but even so, it continues to rise in the 2<sup>nd</sup> semester when comparing with the demand for credit without guarantees. The rise is supported by the need for liquidity, by the creation of precautionary liquidity and substitution of credit existent (that pressured downwards the demand in the 2<sup>nd</sup> semester of 2020) (Banco de Portugal, 2021d; Falagiarda et al., 2020). A state guarantee scheme motivates the credit flow towards the firms, mainly for those more constrained, by rising both demand and supply. It stimulates the credit supply by moving the credit risk from banks to the state, and the credit demand through the accessible terms and conditions with longer maturities.

#### ***Credit without a government guarantee***

During the 1<sup>st</sup> semester of 2020, the BLS results indicate that the standards and the conditions became more restrictive, and it is expected for the 1<sup>st</sup> semester of 2021 a slight tightening on standards of SME borrowing (Banco de Portugal, 2021d). Concerning the demand for credit without a state guarantee, in the 1<sup>st</sup> half of 2020, there was a reduction

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<sup>26</sup> The BLS is a Euro area survey that provides information about the credit market, on a quarterly basis. The survey targets a predefined group of banks, and it provides information on credit granted to non-financial firms and households.

<sup>27</sup> An analysis of demand and supply of credit to firms in Europe (using the BLS results) is in Annex 4.

when comparing with the previous period, while in the 2<sup>nd</sup> half a small increase. The demand growth was particularly higher in the case of SME lending (Banco de Portugal, 2021d).

### ***Reasoning – Guaranteed vs. Non-Guaranteed Credit<sup>28</sup>***

The pandemic situation caused a deterioration in firm liquidity (see Manteu, Monteiro, and Sequeira (2020)), which led the Portuguese state to implement aids, such as guarantees and credit lines with limits on spreads and longer maturities (as explained in Section 2.2). The establishment of this guaranteed credit decreased the price of funds for its beneficiaries, while the credit non-guaranteed tended to become tighter. During 2020, the demand on the credit market faced two different realities: the demand for credit with state guarantees grew strongly (mainly in the 1<sup>st</sup> semester), while the demand for credit without the guarantees felt in both semesters. The latter occurred mainly in SME borrowing due to the access by these firms to the credit guaranteed by the state instead of non-guaranteed one.<sup>29</sup> The main reasons why the demand for credit with guarantees grew was the liquidity emergency felt by the firms and the willingness for precautionary reserves. However, the fall on investment financing<sup>30</sup> and the replacement of existent credit negatively affected demand for credit guaranteed (see Figure (vi) in Annex 5).

### ***Aggregated Credit Market***

Regarding the aggregated credit market for firms, the loan supply became tighten in the 2<sup>nd</sup> quarter due to the risk tolerance and perception of risk (Banco de Portugal, 2020a, 2020b). But after slight ease in the 3<sup>rd</sup> quarter, 2020 ended with an increase in credit prices (Banco de Portugal, 2020c, 2021d), see Annex 5. The loans demand increased immediately in the 1<sup>st</sup> quarter of 2020, with the surging need for liquidity (Banco de Portugal, 2020a), but was only in the 2<sup>nd</sup> quarter that it achieved the maximum growth. However, the great rise was followed by a decrease in the next quarter that led to the negative side (a demand decrease). Now that we understand what happened on credit supply and demand, let's check the numbers of the credit market in Portugal.

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<sup>28</sup> For more on this topic see “Demand and supply of credit to firms with and without State guarantee during the COVID-19 pandemic” Box from Banco de Portugal (2021d).

<sup>29</sup> Note that initially the access to credit lines guaranteed by the Portuguese government is restricted to micro, small and medium firms, small Mid-caps and Midcaps (Banco de Portugal, 2021d; CNSF, 2020).

<sup>30</sup> The uncertainty characterized the year 2020, it negatively affected investment decisions (OECD, 2020).

### 2.3.2 Credit Market in Numbers

Lending provided by monetary financial institutions to non-financial corporations has rapidly increased since March 2020 both in Portugal and the Euro Area (Figure 4). In July 2020, the lending in Portugal grew faster than the Euro Area, contradicting the latest stabilizing tendency. The most recent data, regarding February 2021, records an 11,2% growth (what recalls back to 2008 and the GFC crisis).

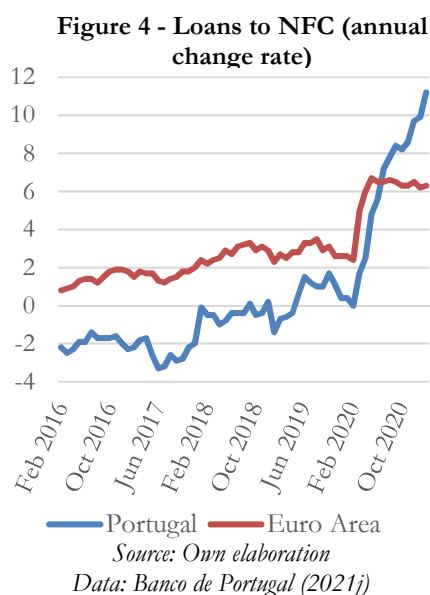
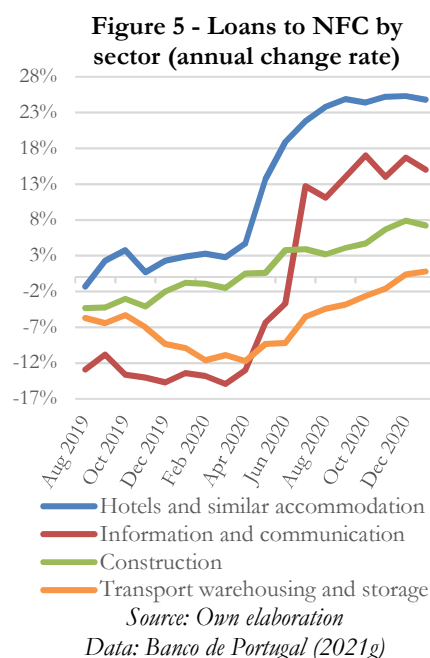


Figure 5 shows the loans growth rate for non-financial corporations by sector. As can be seen for some activities the growth rate changed since the beginning of the pandemic. Among all sectors, the Hotels and similar accommodation and Information and Communication were the ones that most increased (in percentage points) their borrowing. The Hotels and similar accommodation sector suffered a 22-p.p. rise in loans growth, while the information and communication sector increased from -15% in March 2020 to 15% in January 2021 (i.e., a 30-p.p. increase).<sup>31</sup>

### 2.4 Policy Impact Estimation

After all, the relevant question is how to measure a policy impact on the credit market. In the literature, many studies are dedicated to measuring the policies impact on credit, the credit market and bank lending (Agarwal, Duttagupta, & Presbitero, 2020; Altavilla, Boucinha, Peydró, & Smets, 2019; Beck et al., 2021; Blattner, Farinha, & Rebelo, 2019; Boissay & Gropp, 2013; Bosshardt & Kakhbod, 2021; Bureau et al., 2021; Darmouni & Siani, 2021; Degryse, De Jonghe, Jakovljevic, Mulier, & Schepens, 2019; Gan, 2007; Greenwald et al., 2020;



<sup>31</sup> These trends go in line with other literature regarding other countries' credit market. For example The Falagiarda et al. (2020) work highlights the liquidity needs (due to the sudden cash-flow crash) and the necessary investment as the main reason that led to the higher demand by bank lending by firms.

Khwaja & Mian, 2008; Minoiu, Zarutskie, & Zlate, 2021; Morales-Acevedo & Ongena, 2020; O'Hara & Zhou, 2021; Paligorova & Santos, 2017).

Since the last crisis, higher importance was attributed to the shocks on credit supply, and, consequently, to the assessment of policy effectiveness. For an adequate estimation there needs to a distinction between the loan demand and loan supply and to do so the literature has been using fixed effects methods. According to Degryse, Jakovljevic, and Ongena (2020), it is important to “disentangling the effects of loan demand and supply in contemporary banking research”, for which empirical studies have been using demand-related fixed effects. The use of FE to disentangle the loan demand and loan supply was firstly introduced by Gan (2007) and Khwaja and Mian (2008) (KM), see Appendix 1 for a detailed discussion of KM approach. Using loan-level data (firm exposure), Gan (2007) shows how banks' exposure to land price caused a restriction on lending due to a crash on the assets market. Gan (2007) and Khwaja and Mian (2008) applied a model similar to the following difference-in-differences approach:

$$(1) \quad \Delta L_{bf} = \alpha_f + \beta_b + \varepsilon_{bf}$$

Where the dependent variable ( $\Delta L_{bf}$ , on the left side of the equation (1)) is the loan growth (at firm-bank level) and the terms on the right side  $\alpha_f$ ,  $\beta_b$  and  $\varepsilon_{bf}$  represent the firm and bank fixed effects and the error term, respectively. This empirical configuration allows for the variation of the effect on credit before and after the shock.

Over time, new databases were launched, allowing the study at the firm-bank-time level (adding to the first equation the time, (t), effect). This setting continued to be used with an adaptation of the effects at the time fixed effects. Jiménez, Ongena, Peydró, and Saurina (2012) accessing to Spanish dataset with information relative to the loan applications quantify through this methodology the effect of monetary policies on bank lending.

Other examples of the usage of FE to disentangle the loan demand and loan supply are the works of Morales-Acevedo and Ongena (2020) and Agarwal et al. (2020). Morales-Acevedo and Ongena (2020) “employ a difference-in-differences approach to measure what effect a bank robbery has on loan conditions”, using branch-event, industry, quarter, and after-event fixed effects. Agarwal et al. (2020) explore the effect of commodity prices changes

on the economy through the bank lending channel on developing countries<sup>32</sup>, using this empirical setup with bank, country, year fixed effects. They concluded that the strength of this transmission mechanism is higher the lower the bank deposits-assets ratio and higher the NPL.

$$(2) \quad \Delta L_{bft} = \alpha_{ft} + \beta_{bt} + \gamma_{bf} + \varepsilon_{bft}$$

Altavilla et al. (2019) and Paligorova and Santos (2017) also apply a similar KM approach of this model, they added another fixed effect, firm-bank FE (represented on equation (2) as  $\gamma_{bf}$ ). Thus, the heterogeneity of the unobservable relationship between bank and firm (firm-bank) is considered, with a firm and bank matching. Altavilla et al. (2019) in their research about the impact of banking supervision on credit supply used datasets with credit registers from multiple countries. According to this methodology, the model to be correctly specified requires the firms to have more than one bank relationship. Altavilla et al. (2019) work emphasise that this condition may lead to low sample representativeness: “the share of firms with more than one borrowing relationship in the total number of firms may vary between 10% and 46%” (considering several European countries).

Following this issue the Degryse et al. (2019) work arises, the authors created an alternative to firm-time fixed effects, the ILST – industry-location-size-time – fixed effects. This alternative also allows the application of the following model on firms with a single bank relationship. However, in Section 3.2. the KM approach and this novel ILST fixed effects will be better discussed.

$$(3) \quad \Delta L_{bft} = \alpha_{ILSt} + \beta_{bt} + \varepsilon_{bft}$$

The present research is very similar to Beck et al. (2021) methodological work, using a DiD approach with fixed effects. It exploits Portuguese firm- and loan-level data from CB and CRR datasets, with information of firm-bank relationships. Beck et al. (2021) analyse the impact of Banco Espírito Santo (BES) bail-in on credit granted to firms at the intensive margin and its real effects. This research estimates the causal effect of BES resolution on credit supply. Their results show that BES bail-in led to a significant reduction of credit to the most exposed firms, mainly to those which had as the main lender the BES. The model was also performed on the complete sample (i.e., including single-bank firms) using the novel

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<sup>32</sup> The data used is from Uganda, which is a representative example of developing countries.

fixed effects presented by Degryse et al. (2019) (Industry-Size-Location-Time, ISLT, Fixed Effects<sup>33</sup>) and they did not find different conclusions.

This research also relates to the credit channel of the monetary transmission mechanisms. The literature related to monetary policies becomes useful for this matter due to the estimation of the policies impact during periods of crisis, uncertainty, and shocks. Several studies about the effectiveness of some monetary policies, like the TLTRO, the LTRO and the ELA, used credit data (Afonso & Sousa-Leite, 2020; Andrade, Cahn, Fraise, & Mesonnier, 2019; Balfoussia & Gibson, 2016; Bastidon, Gilles, & Gauvin, 2019; Boeckx, Perea, & Peersman, 2020; Gibson, Hall, Petroulas, Spiliotopoulos, & Tavlas, 2020).

During the estimation of econometric models, some approaches took into consideration the size of the firm, some the level of country vulnerability, other the size or number of banks which had access to liquidity within a region, for example. The results found indicates that the impact of these unconventional measures on credit supply is significantly positive. The impact is bigger for larger banks, less vulnerable countries, regions with more banks accessing the liquidity program, and bigger borrowers (Afonso & Sousa-Leite, 2020; Andrade et al., 2019; Gibson et al., 2020).

Gibson et al. (2020) using an ECM model (Error-Correction Form), demonstrated that the relation between the use of ELA and the rise of a single bank gross loans was just a little higher than a 1 to 1 relation (one euro spend on ELA results on more than one euro granted by banks). While, when using a panel VAR model, the authors also found out that the grant of ELA would improve the GDP fall, with a 1 extra euro of ELA being granted increasing the GDP by 0.75 euros within a country. On other hand, the results of Andrade et al. (2019), taking into consideration the firms' size, indicates that the firms top 1% (the biggest firms) benefits more 63% than the average size firm. The authors, including all banks, compute the impact of the three-year LTRO program and the estimates inform an additional increase of 21.5 billion euros in credit supplied. Finally, Afonso and Sousa-Leite (2020) shows that in vulnerable countries 1 extra euro spent in the TLTRO program it would cause an increase of annual net lending by 3.2 euros for larger banks, while a 2.2 euros impact on net lending through smaller banks. Afonso and Sousa-Leite (2020) argue that their research goes in line with the existing literature, e.g. Balfoussia and Gibson (2016).

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<sup>33</sup> Replacing firm FE by industry-size-location FE for firms that have only a relationship with a single bank.



## 2.5 State-aids, the Credit Market, and the Covid-19

Some literature also focuses on how effective fiscal policies measures are and the impact on corporate financing. Studying the effectiveness of the public guarantees scheme in Italy, Viggiano (2016) found that one euro of Tranche Cover Fund would lead to an additional 0,68 euros lent. The main finding of this work was that this specific support measure effectively pushed the bank lending to SMEs, even with market imperfections tightening credit access. It helped to solve market failures and improve SMEs' financing by easing the lending criteria and prices and improving credit availability.

From the recent literature, there are already several studies related to the credit market and the Covid-19 context which the present research can relate with Bosshardt and Kakhbod (2021); Bureau et al. (2021); Darmouni and Siani (2021); Greenwald et al. (2020); Minoiu et al. (2021); O'Hara and Zhou (2021) that also uses a similar methodology.

Unlike the GFC, it seems that banks had the capacity to keep lending after the pandemic shock, mainly to bigger firms (Viral Acharya & Steffen, 2020b; Darmouni & Siani, 2021). The liquidity shock that firms suffered since March 2020 does not appear to extend to the banking sector. Compared to the previous crisis, at the time of the shock, banks were in a much better situation, with more solid balance sheets (Darmouni & Siani, 2021). Darmouni and Siani (2021) emphasises the two different functions that credit has: one is financing the firms' investment, and, on the other hand, it can make a liquidity buffer. During the GFC, credit was mainly accessed to keep the investment level. However, during 2020 investments fell. After a cash flow shock, firms suffered a shortage of liquidity which they tried to compensate. They reduced investments and smoothed dividends, increasing debt (Greenwald et al., 2020). Instead for investment purposes, Bosshardt and Kakhbod (2021) stated that the precautionary reason was what moved firms to exploit their credit lines to accumulate liquidity. "Under the precautionary demand for cash theory, firms hold cash as a buffer against adverse cash flow shocks" (Beck et al., 2021) (p. 1751). Therefore, the uncertainty about the economic future and regarding the pandemic has made firms question the possibility of future liquidity difficulties or the future availability of credit, and the "dash for cash"<sup>34</sup> started right after the pandemic burst.

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<sup>34</sup> See Financial Times news March 25 (2020): <https://www.ft.com/content/6b299c42-6c66-11ea-89df-41bea055720b>

Darmouni and Siani (2021) studied the issuance of bonds during the pandemic and its importance on corporate liquidity management. The authors found that this issuance of bonds had as main objective the fulfilment of these liquidity needs, and it replaced the use of credit lines. According to the results of this research, firms that had access to credit lines from banks preferred not to do the draw down and keep them untouched. Darmouni and Siani (2021) used a DiD model<sup>35</sup> to capture the nature of the shock with firm and industry-quarter fixed effects. Another paper related to corporate bonds is the work of O'Hara and Zhou (2021), which focused on the effects of the Primary Dealer Credit Facility and the Secondary Market Corporate Credit Facility. In the context of moving to more liquid bonds and transaction costs rise, the authors found that the measures effectively lowered these costs and relieved “the illiquidity effects in the high-yield market” (p. 40).

Bureau et al. (2021) analyse the credit given between firms, trade credit, and corporate liquidity through the firm-level panel data. This work showed how the firm trade position at the beginning of the pandemic determined the liquidity stress felt. The second main finding of Bureau et al. (2021) was the heterogeneous consequences of the Covid-19 shock. Their estimates indicate that a firm of the retail sector, that needed to be closed during the lockdown, has five times more chance of default a payment than other firms. Greenwald et al. (2020), using loan-level data, show both sides of the coin regarding credit lines. On one side, credit lines can be advantageous for firms in the face of a shock, as they allow an increase in the firm's credit immediately (drawdown) under the conditions previously agreed. On the other side, it can become disadvantageous after the shock the flow of credit from restricted to unrestricted firms may depress the former.

This research is also related to Minoiu et al. (2021) that analyse the impact of the MSLP, an “emergency lending program”. Even though the bank participants on MSLP have higher potential constraints, the authors found out that these banks tighten less the new loans. Using a survey and credit registers data, Minoiu et al. (2021) found positive spillovers between the participation on MSLP and the disposition to grant credit to firms not covered by the program, both smaller and larger firms. According to Haroutunian, Hauptmeier, and Osterloh (2021), at “the euro area level, the government deficit-to-GDP ratio rose from 0.6%

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<sup>35</sup> This so mentioned “difference-in-differences design” is also used to estimate the impact of drawdown on liquidity by Bosshardt and Kakhbod (2021). The authors analyse the motive that led firms to drawdown the credit lines at the beginning of the pandemic.

to 7.2% between 2019 and 2020 and is set to increase further to 8.7% in 2021". The authors compare (on Chart B) the stability programmes between the euro area countries, noting the small Portuguese deficit planned for 2021.

In an early stage of the pandemic, Albertazzi et al. (2020) studied the potential effect of loan guarantees on the value of the losses of the banking sector (on euro area). Their work explains why there is a high demand for guarantees, mainly in the most economically affected, or with smaller firms or with higher firms' debt countries; or simply in those countries where firms tend to rely more on short-term bank lending. According to Albertazzi et al. (2020), "the effectiveness of the state guarantee schemes hinges on their take-up and the ability of borrowers to access loans quickly". In 2020, Falagiarda et al. (2020) studied the role of government loan guarantees on bank lending, mainly for: Spain, France, Germany, and Italy. The authors highlight the "key role in supporting corporate lending dynamics since April, especially in Spain and France". According to this study, in both countries, most of the new loans were under the guarantees scheme, while in Germany and Italy the state guarantees on loans expressed only 20% (of the total amount of loans). They found evidence of precautionary provisions (i.e., increase on undrawn credit), of favourable effects on financing terms and conditions (which remain low), of credit flows towards SMEs, and longer maturities on new loans.

Using SAFE survey data, De Santis, Ferrando, and Gabbani (2021) found that the state-aids (related to the Covid-19 pandemic) effectively helped firms to alleviate the pressure on their liquidity management. The authors also found that these fiscal support measures would allow would help firms meet their credit responsibilities in the following two years. ESRB (2021) work clearly shows the direct relationship between debt and liquidity measures – public loans and guarantees – and the credit market on EU. Using information from the AnaCredit database, they show the positive relationship between the size of these specific government support measures and the quarterly growth of bank loans. According to ESRB (2021), loans under state guarantee/public support express a considerable percentage of the new bank lending.

### **3. Empirical Study: Data & Methodology**

Now that we reviewed the actions taken by the Portuguese state and the evolution of the credit market, we will proceed by exploiting the COVID-IREE data to study how the corporate credit responded to the access to new support measures during the pandemic period. First, we will describe the datasets used in this research (Section 3.1.), next the empirical methods used in the literature will be discussed (Section 3.2.). Afterwards, the model used to capture the effects of the shock and the unobservable effects are explained (Section 3.3.).

