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The consequences of COVID-19 crisis on firms' liquidity needs

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Abstract

The economic recession triggered by the Covid-19 pandemic has generated a negative impact on firms' liquidity needs, induced both by the rigidity of costs and financial commitments and by the drop in sales linked to the restrictions on economic activities imposed during the periods of pandemic propagation. This paper analyzes these effects on the liquidity needs of Italian firms, before and after the government support interventions, focusing on non-financial firms with revenues up to EUR 50 million and with fewer than 250 employees. By constructing a new dataset that integrates information from multiple sources, we show that government measures have strongly contributed to mitigate the effects of the crisis, almost halving the percentage of companies in liquidity crisis at the end of 2020 (from 38.1% to 18.2%) and limiting the liquidity requirements of companies from 83.7 to 26.5 billion. The access to public guarantee schemes on loans would have further reduced the deficit to EUR 18.5 billion. Debt standstills and fixed cost refunds have been very effective in supporting firms, that have actually recorded a liquidity deficit due to pandemic crisis.

JEL codes: H32, G01, G33
Keywords: COVID-19, Firms, Liquidity

1 Introduction

The economic recession triggered by the Covid-19 pandemic has generated a negative impact on firms' liquidity needs, induced both by the rigidity of costs and financial commitments and by the drop in sales linked to the restrictions on economic activities imposed during the periods of pandemic propagation. Banerjee et al. (2020), using corporate financial statements of 2019, estimate that following a 10% drop in revenues, operating expenses only fall by 6% on average. Therefore, one of the first challenges faced by most governments was to avoid that illiquid but solvent firms would go bankrupt. Thereby a key task for governments was to estimate the amount of liquidity needed to avoid crises and the potential number of companies affected, in order to design a set of policy measures able to minimize the liquidy shortage of firms. These estimates turned out to be crucial for formulating policies aimed at helping businesses in a timely manner (OECD (2020)). Despite of the heterogeneous impact of the policies implemented to address the liquidity gaps on firms and sectors, Ebeke et al. (2021) estimate that announced policy measures in advanced economies of the European Union could have potentially reduced Covid-19-induced liquidity shortfalls by four fifths on average. Among the policy measures, the study suggests that guaranteed loans, job-retention programs, and debt moratoria contribute the most to lowering the liquidity gap. After tackling the initial emergency, in the post-lockdown economy, governments will have to find the right policy-mix to sustain the recovery especially for those markets in which the duration of the shock is still highly uncertain. Blanchard et al. (2020) suggest that public efforts should be focused on including a gradual phasing out of job-retention schemes and the phasing in of sectoral wage subsidies to create incentives to resume production. At the same time, credit guarantees for new loans should continue and a lean process loan restructuring programme should be put in place to better address the likely increase in the number of insolvencies.

We initially undertook this analysis in April 2020 to provide a quantitative contribution to the policymaker, helpful in defining the interventions to support businesses that would have been included in the Covid-19 decrees (starting with the"Rilancio" decree). The results were extended through the use of ex-post data presented in this paper. We extend the accounting framework proposed by Schivardi (2020) that aims at determining which firms will have liquidity constraints and to what extent. We do so, firstly, by constructing a micro-founded database that includes information from multiple sources and allows measuring the variability of the effects on each individual firm of the sample. Thanks to the granularity of the available data, we are able to estimate changes in revenues and costs for each individual firm for every month of

2020. Specifically, information regarding the cost and revenue structure of each firm is derived from the most recent available financial statements[1].

To estimate the changes of such macro aggregates in 2020, we have implemented a forecasting method based on data from VAT returns. Companies are periodically required to submit periodic VAT returns - LIPE[2] - showing all positive transactions subject to VAT (e.g. sales of goods and services) and all negative transactions including those not subject to VAT (e.g. costs for purchase of raw materials, services, etc.) relating to the reference period. We calculate the growth rate of positive components subject to VAT for any month in 2020 compared to those in 2019 and apply this rate to 2019 revenues to estimate the value of sales in 2020. Instead, assuming lease and rental costs constant over the period, raw material and services costs in 2020 were calculated as the sum of their balance sheet value in 2019 and the difference, resulting from LIPE statement on negative components, between each month of 2020 and the corresponding month of 2019. The estimate of labor costs for 2020 was obtained using the data provided by INPS on wages' expenditure at firm level[3]. In particular, we calculated the rate of change between the wages paid by each firm in each month of 2020 starting from March and the average wages paid by the same firm between January and February 2020. Thanks to this approach, we are able to estimate the variations experienced by each individual firm, thus including in the analysis also a degree of "within sector" heterogeneity, and ensuring a high degree of accuracy in the simulation of revenue and cost trends.

In addition to previous contributions, we have also included in the analysis the effects of the supporting measures provided by the government from March 2020 to December 2020: the "Cura Italia", "Liquidità", "Rilancio", "Agosto", "Ristori", "Ristori Bis", "Ristori Ter" and "Ristori Quater" decrees. This allowed us to highlight the extent to which government support contributed to mitigating the liquidity crisis, while also taking into account sectoral and regional differences in the intensity of support resulting from the regulatory differences introduced by these decrees.

In our contribution we analyse the effects of the Covid-19 shock on the liquidity needs of Italian non-financial firms with revenues up to EUR 50 million and with less than 250 employees, which account for over 20% of the country's total value added and include firms which were most affected by the restrictions on economic activities

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[1]2019 financial statements for corporations and RS section of the 2018 Income Model for partnerships.

[2]LIPE stands for "Liquidazioni periodiche IVA".

[3]The INPS data available, and therefore used in the analysis, refer only to corporations.

imposed to deal with the pandemic. The sample includes corporations (797,224)[4] and partnerships with ordinary accounts[5] (228,920). The analysis shows how government support has strongly contributed to mitigate the effects of the crisis; in particular, we find that these measures have almost halved the percentage of companies in liquidity crisis at the end of 2020 (from 38.1% to 18.2%) and have limited the liquidity requirements of companies from 83.7 to 26.5 billion. In addition, by including in the analysis the public guarantee schemes on loans provided by the "Liquidità" decree, the deficit would be reduced to EUR 18.5 billion and the share of companies in liquidity crises to 13.5%. With respect to support measures, we found that debt standstill and support to business expenditures have been very effective in supporting businesses, especially those that have actually recorded a liquidity deficit.

The results derived from our analysis are consistent with those proposed by other institutions like Bank of Italy (2020) and European Commission (2020), whose work is based on a methodology relying on the early contribution of Schivardi (2020).

Section 2 provides a brief description of the methodology implemented to estimate liquidity deficit for each firm. In Section 3 we describe the support measures adopted by the Government in the period of interest, while Section 4 shows the main results of the analysis. Section 5 concludes.

2   Methodological approach

Firms' liquidity requirement was simulated starting from the immediate liquidity, intended as cash and cash equivalent, observed in the most recent balance sheet data. Then the operating cash flow was calculated, with a top-down approach, by subtracting to the revenues the costs sustained for the purchase of goods and services, for the lease of assets and for wages and salaries, and by excluding loan repayments and related interests, taking into account the debt standstill introduced with the "Cura Italia" decree and extended by the "Agosto" decree. Also, we assumed that expenditure to finance new investments (or the mere replacement of obsolete machinery) was reduced to zero during the period considered. The analysis, therefore, provides a conservative estimate of the overall liquidity needs of companies. The baseline equation, in the case

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[4]From the initial sample of companies included, have been excluded, for the purposes of analysis: (i) companies in conditions of non-normal activity; (ii) companies that carry out financial activities (ATECO 64-66); (iii) companies with revenues above EUR 50 million.

[5]partnerships with simplified accounts are excluded form the analysis

of a debt standstill and interest freeze is the following:

$$L_{i,t} = L_{i,t-1} + V_{i,t} - C_{i,t} \qquad (1)$$

where $L_{i,t}$ and $L_{i,t-1}$ represent, respectively, the liquidity at time t and time $t-1$ of the i-th company, $V_{i,t}$ represents the revenues of ordinary operations and $C_{i,t}$ represents the costs, in the reference period, t, under the assumption of no time lags between incomes and payments and their accounting records.

Thanks to this dynamic equation, it is possible to calculate both the number of companies that could have become illiquid by the end of 2020 and the size of the liquidity deficit for each company and for the economy as a whole. In particular, an illiquid firm is defined as a firm whose liquidity at time t, simulated through the above equation, is strictly negative, while a liquidity deficit is the amount required by each firm to restore the value of its liquidity to a non-negative level.