#### **3.1 Data**

##### **3.1.1. Data Description**

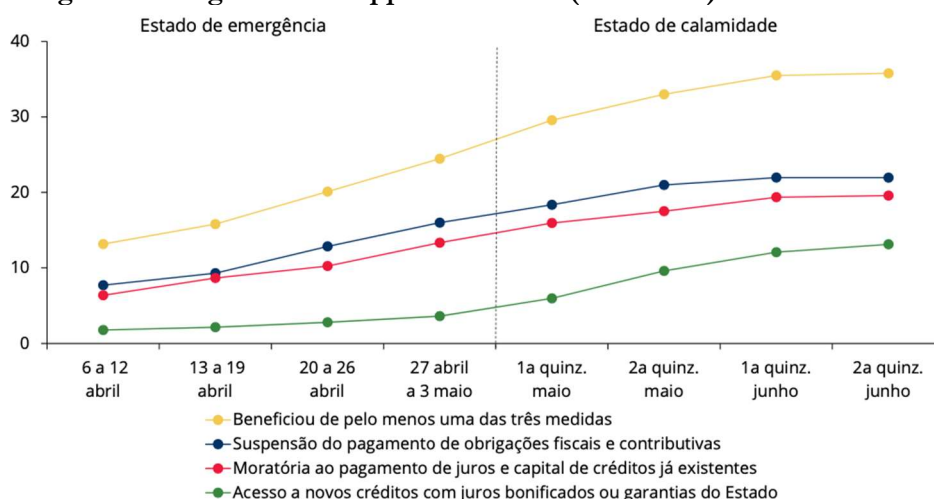
The data used in the present research is a compilation of three databases from Banco de Portugal Microdata Research Laboratory (BPLIM): The Central Balance Sheet Database (CB), the Central Credit Responsibility Database (CCR) - Bank-Firm Level, the Central Credit Responsibility Database - Firm Level and the Fast and Exceptional Enterprise Survey (COVID-IREE). First, the CB is an annual record of economic and financial information of Portuguese non-financial firms from 2006 until 2018. Second, the CCR Database at the Bank-Firm Level has information relative to the credit supplied by all Portuguese credit-granting institutions. It gives important detail about the indebtedness of economic agents (private persons, collective persons, and individual entrepreneurs), credit exposure and bank relationships. The credit-granting institutions include different categories of banks, such as saving banks and mutual agricultural credit banks, other financial credit institutions, leasing, factoring and securitization firms, mutual guarantee societies and financial firms for credit acquisitions. The CCR Database at the Firm Level being a monthly data like CCR at bank-firm level, the CCR at the firm level has information relative to credit granted by institutions to firms. Thus, it excludes private persons and individual entrepreneurs. Fourth, the COVID-IREE survey collects information relative to the impacts of the coronavirus pandemic, as referred to before. This dataset started in the second week of April 2020 (edition 15) weekly, from May to July 2020 it turned out to be a fortnight regularly (edition 19 to 23). Due to the pandemic situation by the end of 2020 and the beginning of 2021, two new editions were launched in November 2020 (reporting to that month, edition 24) and in February 2021 (relative to the first fortnight, edition 01).

### 3.1.2. Data Analysis

#### *COVID-IREE Data*

To identify the short-run effects of COVID-19 and the impact of the state support measures, Statistics Portugal (INE) created the Fast and Exceptional Enterprise Survey (COVID-IREE)<sup>36</sup> and inquired more than 8800 firms<sup>37</sup> throughout the year 2020 (starting in April, with a weekly periodicity). Note that the sample is representative and includes micro, SME, and large firms across different sectors (see Annex 6). In COVID-IREE, firms were questioned about the establishments' closure, the pandemic impact on revenue and the number of employees, the use of the state measures and the expectations for the future, for example.

**Figure 6 - Usage of state support measures (% of firms) – COVID-IREE**



Note: The chart is split in two, the left part of the chart contains the first four editions of the COVID-IREE survey with a weekly regularity (during the state of emergency, from April 6 to May 3). As for the part on the right, the graph shows the period of calamity, where the survey becomes regular every two weeks (from the first half of May to the second half of June). The blue line expresses the percentage of firms that benefited from the suspension of payment of tax and contribution obligations within those that participated in each edition of COVID-IREE (from April to June). The red and green lines represent, respectively, adherence to moratoria (of payments of interest and principal on existing credits) and access to new credits with bonified interest or state guarantees. The yellow line represents the percentage of firms that benefit from at least one of the three measures.

*Source: Mantem et al. (2020)*

According to this survey, over the first months of the pandemic, the percentage of firms claiming to benefit from any of the three types of support considered here increased with the increasing difficulties, see Figure 6. During the aggravation of the state of emergency

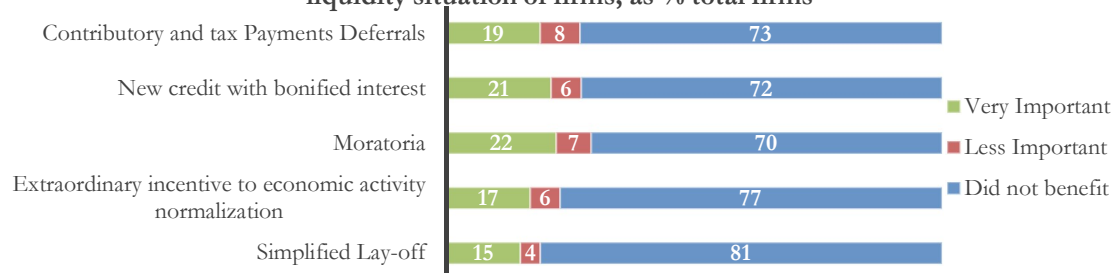
<sup>36</sup> See more detailed information on Instituto Nacional de Estatística (2021) and (Banco de Portugal Microdata Research Laboratory [BPLIM], 2021b), and (Banco de Portugal, 2021k).

<sup>37</sup> The average response rate is around 60%, which means 5500 firms, being the only representative in terms of revenue. The sectors accounted for in this survey are Industry and Energy, Construction and Real Estate activity, Wholesale and Retail, Transports and Storage, Accommodation and Food Service activities, Information and Communication and Other Services.

to the state of calamity, a greater percentage of firms benefited from the support. According to the figure, the state support with greater adhesion is the suspension of payments of taxes and other contributions, followed by moratoria on existing credits and finally by the access to state guarantees and credit lines with subsidized interest.

In the November edition, 19% to 30% of the inquired firms affirmed to adopt a particular measure (sum of green and red bars in Figure 7). It is important to highlight that within the beneficiaries the majority considers the measure very important to their liquidity situation (See Figure 7). The moratorium on interest and capital payments of credit already existent was the most adopted with 30% of inquired firms, followed by the ease access of credit and state grants (28%), the payment suspension of taxes and contributory obligations (27%), the extraordinary incentive to normalize economic activity (23%) and, finally, the simplified layoff (19%).<sup>38</sup>

**Figure 7 - Importance of the support measures in firms' liquidity situation**  
Importance attributed to state aids within the scope of COVID-19 in the liquidity situation of firms, as % total firms



Source: COVID-IREE results - November 2020

In the COVID-IREE analysis, Manteu et al. (2020) concluded that: the firms which accessed the state aids were the ones more affected<sup>39</sup>, and the government measures had a key role in keeping jobs and financial stability. Manteu et al. (2020) pointed out that, during April, 80% of the inquired firms reported a significant drop in sales<sup>40</sup> (when compared with no COVID-19 scenario). The recovery of sales in the following months was gradual but much slower in the sectors most affected, for example, Accommodation and Food Service activities and Transports and Storage.

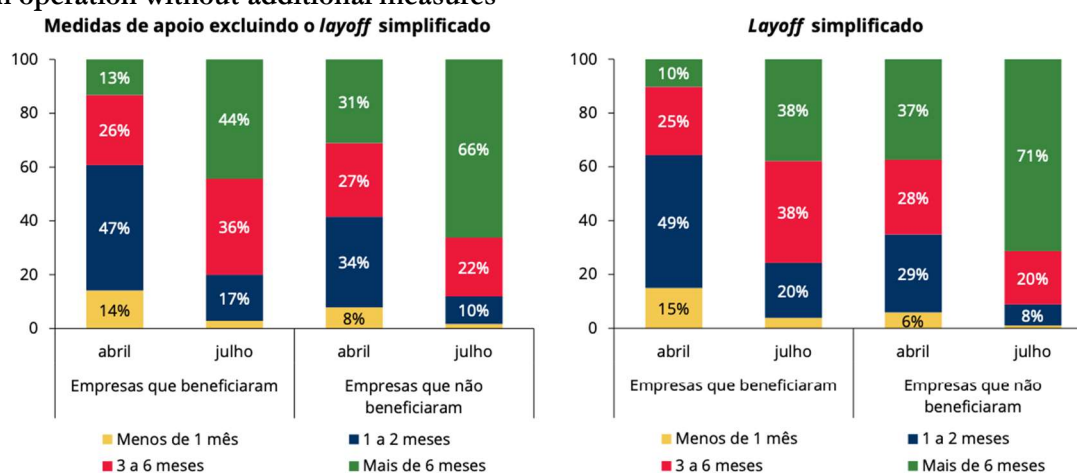
<sup>38</sup> The percentages presented in parenthesis are the sum of the green and red bars in Figure 7 (for each category).

<sup>39</sup> It was also observed in Bennedsen, Larsen, Schmutte, and Scur (2020) survey for Danish state aids. For French, Spanish and Italian firms, Falagiarda et al. (2020) show that smaller firms of the most affected sectors (e.g. tourism, ...) were the ones that used more state guaranteed loans, due to their greater needs for liquidity and their higher bank financing dependency.

<sup>40</sup> According to Bloom, Bunn, Chen, Mizen, and Smietanka (2020) analysis relative to the Decision Maker Panel (DMP) survey for the UK business environment 71% of the inquired firms in March 2020, expected for the next year a negative sales impact, and 81% considered the COVID-19 the (1<sup>st</sup> or 2<sup>nd</sup>) main source of uncertainty.

From April to July 2020, the firms' liquidity situation improved significantly, which partly reflects the recovery of economic activity, but it was more expressive in firms that benefited from the support measures (Figure 8). In July 2020, around 20% of beneficiary firms did not have the liquidity to remain in business for more than 2 months (it means an increase of 40 p.p.). Regarding non-beneficiary firms, the development in the liquidity management was modest (moving from 42% in April 2020 to 12% in July 2020). This appears to confirm the effects of state aids, by improving corporate financial position, and preventing layoffs and defaults<sup>41</sup>.

**Figure 8 - Impact of the state aids on firm liquidity considering the expected time to remain in operation without additional measures**



Note: This figure shows the expected ability of firms to remain in business without resorting to additional support measures. In this figure there are two graphs: the one on the right considers only the simplified layoff while the one on the left considers all the other support measures. Each chart contains four columns, the first two on the left referring to firms that benefited from the mentioned state support and the two on the right to firms that did not benefit from the support. Within each of these categories, the first column refers to the month of April and the second to the month of July. The time in which firms think they can remain in business without any additional support is divided into four categories: 1 month of operation in yellow, 1 to 2 months in blue, 3 to 6 months in red and more than 6 months in green.

Source: Manteu et al. (2020)

Manteu et al. (2020) in their analysis of the COVID-IREE survey, demonstrate that firms that were in a situation of more fragile liquidity are those that increased their indebtedness the most. But even within the same liquidity situation (for example, those firms with liquidity just to remain in business for another month without any additional support measure), there is heterogeneity between the different sectors of activity. Both the sectors of Transport and Storage and Accommodation and Restaurants had a high percentage of firms resorting to credit, with 50 and 35%, respectively, of firms in the 1-month liquidity category.

<sup>41</sup> The positive impact of the Portuguese government support measures on firms' liquidity situation goes in line with other literature regarding several European countries, such as, (Albertazzi et al., 2020; De Santis et al., 2021; Falagiarda et al., 2020)

Regarding the impact of the pandemic on the recourse of credit, only a minority of 12% of the firms inquired in the 3<sup>rd</sup> week of April (15% on 2<sup>nd</sup> fortnight of May edition of COVID-IREE) searched for credit to compensate the pandemic shock, noting that larger firms resorted more on credit and that the financial institutions' credit was the most adopted followed by the supplier credit. The percentage of firms that raised their indebtedness was superior in the group that had more liquidity fragilities.

Looking at Figure 9, we can analyse the use of credit according to the benefit or not of certain state support. Something in common across all types of support presented in Figure 9 is the fact that, on average, firms that benefit from some support increase their use of credit more than firms that do not (only 10% of these firms increase their use of credit). Among the state support, this increase of use of credit on the beneficiaries of subsidized credits and state guarantees stands out. About 70% of the firms that benefited from this state support increased their use of credit. There is a significant value for beneficiaries of subsidized credits and state guarantees due to the easier access to more advantageous debt with favourable and accessible conditions. This increase in credit was less strong in firms that benefited from moratoria of existing credits and, finally, in firms that benefited from the suspension of payments of tax and contributory obligations.

Among all firms, the ones that remained closed during June 2020 were the firms with the most pessimistic expectations<sup>42</sup>, the majority expected only a recovery up to the normal turnover level only achievable at the end of 2020. Due to the emergence of the (coronavirus) third wave, the restriction measures were imposed again, giving a pretext to another edition of COVID-IREE in the first half of February 2021. Facing the new lockdown, 92% of the questioned firms affirmed to be functioning/producing, which means a 10-p.p. increase relative to the first one (Banco de Portugal, 2021e).

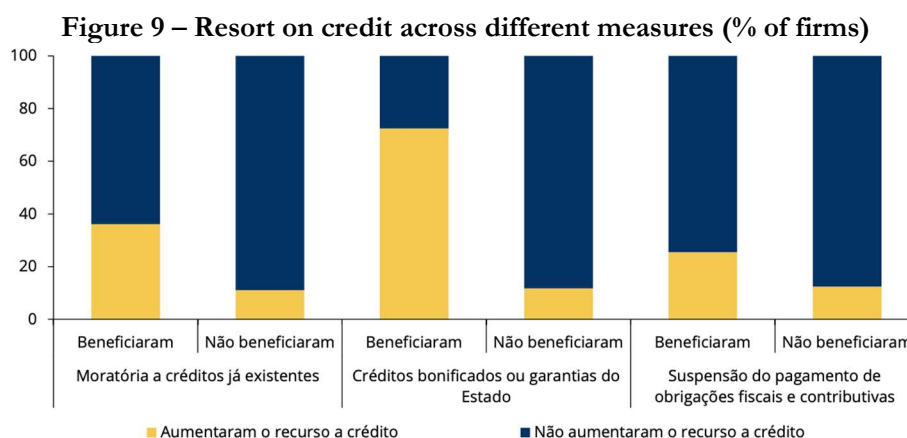
However, in the Accommodation and Food Service, it represented a 22-p.p. recovery, from 40% in April 2020 to 62% in February 2021 (Banco de Portugal, 2021e). The sales abruptness was also less substantial (by 19 p.p.), comparing the 62% of the firms recording a fall in sales with the initial 81% (Banco de Portugal, 2021e). Regarding the firm's liquidity in the absence of any additional aid, 68% estimate to be able to continue to operate

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<sup>42</sup> Balduzzi et al. (2020) show the tendency for non-essential firm in the most affected regions of Italy (and subjected to more restrictive measures) have more pessimistic expectations for the future level of sales and orders. Such firms also intend to decrease more investment and employment and increase more prices.



during at least 6 months (i.e., a significant recovery of 43 p.p. relative to the first lockdown) (Banco de Portugal, 2021e).



Note: In this chart, there are 6 different columns: the first two referring to firms that benefited (1st column) or not (2nd column) from moratoria on existing credit, respectively; the third and fourth referring to firms that benefited or not from subsidized credits and state guarantees; the last two refer to firms that benefited or not from the suspension of payments of tax and contributory obligations. The yellow colour represents firms that have increased their use of credit, while the blue colour represents those that have not increased their use of credit. The data presented is the average of the responses obtained during April 2020 and the two fortnights of May 2020.

*Source: Mantau et al. (2020)*

In July and November 2020 and February 2021 editions of COVID-IREE, it was not questioned if firms benefited or not from the support. Therefore, editions 23, 24 and 01 will not be considered due to the lack of relevance to the subject. Between edition 15 and 23, 7 745 firms participated in the survey, which includes four classes relative to the firms' size<sup>43</sup> (micro, small, medium, and large firms) and seven economic sectors.<sup>44</sup> <sup>45</sup> The information regarding which firms used each support comes from the answer to questions like "The enterprise benefited or is planning to benefit from the moratorium for the payment of interests and principal on existing loans?" (code: V6010) (BPLIM, 2021b). There are similar questions for the use of credit with bonified interest or government guarantees (V6020), of suspension of tax payments and other obligations (V6030) and other support measures<sup>46</sup> (V6040).

<sup>43</sup> The criteria that define the firm size according to (BPLIM, 2021b) are the following: micro firms have less than 10 employees and less than 2 million euros of Sales and Services; small firms have less than 50 employees and less than 10 million euros of Sales and Services; medium firms have less than 250 employees and less than 50 million euros of Sales and Services; and large firms have equal to/more than 250 employees and equal to/more than 10 million euros of Sales and Services.

<sup>44</sup> In Annex 6 a comparison between the Portuguese economic activity classification and the sectors applied in COVID-IREE is made for a better understanding.

<sup>45</sup> See Annex 7 for general statistics regarding the size and economic sector of the participating firms.

<sup>46</sup> The supports measures titled 'others' may contain the simplified layoff in the first editions since only from edition 18 onwards firms were informed that they should exclude the benefit of layoff from this category.

**Table 1 - COVID-IREE: Editions, Responses and Representativeness**

Code	Reference Period	Responses	Representativeness <sup>47</sup>
15	Week of April 6, 2020	5 010	68,8 %
16	Week of April 13, 2020	5 973	80,0 %
17	Week of April 20, 2020	5 928	81,0 %
18	Week of April 27, 2020	5 571	77,9 %
19	1 <sup>st</sup> fortnight May, 2020	5 628	77,2 %
20	2 <sup>nd</sup> fortnight May, 2020	5 424	77,4 %
21	1 <sup>st</sup> fortnight June, 2020	5 785	79,3 %
22	2 <sup>nd</sup> fortnight June, 2020	4 920	70,5 %

*Source: own elaboration. Data source: (BPLIM, 2021b)*

However, there is no financial and credit information from 890 firms (172 firms that benefited from state aids and 718 firms that didn't). Thus, the analysis will proceed only based on 6 855 firms. Regarding this finer sample, around 63,8% of the firms affirmed that did not benefit from any support given by the state (corresponding to 4 374 firms), while 36.2% stated the opposite (i.e., 2 481 firms).

### ***State Support Measures and Firm Characteristics***

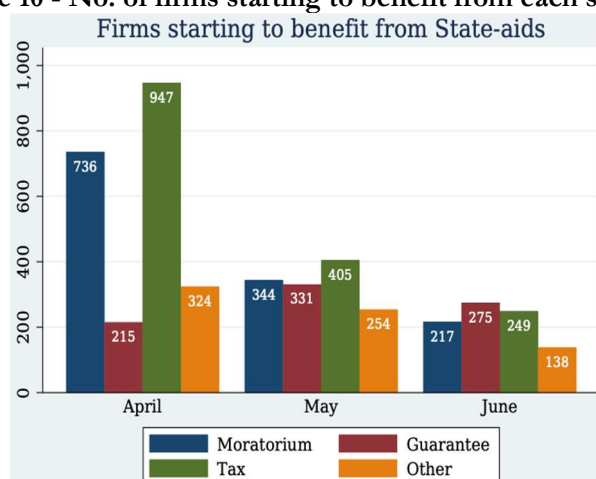
Among the firms who adopted at least one support, 1 297 firms benefited from moratoriums on existing credit (referred as 'Moratorium'), 821 from state guarantees and credit lines (referred as 'Guarantee'), 1 601 from tax payment suspension (referred as 'Tax'), and 716 from at least one other measure (referred as 'Other aids'). So, according to COVID-IREE, the support most used was the suspension of Tax payments and contributory followed by the moratorium of interest and capital payments on existing credits.

As shown in Figure 10, the number of firms starting to adopt state supports decreased over time. There was a high number of firms starting to benefit from Moratorium and Tax and other contributory payments suspension during April also due to the lockdown, but in the following months, it diminished with the recovery of the economic and trade activity. The adoption of other state aids had a smaller variation across time. Finally, the use of Guarantees or access to credit with lower interests increased from April to May, followed by a slight decrease in June.

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<sup>47</sup> The sample representativeness was calculated based on the firms' turnover.

**Figure 10 - No. of firms starting to benefit from each state aid**



Note: This figure presents the number of firms starting to benefit from various state-aids (i.e., Moratorium, Guarantee, Tax and Other aids). The data is obtained from the COVID-IREE survey from April 2020 to June 2020, adapting the weekly and fortnightly frequency to monthly. It is important to emphasize that the total number of figures presented does not represent the total number of firms benefiting from state support, a company can benefit from several supports from the state at the same time. For example, a company that was already benefiting from Moratorium and started to benefit from Tax counts for both categories in the respective months in which it started benefiting from each support.

*Source: own elaboration*

Regarding the main financial indicators (relative to 2018 economic year), when comparing with firms who didn't adopt any support, as can be seen on Table 2, the firms who adopted at least one have, on average, half the amount of sales, have fewer total assets and considerably less cash and bank deposits (it applies to all firms and considering by size) and much lower interest coverage ratio. Thus, we can describe the firms that accessed government support as firms that (on average) have less returns, less assets, and are in a more fragile position.

**Table 2 - Firms' main financial indicators<sup>48</sup>**

Variable	Firms Without State-aids		Firms With State-aids	
	Observations	Mean	Observations	Mean
Assets	4,374	31,430	2,481	18,063
Turnover	4,374	27,723	2,481	19,111
ROA	4,317	0.11	2,457	0.10
Cash Holding	4,374	0.15	2,481	0.11
Current Ratio	4,374	0.68	2,481	0.63
Quick Ratio	4,372	-2.41	2,479	1.66
Leverage net	4,374	0.04	2,481	0.15
Productivity	4,328	132,307	2,469	50,186
Profitability	4,374	0.07	2,481	0.06
Interest	4,374	301,916	2,481	159,129
EBIT	4,374	1,998,884	2,481	1,033,578
Interest Coverage	3,549	92,626	2,248	13,212

Note: The variable Assets represent the total assets of a company, and it is on thousands of euros. The variable Turnover means the sum of sales and services in thousands of euros. The ROA (return on assets) is the last 3-year average of the

<sup>48</sup> Annex 7 presents the same financial indicators for the full sample, considering the two groups of firms, with and without the use of state support measures.

ratio EBITDA over Assets. The Cash Holding represents the cash and bank deposits over total assets. The Current Ratio is the ratio between the total current assets over the total assets. The Quick Ratio represents the difference between the total current assets and the inventories and biological assets over total current liabilities. The Leverage net is the ratio between the firm's debt excluding cash and bank deposits over the sum of equity and total liabilities. Productivity is the ratio between the nominal value and the number of employees the firm has. The nominal value considered here is the difference between two parts: first, the sum of the turnover, the operating subsidies, the variation in production, the capitalized production, and the supplementary income; and the second part is the sum of the cost of goods sold and material consumed, the supplies and external services, and the indirect taxes. Profitability is the ratio of EBIT over the Total assets. The Interest and EBIT represent, respectively, the interest expenses and the earnings before interest and taxes, on euros. The Interest Coverage ratio means the EBIT over interest. The data considered was the sample resulted from the matching process described in Section 3.3.3 and the output is shown in Annex 10, using the COVID-IREE survey and the CB dataset (firms' balance sheet information until 2018). The 6855 firms on this table are divided into two sides, the 2481 firms who benefited from at least one government support (right) and the 4374 firms who did not (left).

*Source: own elaboration*

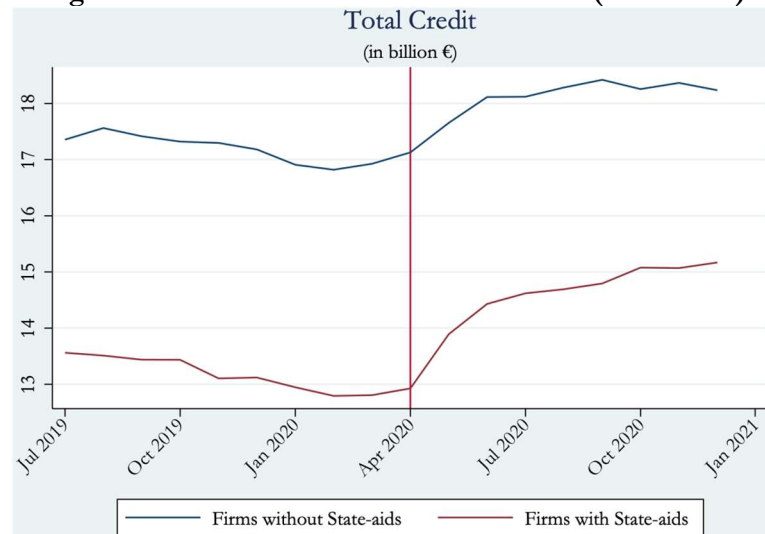
### ***Credit***

Before the credit analyses, let's explain the concepts of regular, potential, and overdue credit. First, the term regular credit refers to the credit that the firm actually has, for example, loans, overdrafts, leasing, amounts expended from credit cards. Next, the potential credit is not an actual debt that the firm holds but credit that the firm can 'potentially' access, for example, credit lines, guarantees, credit card unused value and "any other credit facilities likely to be converted into effective debts" (BPLIM, 2021a). Finally, the overdue credit represents the credit in which the firm defaults its obligations, i.e., non-performing debt (Banco de Portugal, 2021i). This also includes credit that was renegotiated, or in litigation or which the creditor does not expect to be paid (written-off credit). In this work, the term total credit is the sum of regular, potential, and overdue credit. Thus, it is the total debt that the company has, performing and in default, plus the debt that it may have promptly.

In our sample, the firms that did not use any state support entered the post-shock period with around €17 billion on total credit and by the end of the year, these firms increased credit to more than €18 billion (Figure 11). The firms that have benefited from some state support since the start of the pandemic have increased by around €2 billion in total credit (from €13bn to €15bn) (Figure 11). Looking at the averages by firms, we see that in April 2020 what separated these two types of firms was about 100 thousand euros (on average). However, we see that this difference has almost disappeared over the course of the year with the substantial increase in credit for firms without aids (see Figure 20 in Annex 8).

The differences in behaviour between firms of different sizes also becomes interesting. Total credit to firms with and without state aids follow similar patterns for both small and medium firms (see Figure 21 in Annex 8). The medium-sized firms which benefited from state support were the ones that increased credit more (on average) comparing to firms without state aids (see Figure 22 in Annex 8).

**Figure 11 - Total Credit from COVID-IREE (in billion €)**



Note: The data presented refer to the full sample of the COVID-IREE survey and the Credit Responsibility Database with monthly frequency. The total credit is the sum of regular credit (i.e., credit that the firm currently has), potential credit (i.e., credit that the firm can promptly access) and overdue credit (i.e., credit that is in default). The firms are divided according to their benefit (red line) or not (blue line) from any state support.

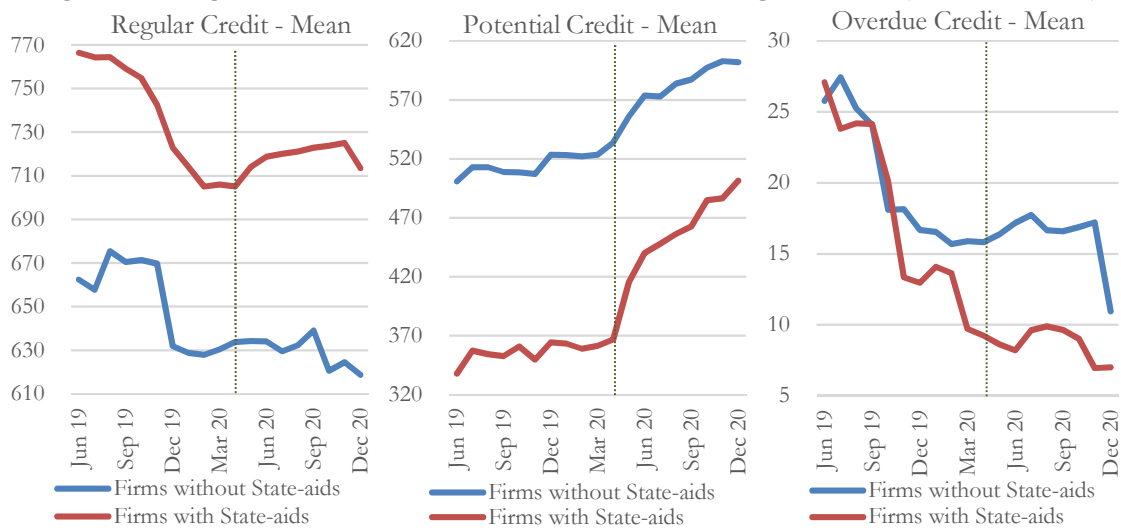
*Source: Own Elaboration*

Regarding regular credit, the firms that benefited from state aids have on average more credit than firms that didn't. Both types of firms followed the same tendency to slight increase credit after the shock and both ended 2020 with a slight decrease. On the other hand, firms that benefited from aids have less potential credit. The potential credit in both types of firms rose after the shock, but it is important to highlight how sharp the rise of credit to firms that benefited from state aids was. After the shock, the overdue credit tended to decrease for firms benefiting from state aids by opposition to credit to the firms without state-aids which remained about constant until December 2020 when it crashed (Figure 12). Despite the growth of credit verified in the population of Portuguese firms (Figure 4), in the sample collected by the COVID-IREE survey, this is not the case. In Figure 11 we can see that, after the initial boom, the total credit tended to stabilize.

The data presented on Figure 12 goes in line with the precautionary savings reasoning.<sup>49</sup> At the moment of the shock, firms undertake credit due the uncertainty and the future availability of credit, for example through the drawdown of credit lines (increasing regular credit). Over time, firms accumulated also undraw credit lines to use only in the ultimate need, potential credit increased considerably since the shock (mainly for firms without state aids).

<sup>49</sup> See Beck et al. (2021); Bosshardt and Kakhbod (2021); Darmouni and Siani (2021); Falagiarda et al. (2020); Jordà et al. (2020)

**Figure 12 - Regular, Potential and Overdue credit on average per firm (in thousands €)**



*Source: own elaboration*

Note: The data presented refer to the full sample of the COVID-IREE survey and the Credit Responsibility Database with monthly frequency. The types of credit analysed here are the following: regular credit (i.e., credit that the firm currently has), potential credit (i.e., credit that the firm can promptly access) and overdue credit (i.e., credit that is in default). On these graphs, it is showed the credit means, i.e., the average of credit each firm holds by credit type. The firms are divided according to their benefit (red line) or not (blue line) from any state support.

### 3.2 Methodology

The panel data, obtained with the merge of CCR and COVID-IREE datasets, records a single relationship between a firm and a bank by type of credit over time. Each line, or let's call it credit, records the credit drawn a firm owes to each specific monetary financial institution and the type of the credit on each period (firm-bank-time level). The methodology applied in this research using this firm-bank-time data is a fixed-effects method and a DiD approach. First let's explain the difference-in-differences method (in Section 3.2.1) and afterwards this more advanced panel data method, the Fixed Effects Estimation (in Section 3.2.2). Finally, in Section 3.2.3 the matching process will be described, and this chapter ends with an explanation of the limitations of this research.

#### 3.2.1. Difference-in-Differences (DiD)

The data collected from 2020 provide a natural experiment basis, the pandemic shock and the change in fiscal policy that transformed the business environment. Thus, the difference-in-difference method, as explained before, can be applied to estimate this policy impact. The first step of this method is to establish the control group and the treatment group, which in this context represent the group of firms that do not benefit from any support given by the government and those who benefited, respectively. In the second step, we segregate the data into two time periods: the pre-shock and the post-shock to control for

the systematic changes between the control group and the treatment group. The first case of coronavirus infection in Portugal took place on March 3 and the first lockdown on March 18<sup>50</sup>, but in this model, the shock was considered in the following month since COVID-IREE data only reflect information from April 2020 onwards. So, after these two procedures, we end up dividing the sample into four groups: the control group before the pandemic, the treatment group before the pandemic, the control group after the pandemic and, the treatment group after the pandemic. The main assumption on DiD methodology is that the control group can be compared with the treatment group, there should be a parallel between them that can be proved by matching. The equation applied is in line with the novel fixed effects method (described on Section 2.4.) and can be described as:

$$(4) \quad \text{Log(credit)}_{fbt} = \beta_0 + \beta_1 \text{aid}_f + \beta_2 \text{post}_t + \delta_3 \text{aid}_f * \text{post}_t + \varepsilon_{fbt}$$

Where the dependent variable is the credit logarithm at the firm-bank-time level, it represents the amount of credit a single firm (f) holds towards a specific bank (b) on each period (t, in months). On the equation right-hand side, besides the constant term, the first independent variable is ‘aid’ which is a dummy variable that is constant over time, which equals 0 when the firm (f) did not benefit from any state aid and equals 1 otherwise (when the firm benefited at least one state aid). The second independent variable is ‘post’ another dummy variable that represents the pre- and post-shock periods, until March 2020 it equals 0 and 1 afterwards (the shock was defined in April 2020).

Regarding the difference-in-difference, the relevant coefficient to this study appears next to the interaction term,  $\delta_3$ , called the *average treatment effect* (Wooldridge, 2012). The interaction between the effect of the aid and the shock effect will give us the impact of the adoption of state aids in this critical moment, already controlling for systematic differences, which is the main goal of the present research. Table 3 illustrates the process in which DiD estimation is based.

**Table 3 - Difference-in-differences Estimator<sup>51</sup>**

	<i>Pre-Shock</i>	<i>Post-Shock</i>	<b><i>Post - Pre</i></b>
<i>Control Group</i>	$\beta_0$	$\beta_0 + \beta_2$	$\beta_2$
<i>Treatment Group</i>	$\beta_0 + \beta_1$	$\beta_0 + \beta_2 + \beta_1 + \delta_3$	$\beta_2 + \delta_3$
<b><i>Treatment - Control</i></b>	$\beta_1$	$\beta_1 + \delta_3$	<b><math>\delta_3</math></b>

<sup>50</sup> See Annex 9 for a better understanding of the 2020 main events plus the evolution of the number of daily cases of covid infections.

<sup>51</sup> See Appendix 2 for the detailed explanation of how to calculate the DiD estimator in Table 3.

Note: In table the concept of treatment effect is explained. The first row contains the coefficients for the Control Group, i.e., the firms that did not benefit from any support. The second row refers to the Treatment Group, i.e., the firms that benefited from at least one state support measure. The third row is the difference between the first two rows, the difference between the coefficients of the Treatment Group and the Control group. The first column represents the coefficients for the moment previous the shock (before April 2020) and the second column is the coefficients for the period after the shock (after April 2020). The third column is the difference between the first two columns, i.e., the difference between the coefficients in the post-shock period and the post-shock period.

*Source: Own elaboration*

The coefficient of the interaction term,  $\delta_3$ , also called the difference-in-differences estimator, can also be expressed as:

$$(5) \quad \widehat{\delta}_3 = \left( \overline{\log(\text{credit})}_{aid*post} - \overline{\log(\text{credit})}_{no-a *post} \right) - \left( \overline{\log(\text{credit})}_{aid*pre} - \overline{\log(\text{credit})}_{no-a *pre} \right)$$

What means the difference between the credit differentials between firms that benefited at least from one state support measure and firms that did not benefit from any support after and before the shock. Note that the bar over the variables represents their averages.

### 3.2.2. Fixed Effects Estimation

The model considers the relationship between firms and banks relative to credit, but as explained before, the credit granted from one bank to a specific firm depends on several aspects, such as the firm and bank characteristics for example. Therefore, in order to consider the “unobserved firm heterogeneity assigned to loan demand” (Degryse et al., 2020) we need to apply the firm fixed effects method. Using this method, the KM approach analyses the credit granted to a single firm by more than one bank, comparing the credit conceded by each bank to the same firm.

In line with the recent FE methods<sup>52</sup>, the methodology applied in the present study uses a firm, bank, and time fixed effects to disentangle demand and supply of credit considering the unobserved heterogeneity. Thus, it is of utmost the comprehension of fixed effects estimation. Due to the existence of unobserved effects that we want to exclude from the estimators, we add to our model a term for each unobserved effect:  $\gamma_f$  for firm unobserved effects,  $\lambda_b$  for bank unobserved effects and  $\theta_t$  for time effects. Then, our model can be expressed as follows:

$$(6) \quad \log(\text{credit})_{fbt} = \beta_{0t} + \beta_1 \text{aid}_f + \beta_2 \text{post}_t + \delta_3 \text{aid} * \text{post}_{ft} + \gamma_f + \lambda_b + \theta_t + \varepsilon_{fbt}$$

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<sup>52</sup> Examples of such literature are Beck et al. (2021); Bosshardt and Kakhbod (2021); Bureau et al. (2021); Darmouni and Siani (2021); Greenwald et al. (2020); Minoiu et al. (2021); O'Hara and Zhou (2021).



Where (f) identifies an individual firm, (b) a specific bank and (t) a time period (in months). From the moment that the fixed effect method is applied, the “aid” dummy variable and post will also be omitted since they are colinear with the fixed effects.

$$(7) \quad \log(\text{credit})_{\text{fbt}} = \beta_0 + \delta_3 \text{aid} * \text{post}_{\text{ft}} + \gamma_f + \lambda_b + \theta_t + \varepsilon_{\text{fbt}}, \quad t = 1, 2, \dots T.$$

To absorb these unobserved effects, we perform a fixed-effects transformation, also called within the transformation. For each firm-bank level, the average equation over time is the following:

$$(8) \quad \overline{\log(\text{credit})}_{\text{fb}} = \bar{\beta}_0 + \delta_3 \overline{\text{aid} * \text{post}}_f + \gamma_f + \lambda_b + \theta_t + \bar{\varepsilon}_{\text{fb}}$$

Where  $\overline{\log(\text{credit})}_{\text{fb}} = T^{-1} \sum_{t=1}^T \log(\text{credit})_{\text{fbt}}$  and the same is applied on the other variables. The  $\gamma_f$ ,  $\lambda_b$  and  $\theta_t$  are all fixed over time; thus, these terms show up both in equation (7) as in equation (8). When we subtract equation (8) from equation (7), we get:

$$(9) \quad \log(\text{credit})_{\text{fbt}} - \overline{\log(\text{credit})}_{\text{fb}} = (\beta_{0t} - \bar{\beta}_0) + \delta_3 (\text{aid} * \text{post}_{\text{ft}} - \overline{\text{aid} * \text{post}}_f) + (\varepsilon_{\text{fbt}} - \bar{\varepsilon}_{\text{fb}})$$

Equation (9) can be simplified as follow:

$$(10) \quad \log(\ddot{\text{credit}})_{\text{fbt}} = \ddot{\beta}_0 + \delta_3 \text{aid} * \ddot{\text{post}}_{\text{ft}} + \ddot{\varepsilon}_{\text{fb}},$$

Where  $\log(\ddot{\text{credit}})_{\text{fbt}} = \log(\text{credit})_{\text{fbt}} - \overline{\log(\text{credit})}_{\text{fb}}$  is known as the time-demeaned data of  $\log(\text{credit})_{\text{fbt}}$ , the same applies to  $\text{aid} * \ddot{\text{post}}_{\text{ft}}$  and so on and so forth. Equation (10) already excludes the unobserved effects ( $\gamma_f$ ,  $\lambda_b$  and  $\theta_t$ ) that remain constant over time (such as the characteristics of firms and banks, as well as the effect of time). In the final model (equation (10)) we will have only the interaction term between the aid variable and the post variable, and the constant term. This is sufficient for this study since we are analysing the impact of the adoption of state aids or supports during the pandemic. Now that the methodology is clarified, in the following chapter (Chapter 4) we will move on to the results presentation and their analysis and discussion.

However, there is one disadvantage on the application of fixed effects in our model. The smallest firms tend to have only one bank relationship (Degryse et al., 2020) and the use of firm-time fixed effects excludes these firms from the analysis. The spectrum of Portuguese firms (in terms of turnover) is divided into € 238 bn from SME (including micro-firms with

€ 74 bn) and € 185 bn from large firms<sup>53</sup> (in numbers, 96,1% of total Portuguese firms are micro size, while 3,3% and 0,5% are small and medium-sized, respectively).<sup>54</sup> The use of ISLT fixed effects could be appropriate given the Portuguese business structure, so, one next step would be running additional regressions applying this novel specification to secure if the estimates produced hold.

### 3.2.3. Matching Process

As explained in Section 3.3.1, the econometrician method used in this research, the DiD method, requires one main assumption, which is the comparability between the control group and the treatment group. To secure this assumption holds we undertake a matching process, i.e., the procedure to balance the distribution of covariances in both control and treatment groups. It aims to reduce the variance, the bias, and the model dependence. The matching method used was the Coarsened Exact Matching (CEM)<sup>55</sup> that “is a monotonic imbalance reducing matching method — which means that the balance between the treated and control groups is chosen by ex-ante user choice rather than discovered through the usual laborious process of checking after the fact, tweaking the method, and repeatedly reestimating” (Blackwell et al., 2009) (p. 524).

The variables used in the matching process refers to the main firm characteristics: total credit, profitability, size, and classification of economic activity (according to COVID-IREE classification). This choice of variables to execute the CEM is based on the main characteristics that may be decisive during these hard times. For example, SMEs are more restricted to additional funding when comparing to larger firms. The same applies to the economic activities: while the communication and information sector had a favourable environment during the pandemic, the restaurant and food services and accommodation sectors were facing a highly adverse situation (see Section 2.1.2). Since the shock had this heterogenic impact across several economic sectors, it is also important to consider this variable.

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<sup>53</sup> Source: Pordata, data from 2018. For SME, see PORDATA : (<https://www.pordata.pt/en/Portugal/Turnover+in+small+and+medium+sized+enterprises+total+and+by+size-2932>) and for larger firms see PORDATA : <https://www.pordata.pt/en/Portugal/Enterprises%27+turnover+total+and+by+size-2914>.

<sup>54</sup> Source: Pordata, data from 2018. See PORDATA : <https://www.pordata.pt/en/Portugal/Small+and+medium+sized+enterprises+as+a+percentage+of+total+enterprises+total+and+by+size-2859>.

<sup>55</sup> For example, see Blackwell, Iacus, King, and Porro (2009).

## 4. Empirical Results

In this chapter, we present the results of the empirical model constructed in the previous section. Besides the estimation of the state-aids impact on credit, equation (10) is also adapted to answer several questions raised during this paper, such as the impact of state aids on each type of credit and how the impact differs according to each support. In Section 4.1 the main question of this study will be addressed and discussed: what the impact of state aids on credit during the pandemic is. Next, in Section 4.2 we will perform the same analysis by type of aid, looking if there is a difference between their impact on credit. Finally, in Section 4.3 the main results are summarized.

### 4.1 Impact of Government Supports on Credit after the Pandemic Shock

The purpose of this research is to quantify the causal effect that the incentive and support measures, implemented by the state, had on the credit. In Table 4, column (1) is the results of equation (4) estimation by ordinary least squares (OLS), where the so mentioned unobserved effects are not considered. On this regression, our independent variables (variable aid, post, and the interaction term) cannot explain much the variance of credit (low R-Squared).