In this perspective, a main aspect is that the soundness of this simulation takes advantage of the most up-to-date information available on the actual performance of the real economy, strictly reflecting the changes in the cost and revenue structure of individual economic operators. Specifically, as better explained in the followings paragraphs, for any month of 2020 the LIPE statements allow to simulate with accuracy the shifts both on revenues and intermediate expenses (to be intended as costs for raw materials and services, not including lease and rental ones because of the assumption on their inter-temporal in-variance), while INPS data enables a sound estimate of the wages expenditure.

Considering these further details, equation (1) can be rewritten as:

$$L_{i,t} = L_{i,t-1} + V_{i,t} - M_{i,t} - G_{i,t} - W_{i,t} \qquad (2)$$

Where t refers to each month starting from January 2020, i represents each company included in the analysis, and, as mentioned before, $L_{i,t}$ and $L_{i,t-1}$ are respectively, the liquidity in the month t and $t-1$ of the i-th company. Instead $V_{i,t}$ is the monthly value of sales for the i-th company in the month t, $M_{i,t}$ the monthly value of costs of raw materials and services sustained by the i-th company in the month t, while $G_{i,t}$ refers to the monthly costs for the use of third party assets undergone by the i-th company in the month t and $W_{i,t}$ is the monthly costs for employees experienced by the i-th company in the month t.

Before going into more details we would like to stress that, considering that the balance sheet only provides annual aggregates and that our analysis is conducted on a monthly basis, at a preliminary stage we proceeded by disaggregating the macro items of 2019 revenues and intermediate costs on a monthly basis. To do this, the value of sales and intermediate costs for the i-th company in the t-th month of 2019 (respectively $V_{i,t-12}$ and $M_{i,t-12}$) are calculated by multiplying the annual value of the items observed for the i-th company in the 2019 balance sheet by a weighting factor defined ad hoc per each month of the year. The size of this weighting factor, identified at the 6-digit ATECO level, is defined by calculating the relative weight of each month on the annual taxable amount observed from the 2019 e-invoicing data. This makes it possible to reconstruct a picture of the trend in cash flows in line with the businesses' operations, reproducing any seasonal trends or particular concentration of flows at certain times of the year.

Moreover, as better clarified in the following, $V_{i,t}$, $M_{i,t}$ and $W_{i,t}$ can be so represented:

$$V_{i,t} = V_{i,t-12} * (1 + \gamma_{i,t/t-12}) \tag{3}$$

$$M_{i,t} = M_{i,t-12} + \Delta M_{i,t/t-12} \tag{4}$$

$$W_{i,t} = W_{i,t-12} * (1 + \lambda_{i,t/\bar{t}}) \tag{5}$$

Firstly, in order to obtain $V_{i,t}$ we exploit VAT declarations acquirable from 2020 LIPE statements. Through the latter it is possible to calculate for each month of 2020 the growth rate of the positive component ($\gamma_{i,t/t-12}$) compared to the same month of 2019. Assuming that for each firm i the revenues change at the same rate as the positive components, we calculate $V_{i,t}$ for each month of 2020 by applying the coefficient γ to the balance sheet value of the same month of 2019, $V_{i,t-12}$.

Instead, $M_{i,t}$ was calculated as the sum of the balance sheet value in 2019 $M_{i,t-12}$ and the difference, resulting from LIPE statement on negative components, between each month of 2020 and the corresponding month of 2019 ($\Delta M_{i,t/t-12}$)[6]. The different

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[6]In the absence of periodic VAT returns, the variation in revenue is applied to the increase or decrease resulting from the comparison between 2019 and 2020 of the electronic invoicing data, available by 6-digit ATECO sector. For the purpose of the simulation of the costs for the purchase of raw materials and services, the elasticity to the change in revenue is calculated by identifying a representative value for the sector: in particular, the median value that can be found from the distribution of the entities - with sign matching between the change in revenue and costs - for which

treatment of cost items with respect to revenues is due to the fact that the negative components of LIPE include both costs for raw materials and services and, if incurred, lease and rental costs. Due to the heterogeneity of lease and rental costs, both in terms of occurrence (depending also on the legal nature of the ownership of the assets) and distribution through the year (monthly, quarterly, half yearly, etc.) and the impossibility to disaggregate the two cost components, applying the aggregate rate of change in negative components to the 2019 budget value would have resulted in an underestimation (or overestimation, according to the specific cases) of the monthly changes. To avoid also distortions at firm level, therefore, we assumed the lease and rental costs as constant, between years and on a monthly basis, and treated them separately. In the meanwhile, this invariance assumption allowed us to calculate per each month of 2020 the value of costs of raw materials and intermediate services by adding to the 2019 budget values the absolute change in the negative components of LIPE.