Log (Total Credit)	Log (Total Credit)		
	(1)	(2)	(3)
Aid	0.46*** (0.01)	-	-
Post	0.14*** (0.01)	-	-
Aid*Post	<b>0.06***</b> <b>(0.02)</b>	<b>0.07***</b> <b>(0.01)</b>	<b>0.11***</b> <b>(0.01)</b>
Firm FE	No	Yes	Yes
Bank FE	No	Yes	Yes
Date FE	No	Yes	Yes
Firm-Bank FE	No	No	Yes
N° Observations	560,917	560,891	558,842
R-Squared	0.01	0.51	0.89
$(e^{\hat{\delta}_3}-1)\times 100$	<b>6.45%</b>	<b>7.77%</b>	<b>11.16%</b>

Note: This table shows the estimates from the difference-in-differences technique applied to quantify the causal effect of the adoption of any state aid (in the Covid-19 context) after the pandemic shock on credit. The sample has 6,857 Portuguese firms, of which 2473 benefited from at least one of the states supports and 4384 firms that did not benefit from any support. The Aid\*Post is the interaction term ( $\hat{\delta}_3$ ) between the adoption of state-aids (the treatment) and the post-shock period. The dummy variable Aid is equal to one if the firm benefited from at least one government aid, while the dummy variable Post equals one when the date is equal to or later than April 2020 (when the shock occurred). The data used here result from the COVID-IREE survey, the CB dataset and the Credit Responsibility registers. The COVID-IREE data refers to April, May, June, and July of 2020, while the data CRR refers to the period between September 2018 and December 2020. The data considered in all columns is the matched data, see Annex 10 for more information regarding the CEM matching

process. The total credit (column (1)) is the sum of regular credit (credit that the firm currently has, see column (2)), potential credit (credit that the firm can readily contract, see column (3)) and overdue credit (credit that is in default, see column (4)). As described in the table, the regressions presented in columns (2) and (3) include specific fixed effects, which in turn makes the dummy variables Aid and Post unusable. The standard error for the respective coefficient appears below in parentheses and the statistical significance is recorded with asterisks as follows: \*\*\* means 1% significant. The last line shows the conversion to the percentage of the interaction term coefficient's estimate.

Column (2) presents the outputs of equation (10) regression using the FE method with firm, bank, and date fixed effects. Thus, the outputs consider the firm and banks characteristics and the effects time related. However, as explained before, the firm-bank relationship also affects the access of external funding of the firms. Banks that do not have any relationship with a firm tend to grant less credit comparing to banks that do have. The information asymmetry problem and the monitoring costs have less effect when a firm has a long relationship with a specific bank. So, it may represent a significant bias in our estimation. This is considered in column (3) from Table 4. We immediately notice the difference in our interest coefficient ( $\delta_3$ ) values from columns (1) and (2) to column (3). The interaction term coefficient rises from 7% to 11% when we control the “unobservable firm-bank heterogeneity” (Degryse et al., 2020), using the firm-bank FE. Using this model, we can attribute part of the increase in firms’ credit to the benefit of these support measures. In other words, the use of state aids after the pandemic shock led to a 11% higher increase in firms’ credit (on average). From column (1) to (3), the standard errors diminish and the R-Squared increases substantially, decreasing the residual variance. The results obtained in column (3) in Table 4 are going to be further discussed in the next step of the analysis.

The support measures delayed some short-term liabilities, such as credit payments and taxes (credit moratoria and tax payment deferral), and increased access to new funds, decreasing the liquidity needs. By reducing the pressure on liquidity, the state helped to prevent fire sales and improving the firm’ creditworthiness. The lower liquidity risk and credit risk would prevent the tightening tendency from banks in providing credit and ultimately prevent a credit crunch. These results suggest that the government support measures, combined with the context of Regulatory, Monetary and Prudential policies, contributed to easing and stimulating access to credit for the beneficiaries of state aids.

#### **4.1.1. Types of Credit**

For a better understanding of this impact, besides the application of the model through firms’ total credit, we now also undertake an analysis by the type of credit. To recap, equation (10) allows the estimation of the average treatment effect,  $\delta_3$ . Thus, in this section, it will also be adapted by using as dependent variables the logarithm of regular, potential, and

overdue credit. The results from all these regressions have an interaction term that is statistically significant at a 1% level. As shown in Table 5, the interaction term presents different values and sign according to the type of credit.

**Table 5 - FE regression by types of credit**

Log (Dependent Variable)	Firm, Bank, Time, and Firm-Bank Fixed Effects			
	Total Credit (1)	Regular Credit (2)	Potential Credit (3)	Overdue Credit (4)
Aid*Post	<b>0.11***</b> (0.01)	<b>0.29***</b> (0.01)	<b>0.18***</b> (0.01)	<b>-0.09***</b> (0.01)
Firm FE	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes
Date FE	Yes	Yes	Yes	Yes
Firm-Bank FE	Yes	Yes	Yes	Yes
N° Observations	558,842	558,842	558,842	558,842
R-Squared	0.89	0.83	0.89	0.68
$(e^{\hat{\delta}_3}-1) \times 100$	<b>11.16%</b>	<b>33.24%</b>	<b>19.64%</b>	<b>-8.75%</b>

Note: This table shows the estimates from the difference-in-differences technique applied to quantify the causal effect of the adoption of any state aid (in the Covid-19 context) after the pandemic shock on credit. The results in column (1) are the same as the ones shown in column (3) in Table 4. The sample has 6,857 Portuguese firms, of which 2473 benefited from at least one of the states supports and 4384 firms that did not benefit from any support. The Aid\*Post is the interaction term ( $\hat{\delta}_3$ ) between the adoption of state-aids (the treatment) and the post-shock period. The dummy variable Aid is equal to one if the firm benefited from at least one government aid, while the dummy variable Post equals one when the date is equal to or later than April 2020 (when the shock occurred). The data used here result from the COVID-IREE survey, the CB dataset and the Credit Responsibility registers. The COVID-IREE data refers to April, May, June, and July of 2020, while the data CRR refers to the period between September 2018 and December 2020. The data considered in all columns is the matched data, see Annex 10 for more information regarding the CEM matching process. The total credit (column (1)) is the sum of regular credit (credit that the firm currently has, see column (2)), potential credit (credit that the firm can readily contract, see column (3)) and overdue credit (credit that is in default, see column (4)). As described in the table, all regressions include specific fixed effects. The standard error for the respective coefficient appears below in parentheses and the statistical significance is recorded with asterisks as follows: \*\*\* means 1% significant. The last line shows the conversion to the percentage of the interaction term coefficient's estimate.

### **(1) Total Credit**

Again, after the shock, the state aids are responsible for an 11,16% higher increase in total credit, comparing to firms that did not benefit from the supports (see column (1) from Table 5). The positive coefficient on the interaction term suggests that firms with aids are able to obtain more credit during the pandemic relative to firms without aids. The total credit of a typical firm with state aids was much smaller than the total credit of a typical firm without state aids before the pandemic, while both reached a similar level (see Annex 8). Taken together, this indicates that the use of state aids led to a decrease in the credit gap between these two groups of firms. Therefore, firms under government supports would have improved access to funds and liquidity. These results are in line with Manteu et al. (2020) and with the preliminary analysis (Section 3.1.2.) from the sample collected from COVID-IREE. The firms that adopted state support were those that were in a more fragile situation and with a greater need for financing. The measures acted by reducing the pressure on

corporate liquidity and giving access to cheaper credit. This, in turn resulted in a higher increase in firm indebtedness when comparing to firms that did not receive any support given by the state.

### ***(2) Regular Credit***

Regarding regular credit, on average 33,24% of the increase in credit derives from the use of government aids, which means a rise in the gap between the control and the treatment group (see column (2) from Table 5). On average, the firms that did not use state aids decreased their amount of regular credit during 2020, while the treatment group recorded the opposite (see Figure 12 in Section 3.1.2.). The treatment group may have increased their actual debt in response to the pandemic to face the liquidity needs or by precautionary reasons. The lower credit price, the guarantees and new credit lines may also have boosted the credit market for the treatment group.

### ***(3) Potential Credit***

There was a tendency for accentuated growth for both groups, however, this increase for the treatment group was on average 19.6% higher than for those not benefiting (see column (3) from Table 5). The average treatment effect of the benefit of state aids after the shock in potential credit is positive, this suggests that firms with aids can access promptly more credit during the pandemic relative to firms without aids. Figure 12 shows that the potential credit of the average firm with state aids was much smaller than the potential credit of the average firm without state aids before the pandemic, while, in December 2020, there was a smaller difference between them. The potential credit for firms that benefited from state aids grew more than the firms that did not benefit from any support. So, this suggests that the use of state aids led to a decrease in the credit gap between these two groups of firms. The state aids contributed to the access of additional credit if needed. Through the balance sheet channel, the improvement of firms' creditworthiness and the improved credit risk may have made possible access (or higher access) to lines of credit, for example.

### ***(4) Overdue Credit***

Since overdue credit is the credit to which firms defaulted on payments, we expect that state support both through suspension of payments and access to new credit (facilitating debt rollover) will cause a decrease in this type of credit after the shock. The impact of the use of state supports over the firms' overdue credit is presented in column (4) of Table 5.

The estimation indicates that after the shock overdue credit fell 8,75% due to the aid measures, by comparison with the control group. In April 2020, the amount of overdue credit was considerably lower in the case of firms that benefited from state-aids (see Figure 12 in Section 3.1.2.). For example, the moratorium on existing credit suppressed the default on payment, postponing payments that firms might not be able to pay. In addition, the support helped firms in their debt rollover, with guarantees and access to new, more accessible lines of credit.

## **4.2 Impact on Credit by Type of Support Measure**

Now that we already discussed the general effect of government supports on firms' credit, the next step is to decompose the analysis by different types of aids. It is crucial to do so because we want to measure the impact of these support measures, and, as explained in Section 2.2.2, they are very different between each other. We might expect that the impact of each aid varies. For example, firms benefiting from state guarantees and credit lines with lower interest rates raise more their indebtedness (the use of the support itself implies a credit increase) comparing to other less relevant support measures. In this section, we will start by presenting the individual results by each support and ending with the main reasonings.

### **4.2.1. Moratorium**

Table 6 presents the results of the application of equation (10) adapted to the specific use of moratorium on existing credit. The sample in which the model is applied is also different, the firms that benefit from more than one state aid are removed from the sample because we want to measure the impact of moratoria on existing credit without bias. We keep only the firms that did not benefit from any state aid and the firms that benefited from moratoria. It was also performed the matching process using as treatment the benefit of this support measure. The results, in Table 6, differ from the ones obtained from the aggregation of all support measures.

The average treatment effect of the moratoria (Table 6) was lower on total credit and regular credit comparing to the results obtained in Table 5 (considering all state support measures), 5,8 and 17,86% respectively. On the other hand, the effect of the moratoria was greater on reducing overdue credit and increasing the potential credit. After the shock, firms that benefited from the moratorium increased on average 32,64 % regular credit comparing to firms that did not benefit from any support.

**Table 6 - Moratoria impact on credit**

Log (Dependent Variable)	Firm, Bank, Time, and Firm-Bank Fixed Effects			
	Total Credit (1)	Regular Credit (2)	Potential Credit (3)	Overdue Credit (4)
Moratorium*Post	<b>0.06***</b> <b>(0.01)</b>	<b>0.16***</b> <b>(0.03)</b>	<b>0.28***</b> <b>(0.02)</b>	<b>-0.13***</b> <b>(0.01)</b>
Firm FE	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes
Date FE	Yes	Yes	Yes	Yes
Firm-Bank FE	Yes	Yes	Yes	Yes
N° Obs.	350,310	350,310	350,310	350,310
R-Squared	0.89	0.83	0.90	0.71
$(e^{\hat{\delta}_3}-1)\times 100$	<b>5.81%</b>	<b>17.86%</b>	<b>32.64%</b>	<b>-12.21%</b>

Note: This table shows the estimates from the difference-in-differences technique applied to quantify the causal effect of the adoption of a moratorium on existent credit (in the Covid-19 context) after the pandemic shock on credit. The sample has 6,821 Portuguese firms, of which 1,271 benefited from moratoria on existing credit and 5,550 firms that did not benefit from this support. The Moratorium\*Post is the interaction term ( $\hat{\delta}_3$ ) between the adoption of this state-aid (the treatment) and the post-shock period. The dummy variable Moratorium is equal to one if the firm benefited from the moratorium on existing credit, while the dummy variable Post equals one when the date is equal to or later than April 2020 (when the shock occurred). The data used here result from the COVID-IREE survey, the CB dataset and the Credit Responsibility registers. The COVID-IREE data refers to April, May, June, and July of 2020, while the data CRR refers to the period between September 2018 and December 2020. The data considered in all columns is the matched data, see Annex 10 for more information regarding the CEM matching process. The total credit (column (1)) is the sum of regular credit (credit that the firm currently has, see column (2)), potential credit (credit that the firm can readily contract, see column (3)) and overdue credit (credit that is in default, see column (4)). As described in the table, all regressions include specific fixed effects. The standard error for the respective coefficient appears below in parentheses and the statistical significance is recorded with asterisks as follows: \*\*\* means 1% significant. The last line shows the conversion to the percentage of the interaction term coefficient's estimate.

The reasoning behind these results is connected to the composition of the aid by itself. After one pandemic year, the bank lending survey published by the BdP pointing out the effect of moratoria as to “mitigate the materialization of credit risk” (Banco de Portugal, 2021c). The perception of risk associated with the present situation and the prospects led to more restrictive credit granting criteria. Despite the economic contraction and a higher level of uncertainty having overcome that of the last crisis, these required standards were less tighten than those observed during the last recession<sup>56</sup> (Banco de Portugal, 2021c). The fall on debt payments remove the pressure on liquidity management and improve their financials, reducing their credit risk. Through the balance sheet channel, the better financial position results in easier access to additional credit by the higher collateral the firms can assure, and the lower risks.

Regarding the overdue credit, the moratoria on existing credit had substantial importance. The credit moratorium is responsible for a 12% reduction of debt with default

<sup>56</sup> See Graph C.1 on Box from page 9 on Banco de Portugal (2021c).



payments. As explained earlier, allowing firms to postpone credit payments reduces the short-term liabilities. This support delays payments that otherwise would become in default.

#### 4.2.2. Guarantee

The same applies to the guarantees schemes, Table 7 present the results when we isolate the effect of this particular support measure. After the shock, firms benefiting from Guarantees increased more 26% total credit than firms that did not benefit from any aid (see Table 7). But rising credit may be implied in the use of this aid (see Table 7). Accessing guarantees and credit with lower interest allows the firms, mainly the ones most affected by the pandemic, to be funded without the banks bearing all the risks. Hence, the banks, by incurring lower risks, may not constrain credit standards as they would so in the absence of such government intervention. The firms that benefit from state guarantees and credit lines aim to access new funds. Unlike the moratoria that strengthen the financial positions of firms and facilitate their access to new (potential) credit if needed, when firms apply for state guarantees, their purpose is to obtain (regular) credit. Pre-accorded credit lines act as liquidity insurance in the future, they are a particularly important provision during bad times (Viral Acharya, Almeida, Ippolito, & Perez-Orive, 2021).

When comparing the general results (in Table 5) and the ones get in Table 7, we can see that the coefficient estimation for total and regular credit is considerably higher. Besides the lower average treatment effect on overdue credit, it can be said that the guarantees and subsidized credit lines were effective in increasing firms' credit. After the pandemic shock, the impact of the use of state guarantees and credit lines was a higher increase of 67% on regular credit, i.e., credit that the firm effectively has, and 20,4% on potential credit, i.e., credit that the firm can access promptly.

**Table 7 - Guarantees and Credit Lines impact on credit**

Log (Dependent Variable)	Firm, Bank, Time, and Firm-Bank Fixed Effects			
	Total Credit (1)	Regular Credit (2)	Potential Credit (3)	Overdue Credit (4)
Guarantee *Post	<b>0.23***</b> (0.02)	<b>0.51***</b> (0.04)	<b>0.19***</b> (0.03)	<b>-0.05***</b> (0.02)
Firm FE	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes
Date FE	Yes	Yes	Yes	Yes
Firm-Bank FE	Yes	Yes	Yes	Yes
N° Obs.	320,837	320,837	320,837	320,837
R-Squared	0.89	0.82	0.90	0.71
$(e^{\delta_3}-1) \times 100$	<b>26.16%</b>	<b>67.27%</b>	<b>20.41%</b>	<b>-5.15%</b>

Note: This table shows the estimates from the difference-in-differences technique applied to quantify the causal effect of the adoption of state guarantees and bonified credit lines (in the Covid-19 context) after the pandemic shock on credit. The sample has 6,712 Portuguese firms, of which 797 benefited from state guarantees and bonified credit lines and 5,915 firms that did not benefit from this support. The Guarantee\*Post is the interaction term ( $\hat{\delta}_3$ ) between the adoption of this state-aid (the treatment) and the post-shock period. The dummy variable Guarantee is equal to one if the firm benefited from state guarantees and bonified credit lines, while the dummy variable Post equals one when the date is equal to or later than April 2020 (when the shock occurred). The data used here result from the COVID-IREE survey, the CB dataset and the Credit Responsibility registers. The COVID-IREE data refers to April, May, June, and July of 2020, while the data CRR refers to the period between September 2018 and December 2020. The data considered in all columns is the matched data, see Annex 10 for more information regarding the CEM matching process. The total credit (column (1)) is the sum of regular credit (credit that the firm currently has, see column (2)), potential credit (credit that the firm can readily contract, see column (3)) and overdue credit (credit that is in default, see column (4)). As described in the table, all regressions include specific fixed effects. The standard error for the respective coefficient appears below in parentheses and the statistical significance is recorded with asterisks as follows: \*\*\* means 1% significant. The last line shows the conversion to the percentage of the interaction term coefficient's estimate.

The firms that accessed the state guarantees and the new subsidized credit lines had the objective of accessing additional funds. The affordable rates and the state guarantee convinced firms to substitute other credits for these. As explained in Section 3.2.1, the credit market moved at two paces with the launch of this support. The demand for these support measures was so high that the state had to increase the amount invested and extend the maximum term (CNSF, 2020).

#### 4.2.3. Tax

Table 8 shows the results for impact of taxes deferral on credit, according to the types of credit, and isolating it from the mixed effects of other state aids. Comparing to the general model (Table 5) it stands out the fact that all coefficients are considerably smaller. The coefficients closest to the general ones are the ones referring to regular and overdue credit. The payment suspension of taxes and other contributory obligations contributed to a 3,8% higher increase in the firm's total credit (see Table 8). It improved the firm financial position through the decrease in short-term liabilities. Regarding the regular credit, after the shock, the firms that benefited from tax deferrals increased more 24% compared to firms that did not benefit from any support.

**Table 8 - Tax deferral impact on credit**  
Firm, Bank, Time, and Firm-Bank Fixed Effects

Log (Dependent Variable)	Total Credit (1)	Regular Credit (2)	Potential Credit (3)	Overdue Credit (4)
Tax*Post	<b>0.04***</b> (0.01)	<b>0.22***</b> (0.03)	<b>-0.07***</b> (0.02)	<b>-0.06***</b> (0.01)
Firm FE	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes
Date FE	Yes	Yes	Yes	Yes
Firm-Bank FE	Yes	Yes	Yes	Yes
N° Obs.	349,800	349,800	349,800	349,800
R-Squared	0.89	0.82	0.90	0.70
$(e^{\hat{\delta}_3}-1) \times 100$	<b>3.81%</b>	<b>24.04%</b>	<b>-6.29%</b>	<b>-6.16%</b>

Note: This table shows the estimates from the difference-in-differences technique applied to quantify the causal effect of the adoption of suspension of tax and other contributory payments (in the Covid-19 context) after the pandemic shock on credit. The sample has 6,839 Portuguese firms, of which 1,478 benefited from a suspension of tax and other contributory payments and 5,361 firms that did not benefit from this support. The Tax\*Post is the interaction term ( $\hat{\delta}_3$ ) between the adoption of this state-aid (the treatment) and the post-shock period. The dummy variable Tax is equal to one if the firm benefited from the suspension of tax and other contributory payments, while the dummy variable Post equals one when the date is equal to or later than April 2020 (when the shock occurred). The data used here result from the COVID-IREE survey, the CB dataset and the Credit Responsibility registers. The COVID-IREE data refers to April, May, June, and July of 2020, while the data CRR refers to the period between September 2018 and December 2020. The data considered in all columns is the matched data, see Annex 10 for more information regarding the CEM matching process. The total credit (column (1)) is the sum of regular credit (credit that the firm currently has, see column (2)), potential credit (credit that the firm can readily contract, see column (3)) and overdue credit (credit that is in default, see column (4)). As described in the table, all regressions include specific fixed effects. The standard error for the respective coefficient appears below in parentheses and the statistical significance is recorded with asterisks as follows: \*\*\* means 1% significant. The last line shows the conversion to the percentage of the interaction term coefficient's estimate.

One possible explanation for the negative sign on potential credit and the high impact on regular credit is the difficulties that the firms have been going through. The firms that require to postpone the basic contributions to the state may be the ones struggling more. Besides the financial situation, these firms increased their regular credit (for example by using their actual credit lines and credit cards) and may not be able to guarantee collateral required for additional credit lines, for example. Turning potential into regular credit, i.e., exploiting all the funds they could access. Through the balance sheet channel, without extra collateral, the weaker financial position restricts firms to access additional credit and increase credit prices granted by financial institutions. This state aid also works through the generation of cash flows. The postpone of short-term liabilities such as taxes it improves the firms' cash flows. This in turn ease the credit access through the balance sheet channel.

#### 4.2.4. Other aids

The support measures considered in this category were the smallest and least substantial compared to the previous ones. In columns (1) and (2) of Table 9, the estimations of coefficient  $\hat{\delta}_3$  are not statistically significant, leaving us with interaction term estimation from potential and overdue credit. After the shock, firms that benefited from other aids increased 6% potential credit comparing to firms that did not benefit from any support. The effect of these other supports is relatively weaker, compared to Table 5 (in Section 4.1.1.), we can immediately see that the impact on the evolution of potential credit was around a third. Regarding the overdue credit, the aids considered in this category had on average an effect of 5% of credit reduction. The supports considered in this category were the smallest ones and the less expressive comparing with the previous analysed. There were also fewer observations to use in the regression regarding the treatment group.

**Table 9 - Other supports' impact on credit**

Log (Dependent Variable)	Firm, Bank, Time, and Firm-Bank Fixed Effects			
	Total Credit (1)	Regular Credit (2)	Potential Credit (3)	Overdue Credit (4)
Other *Post	-0.01 (0.02)	-0.04 (0.04)	<b>0.06**</b> <b>(0.03)</b>	<b>-0.05***</b> <b>(0.02)</b>
Firm FE	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes
Date FE	Yes	Yes	Yes	Yes
Firm-Bank FE	Yes	Yes	Yes	Yes
N° Observations	319,539	319,539	319,539	319,539
R-Squared	0.89	0.83	0.90	0.70
$(e^{\hat{\delta}_3}-1) \times 100$	-	-	<b>6.27%</b>	<b>-4.97%</b>

Note: This table shows the estimates from the difference-in-differences technique applied to quantify the causal effect of the adoption of other aids (in the Covid-19 context) after the pandemic shock on credit. The sample has 6,737 Portuguese firms, of which 648 benefited from other aids and 6,089 firms that did not benefit. The Other\*Post is the interaction term ( $\hat{\delta}_3$ ) between the adoption of these state-aids (the treatment) and the post-shock period. The dummy variable Other is equal to one if the firm benefited from other aids, while the dummy variable Post equals one when the date is equal to or later than April 2020 (when the shock occurred). The data used here result from the COVID-IREE survey, the CB dataset and the Credit Responsibility registers. The COVID-IREE data refers to April, May, June, and July of 2020, while the data CRR refers to the period between September 2018 and December 2020. The data considered in all columns is the matched data, see Annex 10 for more information regarding the CEM matching process. The total credit (column (1)) is the sum of regular credit (credit that the firm currently has, see column (2)), potential credit (credit that the firm can readily contract, see column (3)) and overdue credit (credit that is in default, see column (4)). As described in the table, all regressions include specific fixed effects. The standard error for the respective coefficient appears below in parentheses and the statistical significance is recorded with asterisks as follows: \*\*\* means 1% significant, while \*\* means 5% significant. The last line shows the conversion to the percentage of the interaction term coefficient's estimate.

### 4.3. Main Results

In Table 4, the comparison between different methodologies confirmed that our choice was the most adequate considering the quasi-experimental nature of the Covid-19 shock. The use of DiD method, assisted by fixed effects to control for unobserved effects, resulted in statistical significance and higher explanatory power of our model. So, after we checked the methodological exercise, we used the model considering as treatment the benefit of any support measure (and including firms benefiting from more than one state aid). The estimates in Table 5 demonstrated the effect considerably high of state aids on credit, not only on credit that the firm actually has (that increased more 33%) but also in credit that the firm can access promptly. Beside the raise of funds, the firms that used the state aids also improved the access additional ones in case of need.

Looking for the different support measures, we can see that the firms which benefited from guarantees were the ones that increased most the regular credit on the post-shock period (when compared to firms without state aids). Followed by the Moratorium and Tax, and by last other aids presented a slight increase of credit comparing to firms without state aids. Regarding the potential credit, the support measures more relevant were the

moratoria and the guarantees schemes. The effect of moratoria on total credit is considerably lower than the one obtained in Table 5. The moratoria effects also present some differences, its impact is lower on regular credit while higher impact on potential and overdue credit. Firms that benefited from moratoria had their debt payments delayed, which in turn improved their liquidity situation in the short term.

Among all state aids studied earlier on, the less relevant is the ‘Other aids’ category which have small impact on credit. By one side, the reason why this happen may be the considerably lower share of the state budget dedicated to it. As shown by ESRB (2021) for the public guarantees schemes, the bank lending growth is related with the size of the support measure. On the other side, the programs that are included in this category may have different effects<sup>57</sup> on credit and, when measured, they may seem smaller.

Observing the general results (see Table 5) we can say that they are influenced mainly by the moratoria on existing credit (see Table 6) and by the government guarantee schemes (see Table 7). The high coefficients on Total credit and Regular credit may be driven essentially by the adoption of state guarantees, while the Potential and Overdue credit coefficients may be driven specially by the application of moratoria on existing credit.

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<sup>57</sup> Some aids can have a positive effect on credit, while other can have a negative impact on credit, for example the grants.

## 5. Conclusion

The coronavirus crisis was like any other, without any precedent signs, without any rupture overhang debt. The policymakers faced several issues: what were the best measures to support firms; how to solve the trade-off between keeping these measures (and incur in higher costs) and the potential cliff effects when withdrawing them. State support diversified between deferral of debt payments and taxes/other contributions, lines of credit and guarantees, among others. These supports alleviated pressure on firms, postponing short-term payments and facilitating access to funds at affordable costs. Using a quasi-experimental method, and controlling for some specific characteristics, this work was the first to produce an estimate of the impact of fiscal measures on Portuguese firms' credit. The results are not confounded by unobservable effects related to the firm, bank, time, and firm-bank relationship. We performed a matching process to robust the main assumption of the model, the comparability between the control group and the treatment group.

The results indicated that the state aids, in general, contributed to a greater increase in total firms' credit. They are in line with the state's intended goals of helping firms to survive during this crisis, to withstand the pressure on liquidity and to access funds more easily and at more affordable prices. The average treatment effect of the adoption of the support measures had a positive impact on the evolution of each type of credit, excluding overdue credit which had a negative impact, that is a higher decrease on credit payments default. According to these results, the general adoption of state aids was effective and had a considerable outcome on credit market.

Among the supports, we saw that there are differences in adherence and different ways of acting. Concerning total credit, state guarantees, and credit lines had the greatest impact, followed by credit moratoria. However, as shown the characteristics and the purpose of each support measure led to different effects according to the type of credit. Moratoria on existing credits, being the suspension/postponement of payments, had a greater impact on overdue credit. By suspending payments until firms can pay, it avoids the bankruptcy of many viable firms and ultimately avoid the worse consequences for the economy. According to the results obtained, the guarantees had an average effect of 67% on the increase in the firms' actual credit and 20% on potential credit, being the support measure with the highest

effect on regular and potential credit.<sup>58</sup> The deferral of taxes and contribution payments also had a positive effect on firms' actual credit, but it stands out due to the unexpected negative effect on potential credit, as explained before. Among all the supports, the "Other aids" were the ones with smaller effects on credit. This fact may derive directly from the definition of this category, it contains diverse and smaller aids with mixed effects.

Our results described above are in line with the related literature, especially with European Systemic Risk Board (2021).<sup>59</sup> Indeed the state support measures effectively contributed to the increase in bank lending. They reduced the liquidity and credit risk and improved the firms' net worth, making banks more willing to grant credit, and allowed access to affordable and advantageous credits to financially constrained firms.

Concluding, the methodology applied proved to be adequate to answer our research question. Using novel data from the Banco de Portugal, we can conclude that the state aids (in the Covid-19 context) had a positive impact on credit. However, this effect has different magnitudes considering different support measures and different types of credit. The results obtained are statistically significant and are in line with what was anticipated and with the existing literature. Besides the first assessment of Portuguese fiscal policies measures, this work also contributes to the literature with this disaggregated analysis by types of credit and by specific aids.

### ***Data Limitations***

Regarding the data (COVID-IREE dataset), there are some issues that it is important to recognize. These issues include the representativeness of our sample, the time interval of our data related to state-aids adoption, the inconsistencies detected, and the confounding effects present in the 'Other aids' category. First, the amount of credit owed by the firms on the sample represents only a small share of the total Portuguese firms' credit. In April 2020, the sample totalled 17,6 billion euros of regular credit, which is only a minor part of the total Portuguese business population' credit. Second, there are some issues regarding the time frame and the unbalanced data. Since we have only the information of a few months, firms that until June 2020 did not receive any support might have done it afterwards. We also have unbalanced data relative to firms' answers to the COVID-IREE survey. Some firms only

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<sup>58</sup> See column (2) from Table 7 in Section 4.2.2.

<sup>59</sup> The results presented also goes in line with other literature, such as Albertazzi et al. (2020); De Santis et al. (2021); Falagiarda et al. (2020); Financial Stability Board (2021); Greenwald et al. (2020).

participated in a few editions, which can lead to some bias on the outputs. So, the higher the number of firms with a low number of answers to the survey the worse this problem becomes (the lack of information). On the original data, 23% of the firms participated in 3 editions or less of the survey (See Annex 11). Third, another issue is what state aids are considered on other state aids on the COVID-IREE survey. “From the edition 18 onwards this question indicates the exclusion of the simplified layoff from the definition of other measures” (BPLIM, 2021b) (p.34). This variation on the structure of other aids over time can create confounding effect.<sup>60</sup>

### ***Methodological Limitations***

One methodological limitation present in this research is the definition of the shock in April 2020 instead of March 2020. The first infection case and the first lockdown occurred on March 3 and 18, respectively.<sup>61</sup> In the last two weeks of that month, some firms were already benefiting from state support. So, it would be more appropriate to define the shock in March 2020. However, the dataset related to the support measures only has information from April onwards, thus there is a lag of a fortnight in the model application. Second, a methodological limitation pointed out earlier on is the prerequisite of multiple bank-relationship in our sample. As mentioned in other literature, this requirement can result in a sample that may not represent the whole population (firms) of Portugal, the role of SME may be underestimated (Degryse et al., 2019; Degryse et al., 2020).

### ***Future Research***

Future research that would be interesting to develop in line with the present subject is to study the real effects of the state-aid measures and the spillover of support measures in the Covid-19 context for example. When accessing more complete data, could also be performed the analysis regarding the pandemic waves and the different stages (if the effectiveness changes from the 1<sup>st</sup> to the 2<sup>nd</sup> confinement). Finally, it would be of utmost to analyse the trade-off of policymakers regarding the potential cliff effects and calculate the relationship between restriction measures and economic losses considering the positions of different countries and their characteristics.

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<sup>60</sup> This data-related issue is only present on ‘Other aids’ category, over time the other three categories are accurately described (Moratoria, Guarantees and Tax).

<sup>61</sup> In March 2020 several European countries registered their first case of (coronavirus) infection and imposed the national or local lockdown. For more information see <https://www.bbc.com/news/world-52103747>.



## 6. Bibliographic references

- Acharya, V., Almeida, H., Ippolito, F., & Perez-Orive, A. (2021). Credit Lines and the Liquidity Insurance Channel. *Journal of Money, Credit and Banking*, 53(5), 901-938. doi:<https://doi.org/10.1111/jmcb.12821>
- Acharya, V., Davydenko, S. A., & Strebulaev, I. A. (2012). Cash Holdings and Credit Risk. *Review of Financial Studies*, 25(12), 3572-3609. doi:10.1093/rfs/hhs106
- Acharya, V., & Steffen, S. (2020b). The Risk of Being a Fallen Angel and the Corporate Dash for Cash in the Midst of COVID. *CEPR COVID Economics*, 10. doi:10.3386/w27601
- Afonso, A., & Sousa-Leite, J. (2020). The transmission of unconventional monetary policy to bank credit supply: Evidence from the TLTRO. *Manchester School*, 88, 151-171. doi:10.1111/manc.12335
- Agarwal, I., Duttagupta, R., & Presbitero, A. F. (2020). Commodity Prices and Bank Lending. *Economic Inquiry*, 58(2), 953-979. doi:<https://doi.org/10.1111/ecin.12836>
- Albertazzi, U., Bijsterbosch, M., Grodzicki, M., Metzler, J., & Marques, A. (2020). Potential impact of government loan guarantee schemes on bank losses. In *Financial Stability Review May 2020*: European Central Bank.
- Almeida, H. (2021). Liquidity Management During the Covid-19 Pandemic\*. *Asia-Pacific Journal of Financial Studies*, 50(1), 7-24. doi:<https://doi.org/10.1111/ajfs.12322>
- Altavilla, C., Boucinha, M., Peydró, J., & Smets, F. (2019). Banking Supervision, Monetary Policy and Risk-Taking: Big Data Evidence from 15 Credit Registers. *ECB Working Paper Series, No 2349*, 44. doi:10.2866/213525
- Andrade, P., Cahn, C., Fraise, H., & Mesonnier, J. S. (2019). Can the provision of long-term liquidity help to avoid a credit crunch? Evidence from the Eurosystem's TLTROs. *Journal of the European Economic Association*, 17(4), 1070-1106. doi:10.1093/jeea/jvy020
- Avezum, L., Oliveira, V., & Serra, D. (2021). Assessment of the effectiveness of the macroprudential measures implemented in the context of the Covid-19 pandemic. *Banco de Portugal Working Papers*, 2021(7), 33. Retrieved from <https://EconPapers.repec.org/RePEc:ptu:wpaper:w202107>
- Ayadi, R., De Groen, W., & Thyri, P. (2015). State Aid to Banks and Credit for SMEs: Is There a Need for Conditionality? , 108. doi:10.2139/ssrn.2784300

- Balduzzi, P., Brancati, E., Brianti, M., & Schiantarelli, F. (2020). 'The Economic Effects of COVID-19 and Credit Constraints: Evidence from Italian Firms' Expectations and Plans. *IZA Discussion Paper*, 13629, 62.
- Baldwin, R., & Mauro, B. W. d. (2020). Economics in the Time of COVID-19. *CEPR Press*, 115. Retrieved from <https://cepr.org/sites/default/files/news/COVID-19.pdf>
- Balfoussia, H., & Gibson, H. D. (2016). Financial conditions and economic activity: the potential impact of the targeted long-term refinancing operations (TLTROs). *Applied Economics Letters*, 23(6), 449-456. doi:10.1080/13504851.2015.1080799
- Banco de Portugal. (2020a). *Bank Lending Survey: Results for Portugal Apr. 2020*. Retrieved from <https://www.bportugal.pt/en/publications/banco-de-portugal/all/114?page=all&pager=0>
- Banco de Portugal. (2020b). *Bank Lending Survey: Results for Portugal Jul. 2020*. Retrieved from <https://www.bportugal.pt/en/publications/banco-de-portugal/all/114?page=all&pager=0>
- Banco de Portugal. (2020c). *Bank Lending Survey: Results for Portugal Oct. 2020*. Retrieved from <https://www.bportugal.pt/en/publications/banco-de-portugal/all/114?page=all&pager=0>
- Banco de Portugal. (2020d). *Economic Bulletin: Dec. 2020*. Retrieved from Lisboa: <https://www.bportugal.pt/en/publications/banco-de-portugal/all/381>
- Banco de Portugal. (2021a). Banco de Portugal launches daily economic indicator. Retrieved from <https://www.bportugal.pt/en/comunicado/banco-de-portugal-launches-daily-economic-indicator>
- Banco de Portugal. (2021b, March 24, 2021). Banco de Portugal publishes information about loans' moratorium. Retrieved from <https://bpstat.bportugal.pt/conteudos/noticias/1281>
- Banco de Portugal. (2021c). *Bank Lending Survey: Results for Portugal Apr. 2021*. Retrieved from <https://www.bportugal.pt/en/publications/banco-de-portugal/all/114?page=all&pager=0>

- Banco de Portugal. (2021d). *Bank Lending Survey: Results for Portugal Jan. 2021* Retrieved from <https://www.bportugal.pt/en/publications/banco-de-portugal/all/114?page=all&pager=0>
- Banco de Portugal. (2021e). *Como se refletiu a situação de confinamento na atividade das empresas?* Retrieved from <https://www.bportugal.pt/en/page/what-are-impacts-covid-19-companies>
- Banco de Portugal. (2021f). *Economic Bulletin: The Portuguese economy in 2020 - May 2021*. Retrieved from Lisboa: <https://www.bportugal.pt/en/publications/banco-de-portugal/all/381>
- Banco de Portugal. (2021g). Loans granted to corporations grow in all sectors of activity. Retrieved from <https://bpstat.bportugal.pt/conteudos/noticias/1252>
- Banco de Portugal. (2021h). One year into pandemic in the Portuguese economy. Retrieved from <https://bpstat.bportugal.pt/conteudos/noticias/1277>
- Banco de Portugal. (2021i). Saiba interpretar o seu mapa de responsabilidades de crédito. Retrieved from <https://www.bportugal.pt/page/saiba-interpretar-o-seu-mapa-da-central-de-responsabilidades-de-credito>
- Banco de Portugal. (2021j). Statistical Press Release – Banking loans and deposits – June 2021. Retrieved from <https://bpstat.bportugal.pt/conteudos/noticias/1405>
- Banco de Portugal. (2021k). What are the impacts of COVID-19 on companies? Retrieved from <https://www.bportugal.pt/en/page/what-are-impacts-covid-19-companies>
- Banco de Portugal Microdata Research Laboratory. (2021a). *Central Credit Responsibility Database - Exposure, Firm, and Bank-Firm Level - Data Manual*(pp. 63). Retrieved from <https://doi.org/10.17900/CRC.FRMBNK.Jun2019.V1>
- Banco de Portugal Microdata Research Laboratory. (2021b). *Fast and Exceptional Enterprise Survey - Data Manual*(pp. 69). Retrieved from <https://msites-dee-bplim-prd.azurewebsites.net/content/fast-and-exceptional-enterprise-survey-covid-iree>
- Baqae, D., & Farhi, E. (2020). Supply and Demand in Disaggregated Keynesian Economies with an Application to the Covid-19 Crisis. *National Bureau of Economic Research Working Paper Series, No. 27152*, 67. doi:10.3386/w27152

- Barro, R., Ursúa, J. F., & Weng, J. (2020). The Coronavirus and the Great Influenza Pandemic: Lessons from the “Spanish Flu” for the Coronavirus’s Potential Effects on Mortality and Economic Activity. *National Bureau of Economic Research Working Paper Series, No. 26866*, 26. doi:10.3386/w26866
- Bartik, A., Bertrand, M., Cullen, Z., Glaeser, E., Luca, M., & Stanton, C. (2020). How Are Small Businesses Adjusting to COVID-19? Early Evidence from a Survey. *National Bureau of Economic Research Working Paper Series, No. 26989*(April 2020), 35. doi:10.3386/w26989
- Bastidon, C., Gilles, P., & Gauvin, M.-S. (2019). Drastic Times Call for Drastic Measures: The ECB LTROs and Credit in The Eurozone Before and After December 2011. *Journal of Economic Issues, 53*(1), 234-256. doi:10.1080/00213624.2019.1573090
- Beck, T., Da-Rocha-Lopes, S., & Silva, A. (2021). Sharing the Pain? Credit Supply and Real Effects of Bank Bail-ins. *The Review of Financial Studies, 34*(4), 1747–1788. doi:10.1093/rfs/hhaa067
- Bennedsen, M., Larsen, B., Schmutte, I., & Scur, D. (2020). Preserving job matches during the COVID-19 pandemic: firm-level evidence on the role of government aid. *GLO Discussion Paper Series, 588*, 19. Retrieved from <https://EconPapers.repec.org/RePEc:zbw:glodps:588>
- Berger, A. N., & Udell, G. F. (2006). A more complete conceptual framework for SME finance. *Journal of Banking & Finance, 30*(11), 2945-2966. doi:<https://doi.org/10.1016/j.jbankfin.2006.05.008>
- Bernanke, B. S., & Gertler, M. (1995). Inside the Black Box: The Credit Channel of Monetary Policy Transmission. *Journal of Economic Perspectives, 9*(4), 27-48. doi:10.1257/jep.9.4.27
- Bernanke, B. S., & Lown, C. S. (1991). The Credit Crunch. *Brookings Papers on Economic Activity*(2), 205-247. Retrieved from [https://www.brookings.edu/wp-content/uploads/1991/06/1991b\\_bpea\\_bernanke\\_low\\_n\\_friedman.pdf](https://www.brookings.edu/wp-content/uploads/1991/06/1991b_bpea_bernanke_low_n_friedman.pdf)
- Blackwell, M., Iacus, S., King, G., & Porro, G. (2009). cem: Coarsened exact matching in Stata. *Stata Journal, 9*(4), 524-546. doi:10.1177/1536867x0900900402
- Blattner, L., Farinha, L., & Rebelo, F. (2019). When losses turn into loans: the cost of undercapitalized banks. *ECB Working Paper Series, 2228*, 71. doi:10.2866/827615