As specified in the paragraph above $G_{i,t}$ was considered constant from one year to the next and on a monthly basis and, therefore, we calculated it by equally reproportioning the costs for the use of third party assets resulting from the 2019 balance sheet over each month of 2020.

Finally, $W_{i,t}$ is calculated starting from the cost of employees reported in the balance sheet, split for each month of 2019. Then, in order to calculate the salaries' expenditure in 2020, we exploited the availability of INPS data on wages paid by companies. In particular, we calculated the rate of change between the wages paid by each firm in each month of 2020 starting from March 2020 and the average wages paid by the firm between January and February 2020 ($\lambda_{i,t/\bar{t}}$) and we applied this to the wages reported in the balance sheet for 2019. It was not possible to directly include the value of INPS wages in the cash flow calculation because these do not include the entire amount of the payroll but only a portion of it (net of the company's social security contributions), since for the cash flow calculation it was necessary to include all the company's expenses.

3 Measures introduced by the Government to support businesses

In order to quantify the actual liquidity need at the end of 2020, the analysis includes all the measures implemented by the Government from March to December 2020. The

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the data was available in the periodic returns.

"Cura Italia" decree (D.L. 18/2020) introduced the debt standstill, extended the social safety net and suspended some fiscal payments. The "Liquidità" decree (D.L. 23/2020) introduced loan guarantees to support businesses and further extended fiscal payments deadlines. The "Rilancio" decree (D.L. 34/2020) introduced the non-repayable grants and other measures to support business expenditures. The "Agosto" decree (D.L. 104/2020) and the "Ristori" decree (D.L. 104/2020) strengthened the measures previously adopted. Whereas, the "Ristori Bis", "Ristori Ter" and "Ristori Quater" decrees (D.L. 149/2020, D.L. 154/2020, D.L. 157/2020) are based on the DPCM introduced in November (Figure 1) which identifies different areas of risk (yellow, orange and red zones) within the national territory and determines different levels of restrictions on businesses. These restrictions had a different impact on regions, as reported in Figure 1. The map is built from an index based on the number of days each region spent in the yellow, orange or red zone (regions classified as red for many days are coloured dark red, while regions classified as yellow for the whole period are coloured light pink). A brief analysis of the Government support interventions is useful to understand the impact they had on the liquidity need.

Figure 1: Restrictive measures adopted following the DPCM of 3 November

Note: This figure was constructed from a measure based on the number of days each region was in a given range (from dark red for regions in the red zone for a greater number of days to light pink for regions that remained in yellow zone for the entire period).

3.1 Debt standstill

The "Cura Italia" decree established that micro, small and medium-sized enterprises facing a liquidity shortage can benefit from a debt standstill, available until 30 September 2020 and extended to 31 January 2021 by the "Agosto" decree. The debt standstill refers to long-term loans - not impaired - such as mortgages, instalment loans, non-accrual loans and credit lines. In order to simulate the operating cash flow, debt repayments and related interests are excluded from the simulation.

3.2 Social safety net

In order to simulate the financial outlays related to labour costs, it is necessary to take into account the social safety net as extended by the "Cura Italia" decree and available from 23 February to 31 August 2020. To do this, we use INPS data on wages actually paid. In detail, we compare the wages paid by each firm in each month of 2020 starting from March 2020 and the average wages paid by firms between January and February 2020. From this comparison, we determine for each enterprise a coefficient λ which represents, if negative, the percentage of the remuneration paid directly by INPS [7]. To compute the monthly operating cash flow, the simulated wages are computed by applying the coefficient λ to the wages declared in the balance sheets split for each month in a year time. The "Agosto" decree extended the social safety net for further nine weeks from 13 July to 31 December 2020.

3.3 Non-repayable grants

The "Rilancio" decree introduced a non-repayable grant proportional to the reduction in turnover due to the emergency for VAT number holders who carry out business and self-employment activities. This contribution was introduced for enterprises with a turnover not exceeding EUR 5 million and belonging to one of the following categories: companies with a turnover in the month of April 2020 less than two thirds of the turnover in April 2019; companies with a fiscal domicile in a municipality affected by calamitous events. The amount of the contribution is calculated by applying a percentage to the difference between the turnover in April 2020 and the turnover in the same month of the previous year. There are different percentages according to the revenue declared in the balance sheet 2019[8], and it is also considered a minimum

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[7]It is assumed that the composition of labour costs is the same in the compared periods. This is not true, for example, in the case of seasonal work or restructuring phases. If INPS data are not available, the coefficient λ corresponds to the median value observed in the sector to which the firm belongs.