- Bloom, N., Bunn, P., Chen, S., Mizen, P., & Smietanka, P. (2020). The economic impact of coronavirus on UK businesses: Early evidence from the Decision Maker Panel. Retrieved from <https://voxeu.org/article/economic-impact-coronavirus-uk-businesses>
- Boeckx, J., Perea, M. D., & Peersman, G. (2020). The transmission mechanism of credit support policies in the euro area. *European Economic Review*, 124. doi:10.1016/j.eurocorev.2020.103403
- Boissay, F., & Gropp, R. (2013). Payment Defaults and Interfirm Liquidity Provision. *Review of Finance*, 17(6), 1853-1894. doi:10.1093/rof/rfs045
- Boissay, F., & Rungcharoenkitkul, P. (2020). *Macroeconomic effects of Covid-19: an early review*. Retrieved from <https://www.bis.org/publ/bisbull07.htm>
- Bosshardt, J., & Kakhbod, A. (2021). Why did Firms Draw Down their Credit Lines during the COVID-19 Shutdown? , 71. doi:10.2139/ssrn.3696981
- BPstat. (2021, April 16, 2021). 2020 em números. Retrieved from <https://bpstat.bportugal.pt/conteudos/noticias/1205/>
- Bureau, B., Duquerroy, A., & Vinas, F. (2021). Corporate Liquidity during the COVID-19 Crisis: The Trade Credit Channel. *SSRN Electronic Journal*, 34. doi:10.2139/ssrn.3777929
- Cerqueiro, G., Ongena, S., & Roszbach, K. (2020). Collateral damaged? Priority structure, credit supply, and firm performance. *Journal of Financial Intermediation*, 44, 100824. doi:<https://doi.org/10.1016/j.jfi.2019.05.001>
- Conselho Nacional de Supervisores Financeiros. (2020). *Principais medidas adotadas para mitigação dos impactos da pandemia de COVID-19: uma análise comparativa*. Retrieved from <https://www.cmvm.pt/pt/CMVM/CNSF/ConselhoNacionalDeSupervisoresFinancieiros/Pages/20200710s.aspx>
- Correia, S., Luck, S., & Verner, E. (2020). Pandemics Depress the Economy, Public Health Interventions Do Not: Evidence from the 1918 Flu. *SSRN Electronic Journal*. doi:10.2139/ssrn.3561560

- Cuciniello, V., & Iasio, N. d. (2020). *Determinants of the credit cycle: a flow analysis of the extensive margin*. Retrieved from <https://www.ecb.europa.eu/pub/pdf/scpwps/ecb.wp2445~6e86f7ca0c.en.pdf>
- Darmouni, O., & Siani, K. (2021). Crowding Out Bank Loans: Liquidity-Driven Bond Issuance. *SSRN Electronic Journal*, 52. doi:<http://dx.doi.org/10.2139/ssrn.3693282>
- De Santis, R., Ferrando, A., & Gabbani, E. (2021). The impact of fiscal support measures on the liquidity needs of firms during the pandemic. In *ECB Economic Bulletin, Issue 4/ 2021*: European Central Bank.
- Degryse, H., De Jonghe, O., Jakovljevic, S., Mulier, K., & Schepens, G. (2019). Identifying credit supply shocks with bank-firm data: Methods and applications. *Journal of Financial Intermediation*, 40. doi:[10.1016/j.jfi.2019.01.004](https://doi.org/10.1016/j.jfi.2019.01.004)
- Degryse, H., Jakovljevic, S., & Ongena, S. (2020). Introduction to the Symposium on Contemporary Banking Research: The Use of Fixed Effects to Disentangle Loan Demand from Loan Supply. *Economic Inquiry*, 58(2), 917-920. doi:[10.1111/ecin.12875](https://doi.org/10.1111/ecin.12875)
- Direção Geral do Emprego e das Relações de Trabalho. (2020). Lay-off Simplificado – Medidas excecionais e temporárias de resposta à epidemia COVID-19. Retrieved from <https://www.dgert.gov.pt/covid-19-perguntas-e-respostas-para-trabalhadores-e-empregadores-faq/medidas-excecionais-e-temporarias-de-resposta-a-epidemia-covid-19>
- Ebeke, C., Jovanovic, N., Valderrama, L., & Zhou, J. (2021). Corporate Liquidity and Solvency in Europe during COVID-19: The Role of Policies. *IMF Working Paper No. 2021/056*, 48. Retrieved from <https://www.imf.org/en/Publications/WP/Issues/2021/03/02/Corporate-Liquidity-and-Solvency-in-Europe-during-COVID-19-The-Role-of-Policies-50133>
- Eichenbaum, M., Rebelo, S., & Trabandt, M. (2020). The Macroeconomics of Epidemics. *National Bureau of Economic Research Working Paper Series, No. 26882*, 41. doi:[10.3386/w26882](https://doi.org/10.3386/w26882)
- Elenev, V., Landvoigt, T., & Nieuwerburgh, S. V. (2020). Can the COVID Bailouts Save the Economy? *National Bureau of Economic Research Working Paper Series, No. 27207*, 43. doi:[10.3386/w27207](https://doi.org/10.3386/w27207)

- European Central Bank. (2021). The euro area bank lending survey - Fourth quarter of 2020. *Bank Lending Survey*. Retrieved from [https://www.ecb.europa.eu/stats/ecb\\_surveys/bank\\_lending\\_survey/html/ecb.blssurvey2020q4~e89c77d212.en.html#toc5](https://www.ecb.europa.eu/stats/ecb_surveys/bank_lending_survey/html/ecb.blssurvey2020q4~e89c77d212.en.html#toc5)
- European Commission. (2020a). COVID-19: Commission sets out European coordinated response to counter the economic impact of the Coronavirus\* [Press release]. Retrieved from [https://ec.europa.eu/commission/presscorner/detail/en/IP\\_20\\_459](https://ec.europa.eu/commission/presscorner/detail/en/IP_20_459)
- European Commission. (2020b). State aid: Commission approves €3 billion Portuguese guarantee schemes for SMEs and midcaps affected by Coronavirus outbreak [Press release]. Retrieved from [https://ec.europa.eu/commission/presscorner/detail/en/IP\\_20\\_506](https://ec.europa.eu/commission/presscorner/detail/en/IP_20_506)
- European Commission. (n.d.). Competition Policy: State aid. Retrieved from [https://ec.europa.eu/competition-policy/state-aid\\_en](https://ec.europa.eu/competition-policy/state-aid_en)
- European Investment Bank. (2014). *Credit Guarantee Schemes for SME lending in Central, Eastern and South-Eastern Europe*. Retrieved from <https://www.eib.org/en/publications/viwig-credit-guarantee-schemes-report>
- European Systemic Risk Board. (2021). *Financial stability implications of support measures to protect the real economy from the COVID-19 pandemic*. Retrieved from [https://www.esrb.europa.eu/pub/pdf/reports/esrb.reports210216\\_FSI\\_covid19~cf3d32ae66.en.pdf](https://www.esrb.europa.eu/pub/pdf/reports/esrb.reports210216_FSI_covid19~cf3d32ae66.en.pdf)
- Falagiarda, M., Prapiestis, A., & Rancoita, E. (2020). Public loan guarantees and bank lending in the COVID-19 period. In *ECB Economic Bulletin, Issue 6/2020*: European Central Bank.
- Famiglietti, M., & Leibovici, F. (2020). COVID-19's Shock on Firms' Liquidity and Bankruptcy: Evidence from the Great Recession. *Economic Synopses*, 2020(7), 2. doi:10.20955/es.2020.7
- Ferrando, A., & Ganoulis, I. (2020). *Firms' expectations on access to finance at the early stages of the Covid-19 pandemic*. Retrieved from <https://www.ecb.europa.eu/pub/pdf/scpwps/ecb.wp2446~67ffac1759.en.pdf>

- Financial Stability Board. (2021). *COVID-19 support measures: Extending, amending and ending*. Retrieved from <https://www.fsb.org/2021/04/covid-19-support-measures-extending-amending-and-ending/>
- Gan, J. (2007). The real effects of asset market bubbles: Loan- and firm-level evidence of a lending channel. *Review of Financial Studies*, 20(6), 1941-1973. doi:10.1093/rfs/hhm045
- Garcia, W. C., & Ho, V. (2021). *What Types of Firms Become Illiquid as a Result of COVID-19? A Firm-Level Perspective Using French Data*. Retrieved from [https://ec.europa.eu/info/publications/what-types-firms-become-illiquid-result-covid-19-firm-level-perspective-using-french-data\\_en](https://ec.europa.eu/info/publications/what-types-firms-become-illiquid-result-covid-19-firm-level-perspective-using-french-data_en)
- Ghosal, V., & Loungani, P. (2000). The differential impact of uncertainty on investment in small and large businesses. *Review of Economics and Statistics*, 82(2), 338-343. doi:10.1162/003465300558722
- Gibson, H., Hall, S., Petroulas, P., Spiliotopoulos, V., & Tavlas, G. (2020). The Effect of Emergency Liquidity Assistance (ELA) on Bank Lending during the Euro Area Crisis. *Journal of International Money and Finance*, 108(102154), 13. doi:10.1016/j.jimonfin.2020.102154
- Gobbi, G., Palazzo, F., & Segura, A. (2020). Unintended effects of loan guarantees during the Covid-19 crisis. In *Europe in the Time of Covid-19* (Vol. 1, pp. 104-108): Centre for Economic Policy Research.
- Gonçalves, P., Belo, D., & Pinheiro, T. G. (2020). Recession inevitable in Portugal, despite the good performance prior to the pandemic. *CaixaBank Research*, 2. Retrieved from <https://n9.cl/83f2>
- Governo (Producer). (2020a). Apresentação de novas medidas de apoio à economia. *Governo aprova novo pacote de apoio a empresas de sete mil milhões de euros*. Retrieved from <https://www.portugal.gov.pt/pt/gc22/comunicacao/multimedia?m=v&i=governo-aprova-novo-pacote-de-apoio-a-empresas-de-sete-mil-milhoes-de-euros&p=20>
- Governo. (2020b). Cronologia das medidas de apoio à economia e emprego. Retrieved from <https://www.portugal.gov.pt/pt/gc22/comunicacao/documento?i=cronologia-das-medidas-de-apoio-a-economia-e-emprego>



- Greenwald, D., Krainer, J., & Paul, P. (2020). The Credit Line Channel. *Federal Reserve Bank of San Francisco Working Paper Series*, 2020, 101. doi:10.24148/wp2020-26
- Hai, W., Zhao, Z., Wang, J., & Hou, Z.-G. (2004). The Short-Term Impact of SARS on the Chinese Economy. *Asian Economic Papers*, 3(1), 57-61. Retrieved from <https://EconPapers.repec.org/RePEc:tpr:asiaec:v:3:y:2004:i:1:p:57-61>
- Hanson, S. G., Stein, J., Sunderam, A., & Zwick, E. (2020). Business Credit Programs in the Pandemic Era. *Brookings Papers on Economic Activity*, 40. Retrieved from <https://www.brookings.edu/bpea-articles/business-credit-programs-in-the-pandemic-era/>
- Haroutunian, S., Hauptmeier, S., & Osterloh, S. (2021). Implications of the 2021 stability programmes for fiscal policies in the euro area. In *ECB Economic Bulletin, Issue 4/2021*: European Central Bank.
- The IMF's Response to COVID-19. (2020, April 8, 2021). *The IMF and COVID-19: Questions and Answers*. Retrieved from <https://www.imf.org/en/About/FAQ/imf-response-to-covid-19#Q2>
- Instituto Nacional de Estatística. (2021). *Documento Metodológico: Inquérito Rápido e Excepcional às Empresas COVID-IREE*. Retrieved from <https://smi.ine.pt/DocumentacaoMetodologica/Detalhes/1623>
- Jiménez, G., Ongena, S., Peydró, J.-L., & Saurina, J. (2012). Credit Supply and Monetary Policy: Identifying the Bank Balance-Sheet Channel with Loan Applications. *American Economic Review*, 102(5), 2301-2326. doi:10.1257/aer.102.5.2301
- Jordà, Ò., Singh, S., & Taylor, A. (2020). Longer-run Economic Consequences of Pandemics. *National Bureau of Economic Research Working Paper Series*, No. 26934, 19. doi:10.3386/w26934
- Khwaja, A. I., & Mian, A. (2008). Tracing the Impact of Bank Liquidity Shocks: Evidence from an Emerging Market. *American Economic Review*, 98(4), 1413-1442. doi:10.1257/aer.98.4.1413
- Lee, J. H. J., & McKibbin, W. (2004). Estimating the Global Economic Costs of SARS. In *Learning from SARS: Preparing for the Next Disease Outbreak - Workshop Summary* (pp. 92-109). Washington, DC: National Academies Press.

- Lourenço, N., & Rua, A. (2021). The Daily Economic Indicator: tracking economic activity daily during the lockdown. *Economic Modelling*, 100(105500), 10. doi:<https://doi.org/10.1016/j.econmod.2021.105500>
- Mamede, R. P., Pereira, M., & Simões, A. n. (2020). *Portugal: Uma análise rápida do impacto da COVID-19 na economia e no mercado de trabalho*. Retrieved from [https://www.ilo.org/wcmsp5/groups/public/---europe/---ro-geneva/---ilo-lisbon/documents/publication/wcms\\_754606.pdf](https://www.ilo.org/wcmsp5/groups/public/---europe/---ro-geneva/---ilo-lisbon/documents/publication/wcms_754606.pdf)
- Manteu, C., Monteiro, N., & Sequeira, A. (2020). O impacto de curto prazo da pandemia COVID-19 nas empresas portuguesas. *Banco de Portugal Occasional Papers*, 2020(3), 30. Retrieved from <https://www.bportugal.pt/page/infografia-o-impacto-de-curto-prazo-da-pandemia-covid-19-nas-empresas-portuguesas>
- Minoiu, C., Zarutskie, R., & Zlate, A. (2021). Motivating Banks to Lend? Credit Spillover Effects of the Main Street Lending Program. 57. doi:<http://dx.doi.org/10.2139/ssrn.3773242>
- Morais, B., Peydró, J.-L., Roldán-Peña, J., & Ruiz-Ortega, C. (2019). The International Bank Lending Channel of Monetary Policy Rates and QE: Credit Supply, Reach-for-Yield, and Real Effects. *The Journal of Finance*, 74(1), 55-90. doi:<https://doi.org/10.1111/jofi.12735>
- Morales-Acevedo, P., & Ongena, S. (2020). FEAR, ANGER, AND CREDIT. ON BANK ROBBERIES AND LOAN CONDITIONS. *Economic Inquiry*, 58(2), 921-952. doi:<https://doi.org/10.1111/ecin.12826>
- O'Hara, M., & Zhou, X. (2021). Anatomy of a liquidity crisis: Corporate bonds in the COVID-19 crisis. *Journal of Financial Economics*. doi:<https://doi.org/10.1016/j.jfineco.2021.05.052>
- OECD. (2020). *Coronavirus: The world economy at risk*. Retrieved from <https://www.oecd.org/economic-outlook/march-2020/>
- OECD. (2021). Global prospects are improving but performance diverges strongly across countries. Retrieved from <https://oecd.org/economic-outlook>

- Paligorova, T., & Santos, J. A. C. (2017). Monetary policy and bank risk-taking: Evidence from the corporate loan market. *Journal of Financial Intermediation*, 30, 35-49. doi:<https://doi.org/10.1016/j.jfi.2016.11.003>
- Papanikolaou, D., & Schmidt, L. (2020). Working Remotely and the Supply-side Impact of Covid-19. *National Bureau of Economic Research Working Paper Series*, No. 27330. doi:10.3386/w27330
- PORDATA. (March 29, 2021). Enterprises' turnover: total and by size. Retrieved from <https://www.pordata.pt/en/Portugal/Enterprises%27+turnover+total+and+by+size-2914>
- PORDATA. (March 29, 2021). Small and medium-sized enterprises as a % of total enterprises: total and by size. Retrieved from <https://www.pordata.pt/en/Portugal/Small+and+medium+sized+enterprises+as+a+percentage+of+total+enterprises+total+and+by+size-2859>
- PORDATA. (March 29, 2021). Turnover in small and medium-sized enterprises: total and by size. Retrieved from <https://www.pordata.pt/en/Portugal/Turnover+in+small+and+medium+sized+enterprises+total+and+by+size-2932>
- Schweiger, H. (2011). The Impact of State Aid for Restructuring on the Allocation of Resources. *SSRN Electronic Journal*, 40. doi:10.2139/ssrn.2180457
- Segurança Social. (2021). Layoff Simplificado (Medida Extraordinária de Apoio à Manutenção dos Contratos de Trabalho). Retrieved from [https://www.seg-social.pt/documents/10152/17603605/FAQ+Layoff\\_Simplificado-Medida+Ext+de+Apoio+à+Manutenção+dos+CT+-+18012021/34f22b10-9cdf-4003-ba50-e48cb5049ee5](https://www.seg-social.pt/documents/10152/17603605/FAQ+Layoff_Simplificado-Medida+Ext+de+Apoio+à+Manutenção+dos+CT+-+18012021/34f22b10-9cdf-4003-ba50-e48cb5049ee5)
- Timeline: WHO's COVID-19 response. (2020, April 14, 2021). *Coronavirus disease (COVID-19)*. Retrieved from <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/interactive-timeline#!>
- Viggiano, C. (2016). *Do Government Loan Guarantee Instruments Make Sense? Evaluating Effectiveness of the Tranche Cover Fund*. (Master in Business Administration). Universidade Católica Portuguesa, Lisbon.

Wooldridge, J. M. (2012). *Introductory econometrics: a modern approach* (Fifth ed.): South-Western Cengage Learning.

Zbigniew, K., Paweł, N., & Armando, S. (2021). Impact of the COVID-19 crisis on the Portuguese banking system. Linear ordering method. *Estudios Gerenciales*, 37(159). doi:10.18046/j.estger.2021.159.4414

### **Bibliography – Legislation:**

- Decreto n.º 2-A/2020. Diário da República n.º 57/2020, 1º Suplemento, Série I de 2020-03-20, p. 11(5)-11(17). Presidência do Conselho de Ministros. Lisboa.
- Decreto-Lei n.º 10-A/2020. Diário da República n.º 52/2020, 1º Suplemento, Série I de 2020-03-13, p. 22(2)-22(13). Presidência do Conselho de Ministros. Lisboa.
- Decreto-Lei n.º 10-G/2020. Diário da República n.º 61/2020, 1º Suplemento, Série I de 2020-03-26, p. 21(7)-21(14). Presidência do Conselho de Ministros. Lisboa.
- Decreto-Lei n.º 10-J/2020. Diário da República n.º 61/2020, 1º Suplemento, Série I de 2020-03-26, p. 21(22)-21(28). Presidência do Conselho de Ministros. Lisboa.
- Decreto-Lei n.º 78-A/2020. Diário da República n.º 190/2020, 1º Suplemento, Série I de 2020-09-29, p. 203(2)-203(8). Presidência do Conselho de Ministros. Lisboa.
- Lei n.º 13/2020. Diário da República n.º 89/2020, Série I de 2020-05-07, p. 11-16. Assembleia da República. Lisboa
- Lei n.º 27/2006. Diário da República n.º 126/2006, Série I de 2006-07-03, p. 4696-4706. Assembleia da República. Lisboa
- Lei n.º 95/2019. Diário da República n.º 169/2019, Série I de 2019-09-04, p. 55-66. Assembleia da República. Lisboa
- Treaty on the Functioning of the European Union (2008) *Official Journal* C115, 9 May, p. 91–92. Retrieved 6 November 2020, from [http://data.europa.eu/eli/treaty/tfeu\\_2008/art\\_107/oj](http://data.europa.eu/eli/treaty/tfeu_2008/art_107/oj)

## Datasets References

Banco de Portugal Microdata Research Laboratory (BPLIM) (2020): Bank Balance Sheet Monthly Data. Extraction: June 2020. Version:V1. BANCO DE PORTUGAL. Dataset. <https://doi.org/10.17900/BBS.Jun2020.V1>

Banco de Portugal Microdata Research Laboratory (BPLIM) (2020): Central Balance Sheet Annual Data. Extraction: June 2020. Version: V1. BANCO DE PORTUGAL. Dataset. <https://doi.org/10.17900/CB.CBA.Jun2020.V1>

Banco de Portugal Microdata Research Laboratory (BPLIM) (2019). Central Credit Responsibility Database - Firm Level Data. Extraction: June 2019. Version: V1. BANCO DE PORTUGAL. Dataset. <https://doi.org/10.17900/CRC.FRM.Jun2019.V1>

Banco de Portugal Microdata Research Laboratory (BPLIM) (2019): Central Credit Responsibility Database - Bank-Firm Level Data. Extraction: June 2019. Version: V1. BANCO DE PORTUGAL. Dataset. <https://doi.org/10.17900/CRC.FRMBNK.Jun2019.V1>

Banco de Portugal Microdata Research Laboratory (BPLIM) (2019): Central Credit Responsibility Database - Exposure Level Data. Extraction: June 2019. Version: V1. BANCO DE PORTUGAL. Dataset. <https://doi.org/10.17900/CRC.EXP.Jun2019.V1>

Statistics Portugal and Bank of Portugal (2021): Fast and Exceptional Enterprise Survey – COVID-19. Extraction: April 2021. Version: V1.

## 7. Appendix

### Appendix 1

Using loan information from firms and banks, the Khwaja and Mian (2008) method is one of the most used by the literature in banking research, which applies the difference-in-differences concept and fixed effects method. The difference-in-differences is currently applied in policy analysis when comparing two time periods (Wooldridge, 2012). Due to the existence of exogenous shocks and their interference in loan supply, the methodology can be used to compare a period before the shock and afterwards (Degryse et al., 2020). For example, Gan (2007) do so for the 1990 crash of land price in Japan, while Khwaja and Mian (2008) (using equation (i)) for the revelation of Pakistanis nuclear tests, which caused a dollar deposits shortage.

To control the unobserved effects in the panel data there is a need to implement the fixed effects approach. In this strategy, the unobserved effects are permitted to interact with the independent variables in each period (Wooldridge, 2012). When estimating the impact of state aids during the COVID-19 crises it is also vital to segregate the credit demand and supply. In the literature, the firm and bank fixed effects are being used as a proxy to the demand and supply of loans. The firm fixed effects were used firstly by Khwaja and Mian (2008) and Gan (2007) to account for unobserved firm heterogeneity in credit demand. However, the Khwaja and Mian (2008) approach (KM approach) “compare how the same firm’s loan growth from one bank changes relative to another more affected bank”. Thus, the firm must have more than one relationship with banks for equation (i) to be correctly specified, which can be a particular disadvantage since multi-bank firms may represent only a minor percentage of the total firms (Morais, Peydró, Roldán-Peña, & Ruiz-Ortega, 2019).

$$(i) \Delta L_{bf} = \alpha_f + \beta_b + \varepsilon_{bf}.$$

Where  $\Delta L_{bf}$  represents the loan growth,  $\alpha_f$  is the firm fixed effects and  $\beta_b$  is the bank fixed effects. Finally,  $\varepsilon_{bf}$  denotes the error term of the equation. The FE approach “tests whether the same firm borrowing from two different banks experiences a larger decline in lending from the bank facing a relatively greater fall in its liquidity supply” (Khwaja & Mian, 2008).

With the increasing availability of new databases, the time dimension was added to the new research. The firm-time (FI) fixed effects permit to fix the firm characteristics in a specific month (if time is defined in months), for example, Jiménez et al. (2012) applied when

studying the transmission mechanisms effectiveness of the monetary policy. Additionally, the use of monthly data may be the most adequate since we are studying a recent event with fine timing variations (Bernanke & Gertler, 1995). Low-frequency data may miss some effects as explained by Boeckx et al. (2020).

As an alternative to the firm-time fixed effects, Degryse et al. (2019) applied a new demand control, the industry-location-size-time fixed effects. The main advantages are the inclusion of the single-bank firms in the sample and the independence from an exogenous event. The former is especially important given the significantly different characteristics of single-bank firms. Degryse et al. (2019) show that credit supply shocks obtained through ISLT fixed effects are very similar to those from FT fixed effects. However, when applying to data with a major proportion of multi-bank firms they diverge significantly. On another side, Morais et al. (2019) “use firm\*bank and state\*industry\*month fixed effects to include firms that, in a given period borrow only from one bank”, they argue firm-time and state-industry-month fixed effects in loan-level regressions produce similar coefficients.



## Appendix 2

Regarding equation (10), the expressions presented in Table 3 are obtained as follow:

1. Before the shock, regarding the firms that did not benefit from state aids, the variables: aid and post will be both equal to 0:

$$\text{Log(credit)} = \beta_0 + \beta_1 * 0 + \beta_2 * 0 + \delta_3 * 0 = \beta_0$$

2. Before the shock, for firms that benefited from state aids the variable aid will assume the value 1 and the post 0:

$$\text{Log(credit)} = \beta_0 + \beta_1 * 1 + \beta_2 * 0 + \delta_3 * 0 = \beta_0 + \beta_1$$

3. After the shock, for the control group the aid dummy variable would equal 0 and the post variable 1:

$$\text{Log(credit)} = \beta_0 + \beta_1 * 0 + \beta_2 * 1 + \delta_3 * 0 = \beta_0 + \beta_2$$

4. After the shock, the treatment group have both aid and post equal to 1:

$$\text{Log(credit)} = \beta_0 + \beta_1 * 1 + \beta_2 * 1 + \delta_3 * 1 = \beta_0 + \beta_1 + \beta_2 + \delta_3$$

5. The difference-on-differences estimator results from the difference between the expressions obtained from the differences between points 4. and 3. and points 2. and 1.:

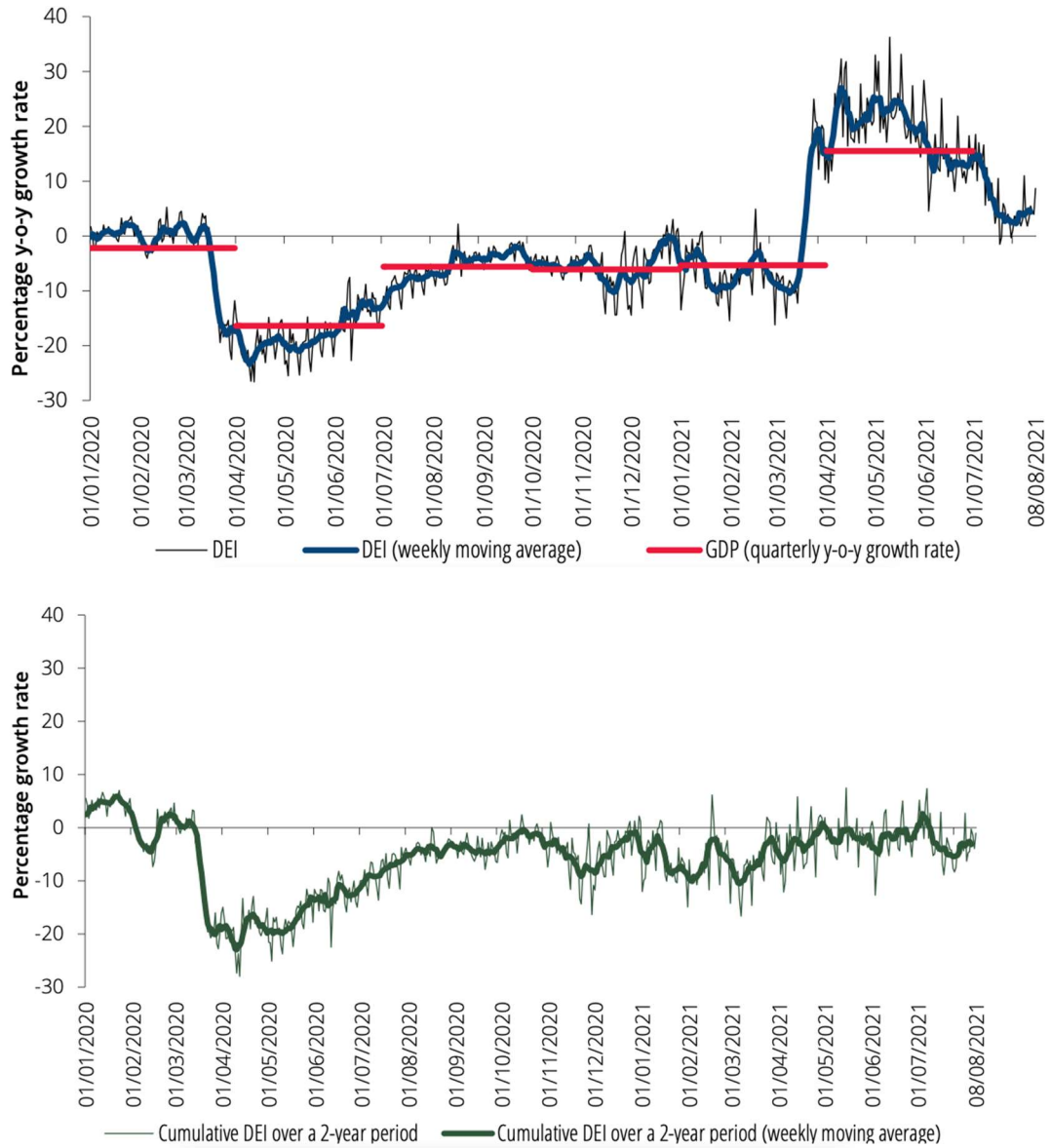
$$[ (4.) - (3.) ] - [ (2.) - (1.) ]$$

$$[ (\beta_0 + \beta_1 + \beta_2 + \delta_3) - (\beta_0 + \beta_1) ] - [ (\beta_0 + \beta_2) - (\beta_0) ] = (\beta_2 + \delta_3) - (\beta_2) = \delta_3$$

## 8. Annex

### Annex 1

Figure 13 - Daily Economic Indicator - 12 August 2021



Source: Banco de Portugal (2021a)

## Annex 2

**Table 10 - Layoff Examples**

Normal Remuneration	Remuneration under Layoff <sup>(1)</sup>	Social Security Support <sup>(2)</sup>	Remuneration paid by the employer <sup>(3)</sup>
635,00 €	635,00 €	444,50 €	190,50 €
650,00 €	635,00 €	444,50 €	190,50 €
750,00 €	635,00 €	444,50 €	190,50 €
960,00 €	640,00 €	448,50 €	192,00 €
1.000,00 €	666,67 €	466,67 €	200,00 €
1.500,00 €	1.000,00 €	700,00 €	300,00 €
2.000,00 €	1.333,33 €	933,33 €	400,00 €
2.500,00 €	1.666,67 €	1.166,67 €	500,00 €
3.000,00 €	1.905,00 €	1.333,50 €	571,50 €
5.000,00 €	1.905,00 €	1.333,50 €	571,50 €

<sup>(1)</sup> 2/3 of the normal (gross) remuneration of the employee (under the limits of 635€ to 1905€)

<sup>(2)</sup> 70% of 2/3 of the normal (gross) remuneration of the employee, until the maximum of 1335,5€

<sup>(3)</sup> 30% of 2/3 of the normal (gross) remuneration of the employee, until the maximum of 571,5€

*Source: Direção Geral do Emprego e das Relações de Trabalho (2020); (Segurança Social, 2021)*

## Annex 3

In situations of reduced normal working hours, the employee has the right to the salary in a proportion of the hours worked plus a compensation up to the 2/3 of the normal (gross) remuneration or the lower limit of 635€. The compensation is paid by the employer (30%) and by the state (70%).

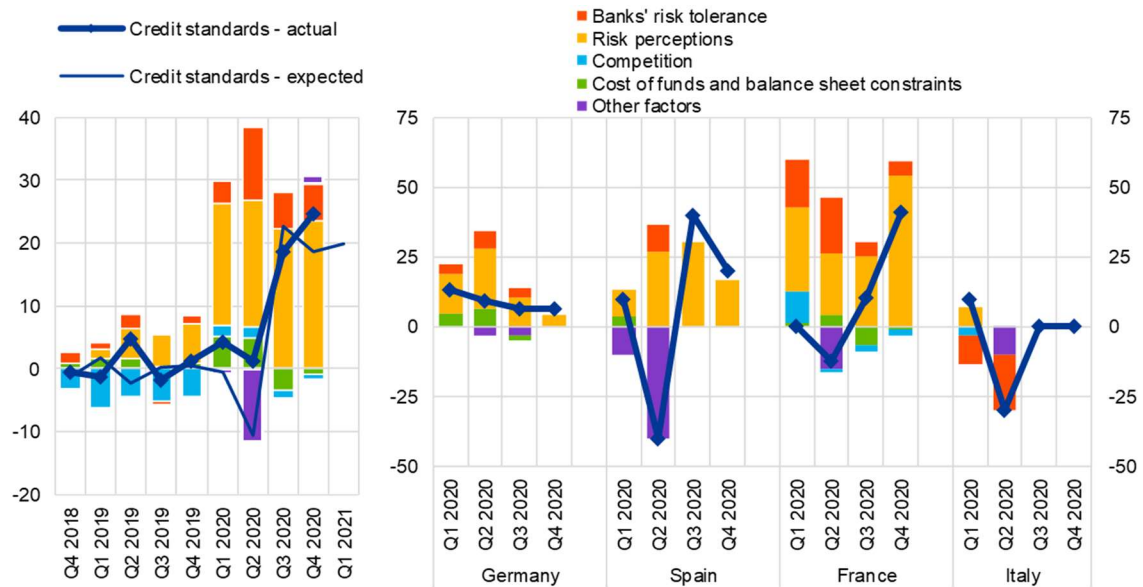
*Example:* If in a normal situation, the employee receives remuneration of 960€ and suffers a reduction of 70% in his working period, the employer pays 288€ (30% of 960€) due to the time worked. The difference between the 2/3 of the normal (gross) remuneration of the employee, that is 640€, and the remuneration by the time worked (288€) is equal to 352€. This difference is supported in part by the employer (30% of the difference), that is 105,6€ (30% of 352€) and in part by the support given by the state (70% of the difference), equivalent to 246,4€ (70% of 352€).

Notes: The layoff support is given by Social Security to the employer, and then, the employer is in charged to pay the worker wage. The only permitted use of this aid is salary payments, another end it is not allowed.

*Source: Direção Geral do Emprego e das Relações de Trabalho (2020); (Segurança Social, 2021)*

## Annex 4

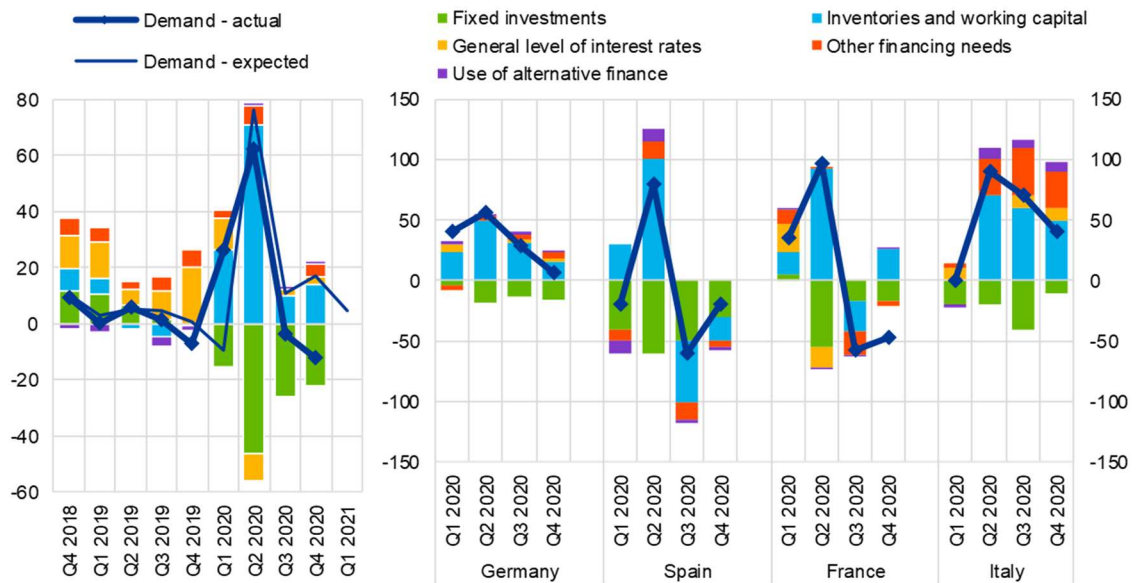
**Figure 14 - Variation in credit standards of loans or credit lines to enterprises, and contributing factors**



*Source: Bank Lending Survey (BLS) European Central Bank (2021)*

Due to the pandemic, in 2020 there was a tendency (all over Europe) to tighten the credit standards. According to the banks' report, the main reasons why there is an increase in the criteria for loans approvals are the banks' risk tolerance and the higher perception of risk. Support measures related to coronavirus are considered by the 'other factors' category that became a decisive easing force in the second quarter of 2020. The unconventional monetary policies from ECB to ease funds supply to the banking sector is also demonstrated here by the change sides of "Cost of funds and balance sheet constraints".

**Figure 15 - Variation in Loans or Credit lines demand to firms and contributing factors**

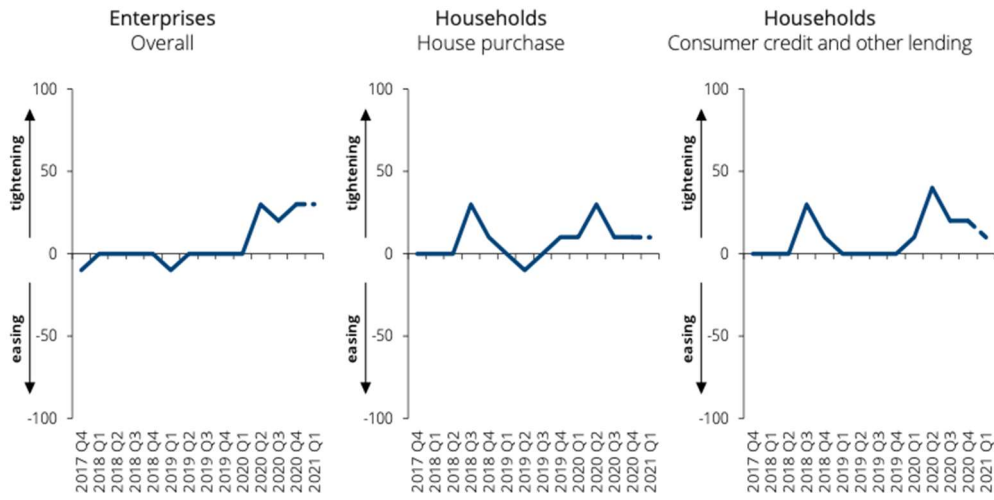


Source: European Central Bank (2021)

As shown in Figure 15, generally, in Europe, the credit demand increased until the second quarter of 2020, afterwards the demand change sharply decreased in the following quarters. The main reason for the increase in loans/credit lines demand was the inventory and working capital needs (that peaked at the second quarter of 2020). On the other side, the major factor which led to a demand reduction was the fall on fixed investments, which also achieved its maximum force in the second quarter. Since then, the credit demand started to diminish mainly due to the reduction of inventory and working capital needs.

Annex 5

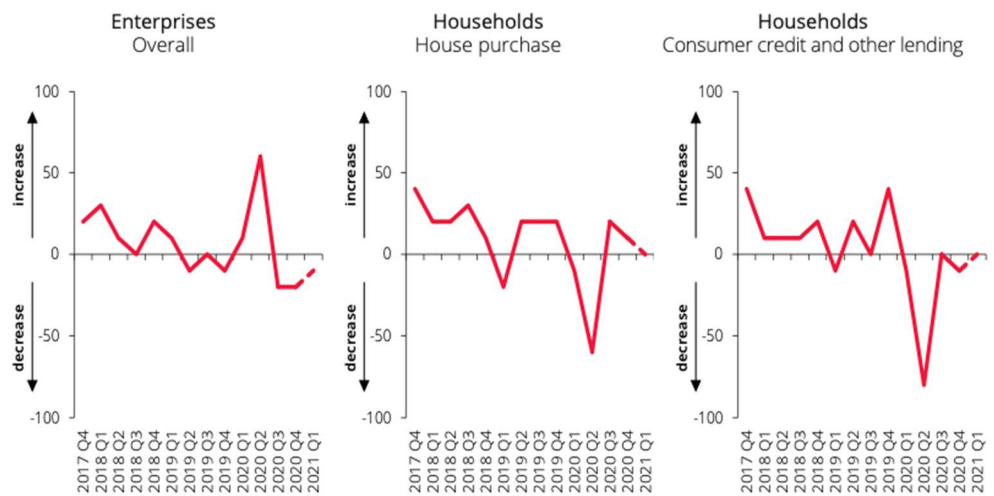
Figure 16 - Credit Supply



Notes: The credit supply corresponds to credit standards. The diffusion index varies between -100 and 100. Values of less (more) than zero mean an easing (tightening) of credit standards. Figures for the last quarter are banks' expectations.

Source: Banco de Portugal (2021d)

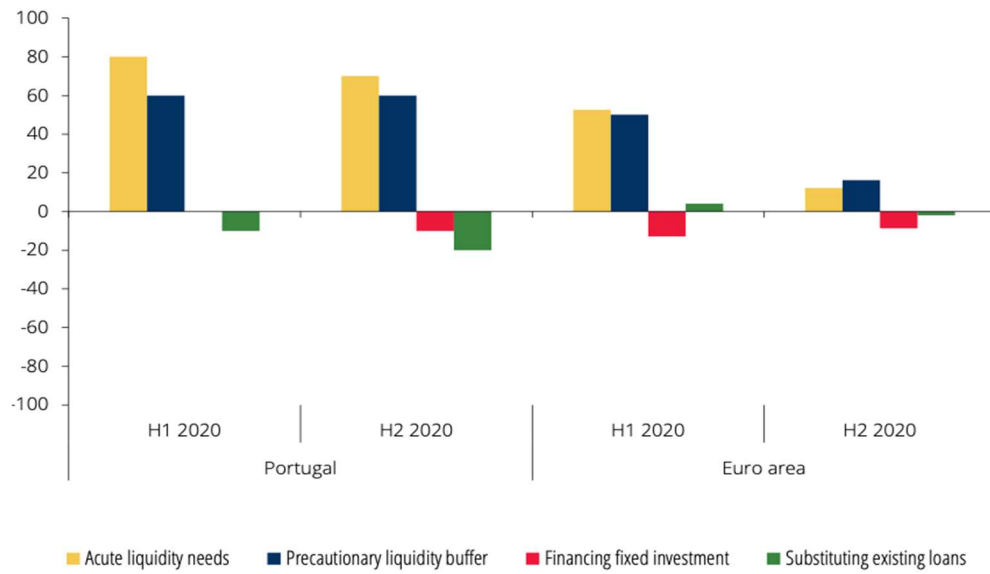
Figure 17 - Credit Demand



Notes: The diffusion index varies between -100 and 100. Values of less (more) than zero mean a decrease (increase) in credit demand. Figures for the last quarter are banks' expectations.

Source: Banco de Portugal (2021d)

**Figure 18 - Factors affecting the demand from enterprises for loans with State guarantee**



Sources: Banco de Portugal and ECB, Bank Lending Survey. | Notes: The diffusion index varies between -100 and 100. The value zero corresponds to the "no impact" situation. Index values higher (lower) than zero mean that the factor contributed to an increase (decrease) in credit demand.

*Source: Banco de Portugal (2021d)*

## Annex 6

**Table 11 - Portuguese Classification of economic activities (revision 3) vs. COVID-IREE activities**

Section	CAE Rev. 3	COVID-IREE	Code
<b>A</b>	Agriculture, farming of animals, hunting and forestry	Not included	-
<b>B</b>	Mining and quarrying	Manufacturing and energy	2
<b>C</b>	Manufacturing	Manufacturing and energy	2
<b>D</b>	Electricity, gas, steam, cold and hot water, and cold air	Manufacturing and energy	2
<b>E</b>	Water collection, treatment, and distribution; sewerage, waste management and remediation activities	Manufacturing and energy	2
<b>F</b>	Construction	Construction and real estate	3
<b>G</b>	Wholesale and retail trade; repair of motor vehicles and motorcycles	Distributive trade	4
<b>H</b>	Transportation and storage	Transportation and storage	5
<b>I</b>	Accommodation and food service activities	Accommodation and food services	6
<b>J</b>	Information and communication activities	Information and communication	7
<b>K</b>	Financial and insurance activities	Not included	-
<b>L</b>	Real estate activities	Construction and real estate	3
<b>M</b>	Consultancy, scientific and technical activities	Other Services	8
<b>N</b>	Administrative and support service activities	Other Services	8
<b>O</b>	Public administration and defence; compulsory social security	Not included	-
<b>P</b>	Education	Other Services	8
<b>Q</b>	Human health and social work activities	Other Services	8
<b>R</b>	Arts, entertainment, sports, and recreation activities	Other Services	8
<b>S</b>	Other service activities	Other Services	8
<b>T</b>	Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use	Not included	-
<b>U</b>	Activities of extraterritorial organizations and bodies	Not included	-



## Annex 7

General Statistics regarding the firms that participated on COVID-IREE survey.

**Table 12 - Classification by Economic Activity**

(Code) Economic Activity	Frequency	Percent (%)
(2) Manufacturing and energy	2,201	28.42
(3) Construction and real estate	882	11.39
(4) Distributive trade	2,357	30.43
(5) Transportation and storage	258	3.33
(6) Accommodation and food services	499	6.44
(7) Information and communication	293	3.78
(8) Other Services	1,255	16.20
<b>Total</b>	<b>7,745</b>	<b>100.00</b>

Note: The data presented is the full sample of COVID-IREE survey. The 7 745 firms are classified in 7 categorical sectors (presented on the first column of the table). The second column of this table shows the number of firms by economic sectors, while the third column shows the percentages.

Source: Own elaboration

Data: COVID-IREE dataset

**Table 13 - Classification by Size**

Firm Size	Freq.	Percent (%)	Cum. (%)
Microenterprise	1,619	20.90	20.90
Small enterprise	2,824	36.46	57.37
Medium-sized enterprise	2,250	29.05	86.42
Large enterprise	1,052	13.58	100.00
<b>Total</b>	<b>7,745</b>	<b>100.00</b>	

Note: The data presented is the full sample of COVID-IREE survey. The 7 745 firms are classified in 7 categorical sectors (presented on the first column of the table). The second column of this table shows the number of firms by economic sectors, while the third column shows the percentages.

Source: Own elaboration

Data: COVID-IREE dataset

**Figure 19 - No of firms starting to benefit from each type of support measure**



Note: The top left graph shows the number of firms that began to benefit from the moratoria on existing credits, while on the right the number of firms that began to benefit from state guarantees and subsidized credit lines. As for the bottom charts: the one on the left mentions the deferral of payment of taxes and other contributions; and the one on the right contains information regarding other state support. The vertical axis of each graph contains the company count and the horizontal axis shows the period to which the counts refer, starting with a weekly period and ending with a fortnightly period (each edition of COVID-IREE). A company that begins to benefit from a particular support in each period is counted for that period and no other. A company that receives more than one state support is counted in more than one graph. The data presented is the full sample of COVID-IREE survey.

*Source: Own elaboration*

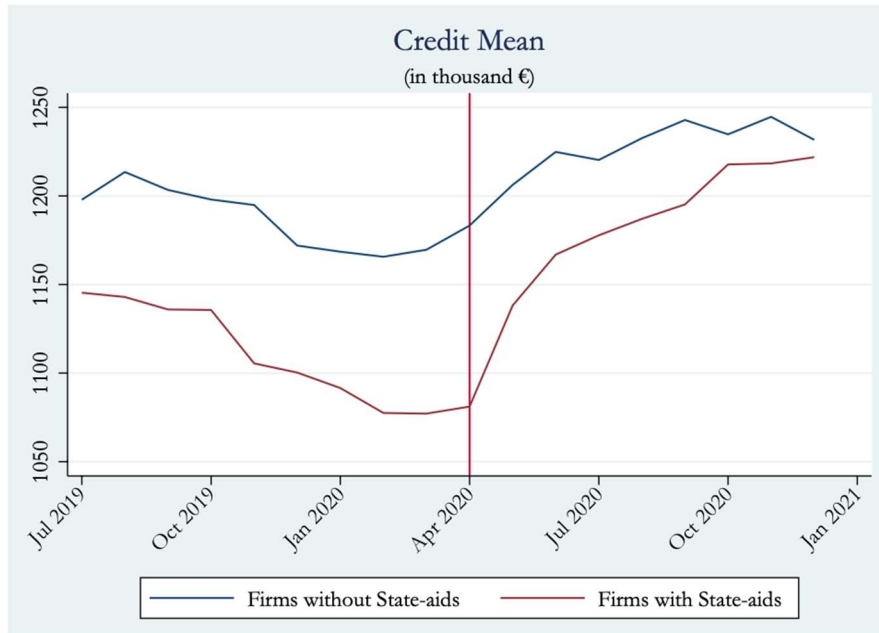
**Table 14 - Firms' characteristics (full sample)**

Variable	Firms Without State-aids		Firms With State-aids	
	Observations	Mean	Observations	Mean
Assets	4,424	35,063	2,493	19,736
Turnover	4,424	30,771	2,493	20,703
ROA	4,365	0.11	2,468	0.10
Cash Holding	4,424	0.15	2,493	0.11
Current Ratio	4,424	0.68	2,493	0.63
Quick Ratio	4,422	-2.34	2,491	1.66
Leverage net	4,424	0.05	2,493	0.16
Productivity	4,378	139,773	2,481	49,892
Profitability	4,424	0.07	2,493	0.06
Interest	4,424	404,782	2,493	211,940
EBIT	4,424	2,143,524	2,493	994,759
Interest Coverage	3,589	91,600	2,258	13,153

Note: The variable Assets represent the total assets of a company, and it is on thousand euros. The variable Turnover means the sum of sales and services on thousand euros. The ROA (return on assets) is the last 3-year average of the ratio EBITDA over Assets. The Cash Holding represents the cash and bank deposits over total assets. The Current Ratio is the ratio between the total current assets over the total assets. The Quick Ratio represents the difference between the total current assets and the inventories and biological assets over total current liabilities. The Leverage net is the ratio between the firm's debt excluding cash and bank deposits over the sum of equity and total liabilities. The productivity is the ratio between the nominal value and the number of employees the firm has. The nominal value considered here is the difference two parts: first, the sum of the turnover, the operating subsidies, the variation in production, the capitalized production, and the supplementary income; and the second part the sum of the cost of goods sold and material consumed, the supplies and external services, and the indirect taxes. The profitability is the ratio of EBIT over the Total assets. The Interest and EBIT represent, respectively, the interest expenses and the earnings before interest and taxes, on euros. The Interest Coverage ratio means the EBIT over interest. The data considered was the full sample of the COVID-IREE survey and the CB dataset (firm's balance sheet). The 6917 firm on this table are divided on two sides, the 2493 firms who benefited from at least one government support (right) and the 4424 firms who did not (left).

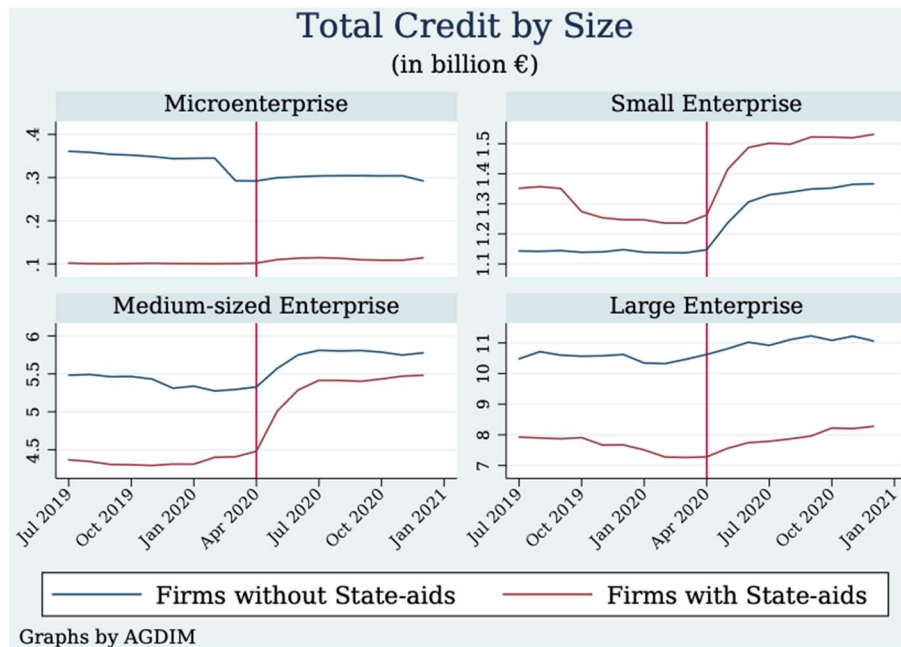
Annex 8

Figure 20 - Credit Mean by the use of state aids



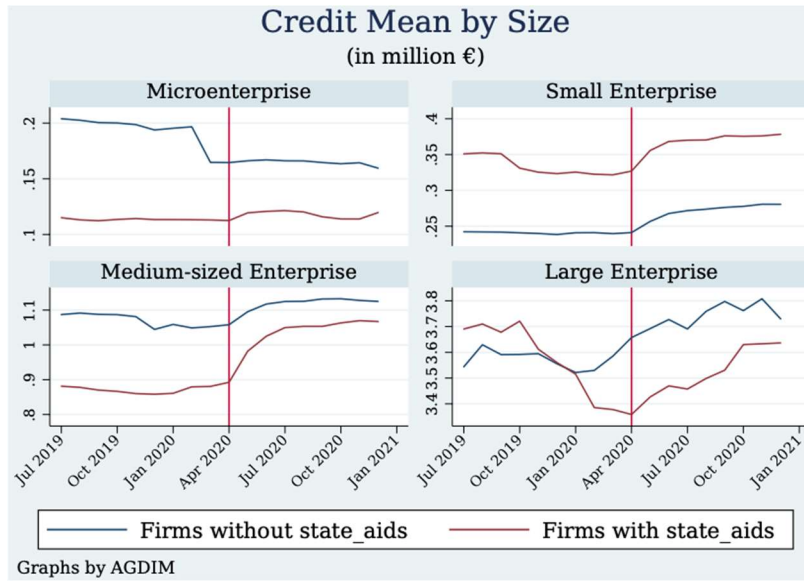
Note: The data showed in the graph is from Central Credit Responsibility Database and the COVID-IREE survey. The graph presents the averages by month of firms' total credit, considering the use of support measures set by the state. Total credit is the sum of regular credit (i.e., the credit that the firms actually have), potential credit (i.e., credit that firms can access promptly) and overdue credit (i.e., credit with default payments).

Figure 21 - Total Credit by size and by the use of state aids



Note: The data showed in the graph is from Central Credit Responsibility Database and the COVID-IREE survey. The graph presents the total credit to firms by month, considering the firm' size and the use of support measures set by the state. Total credit is the sum of regular credit (i.e., the credit that the firms actually have), potential credit (i.e., credit that firms can access promptly) and overdue credit (i.e., credit with default payments).

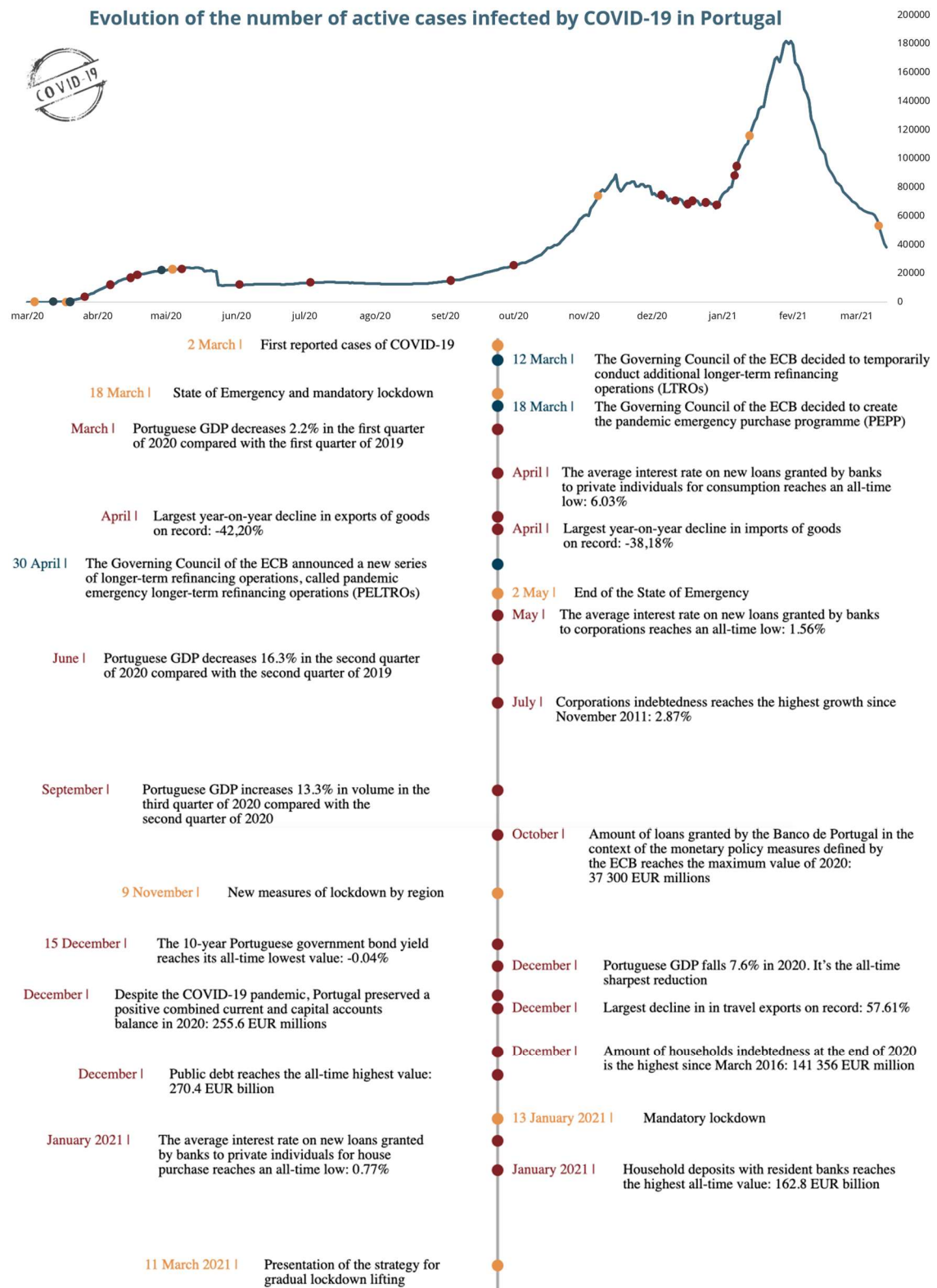
**Figure 22 - Credit Mean by size and by the use of state aids**



Note: The data showed in the graph is from Central Credit Responsibility Database and the COVID-IREE survey. The graph presents the total credit mean of firms by month, considering the firm' size and the use of support measures set by the state. Total credit is the sum of regular credit (i.e., the credit that the firms actually have), potential credit (i.e., credit that firms can access promptly) and overdue credit (i.e., credit with default payments).

## Annex 9

### Figure 23 - Pandemic Evolution & Main Events



Source: Banco de Portugal (2021b)

## Annex 10

### Matching Process – CEM

The variables used to compare the control group and treatment group are the following: Total Credit, Profitability, Firm Size and Economic Activity Sector. When we apply this process to the full sample considering the adoption of any state aid the outputs are the next:

**Table 15 - CEM Output**

Matching Summary:							
Number of strata: 95							
Number of matched strata: 53							
	0	1					
All	4424	2493					
Matched	4374	2481					
Unmatched	50	12					
Multivariate L1 distance: 0.40256579							
Univariate imbalance:							
	L1	mean	min	25%	50%	75%	max
valor_global	0.12448	1.1e+06	0	1.3e+05	5.7e+05	2.2e+06	1.4e+06
profitability	0.08277	-0.01314	0.62321	0.00049	-0.00943	0-0.02472	0.11884
AGDIM	0.04961	0.04961	0	0	0	0	0
AGCAE	0.03365	-0.03365	0	0	0	0	0
(62 observations deleted)							

**Table 16 - No. firms after the matching process**

Aid	Freq.	Percentage
<b>0</b>	4,374	63.81%
<b>1</b>	2,481	36.19%
<b>Total</b>	6,855	100.00%

The outputs of the matching process that applies as treatment each type of state support measure are as follows:

**Table 17 - CEM Output using Moratoria treatment**

Matching Summary:		
Number of strata: 95		
Number of matched strata: 43		
	0	1
All	5643	1274
Matched	5550	1271
Unmatched	93	3
Multivariate L1 distance: 0.52345099		

---

Univariate imbalance:

	L1	mean	min	25%	50%	75%	max
valor_global	0.23859	2.2e+06	628	4.2e+05	1.5e+06	4.0e+06	1.4e+06
profitability	0.18449	-0.02594	0.00328	-0.00166	-0.01714	-0.04398	-0.19139
AGDIM	0.04008	0.04008	0	0	0	0	0
AGCAE	0.03846	-0.03846	0	0	0	0	0

(96 observations deleted)

---

**Table 18 - No. firms after the matching process**

Aid	Freq.	Percentage
<b>0</b>	5,550	81.37%
<b>1</b>	1,271	18.63%
<b>Total</b>	6,821	100.00%

**Table 19 - CEM Output using Guarantee treatment**

---

Matching Summary:

Number of strata: 95

Number of matched strata: 30

	0	1
All	6119	798
Matched	5915	797
Unmatched	204	1

Multivariate L1 distance: 0.54444762

---

Univariate imbalance:

	L1	mean	min	25%	50%	75%	max
valor_global	0.21118	1.8e+06	62	3.9e+05	1.2e+06	2.7e+06	-2.8e+07
profitability	0.16367	-0.00888	0.26835	0.00366	-0.00835	-0.02307	0.45527
AGDIM	0.0618	0.0618	0	0	0	0	0
AGCAE	0.04088	-0.04088	0	0	0	0	0

(205 observations deleted)

---

**Table 20 - No. of firms after CEM - Guarantee**

Guarantee	Freq.	Percentage
<b>0</b>	5,915	88.13%
<b>1</b>	797	11.87%
<b>Total</b>	6,712	100.00%

**Table 21 - CEM Output using Tax treatment**

---

Matching Summary:

Number of strata: 95

Number of matched strata: 48

	0	1
All	5428	1489
Matched	5361	1478

Unmatched 67 11  
 Multivariate L1 distance: 0.43566444

---

Univariate imbalance:

	L1	mean	min	25%	50%	75%	max
valor_global	0.07349	4.9e+05	0	87352	3.4e+05	7.8e+05	-3.5e+07
profitability	0.08787	-0.01371	0.62321	-0.00329	-0.01034	-0.02208	0.11884
AGDIM	0.05804	0.05804	0	0	0	0	0
AGCAE	0.02291	-0.02291	0	-1	0	0	0

(78 observations deleted)

---

**Table 22 - No. of firms after CEM - Tax**

Tax	Freq.	Percentage
0	5,361	78.39%
1	1,478	21.61%
<b>Total</b>	<b>6,839</b>	<b>100.00%</b>

**Table 23 - CEM Output using other aids treatment**

---

Matching Summary:  
 Number of strata: 95  
 Number of matched strata: 29

	0	1
All	6267	650
Matched	6089	648
Unmatched	178	2

Multivariate L1 distance: 0.51712826

---

Univariate imbalance:

	L1	mean	min	25%	50%	75%	max
valor_global	0.03933	-2.5e+05	0	18387	-6738	-29460	-3.5e+07
profitability	0.07763	0.00469	0.62321	0.00319	0.00018	0.00576	0.29308
AGDIM	0.00227	-0.00227	0	0	0	0	0
AGCAE	0.01968	-0.01968	0	0	0	0	0

(180 observations deleted)

---

**Table 24 - No. of firms after CEM - Other aids**

Other	Freq.	Percentage
0	6,089	90.38%
1	648	9.62%
<b>Total</b>	<b>6,737</b>	<b>100.00%</b>



## Annex 11

Figure 24 - No. of answered surveys

Nº of answered surveys	Freq.	Percent	Cum.
1	680	8.78	8.78
2	568	7.33	16.11
3	513	6.62	22.74
4	533	6.88	29.62
5	624	8.06	37.68
6	810	10.46	48.13
7	1,364	17.61	65.75
8	2,653	34.25	100.00
<b>Total</b>	<b>7,745</b>	<b>100.00</b>	

Note: in this figure, the 7745 firms (that responded to the COVID-IREE survey) are divided by the number of editions in which the firms participated.

*Source: Own elaboration Data: COVID-IREE survey*