[8](i) 20%, in the case of revenues and fees less than or equal to EUR 400,000; (ii) 15%, in the case of revenues and fees exceeding EUR 400.000, but not exceeding EUR 1.000.000; (iii) 10%, in the case

contribution. On the other hand, the "Agosto" decree provides for a non-repayable contribution to restaurants and catering activities[9] whose average turnover for the months from March to June 2020 is less than three quarters of the previous year. In detail, a contribution is granted to enterprises that satisfy the requirements described above and it is calculated by dividing the EUR 600 million fund allocated by the Government proportionally to the expenses faced by each possible beneficiary. This contribution is attributed in November with a minimum amount of EUR 1.000 and a maximum amount of EUR 10.000. The "Ristori" decree extends the scope of the benefit to the month of December for enterprises with revenues higher than EUR 5 million. Similarly, the contribution amount incorporates the "Ristori Bis", "Ter" and "Quater" decrees, which further enlarged the population of beneficiaries and, at the same time, intensified the scope of the measure.

3.4 Suspended and exempted fiscal payments

These measures introduced by the Government refer to the value added tax, the regional tax on productive activities and the corporate income tax.

3.4.1 Value Added Tax

The "Cura Italia" decree provided for the suspension of VAT payments due in March until 31 May, in favour of those enterprises that meet the requirements. This deadline was extended until 16 September by the "Liquidità" decree and the "Rilancio" decree, which also introduced the possibility to pay in one lump sum or by instalments. The "Agosto" decree introduced further support to businesses by halving the amount of the payment to be made by 16 September. It established that the remaining 50% of the total amount can be paid in a number of instalments of up to a maximum of 24 with the first instalment due by 16 January 2021. The "Ristori Bis", "Ter" and "Quater" decrees postponed the VAT payments due in November and December, and extended the scope of the support not only to eligible enterprises, but also to those particularly affected sectors[10] and to those businesses operating in territorial areas at risk according to the DPCM introduced in November. It should be remarked that the operating cash flow calculation does not take into account the time mismatch between the collection and the payment of VAT on sales and purchases, and neither considers the payment to the Treasury. However, if the enterprise can benefit from the suspended VAT, the considerable time extension requires the inclusion of the VAT debt in the monthly cash flow calculation. This corresponds to additional liquidity for the enterprise in

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of revenues and fees exceeding EUR 1.000.000 but not exceeding EUR 5.000.000.

[9]ATECO Codes 56.10.11, 56.29.10 and 56.29.20.

[10]ATECO Codes 56, 55.10.00, 79.1, 79.11, 79.12, 47.72.10.

a given month. Therefore, using the data provided by the periodic VAT returns for 2020, the difference between VAT due and VAT deducted[11] , if positive, represents a financial resource for the enterprise. With regard to the VAT credit, deriving from the previous month, it is assumed to be directly absorbed in the month in which it was generated, while the credit from the previous period is added to the cash flow in the corresponding months.

3.4.2 Regional tax on productive activities

The "Rilancio" decree provided for the exemption of the 2019 balance payment and the first instalment of the 2020 advance payment, in favour of businesses with turnover of less than EUR 250 million in the previous tax period. The "Agosto" and "Ristori Quater" decrees postponed the deadline for the payment of the second instalment of the IRAP in favour of businesses with a turnover of less than EUR 50 million and enterprises that suffered a decrease in turnover of at least 33% in the first half of 2020 compared to the previous year. The 2019 IRAP balance and the 2020 IRAP advance payments are treated separately. In the first case, for each enterprise, the residual amount of the tax period 2019 is assimilated to the amount recorded in the tax period 2018, assigning an increase in the cash flow to taxable persons with a credit for the IRAP already paid. In order to determine the taxable base, for the calculation of the 2020 IRAP advance payments, the historical method (taking the net production value resulting from the last IRAP declaration for the 2018 tax year) and the forecasting method are compared, opting for one or the other depending on which is less onerous for the enterprise. In this way, it is possible to identify the IRAP payment split in two instalments for the calculation of the related advances, and the negative cash flow charged to the month of December for all businesses except for those that meet certain requirements.

3.4.3 Corporate Income Tax

According to the DPCM of 27 June 2020, the deadline for the 2019 balance payment and the 2020 first advance payment was extended for taxpayers that apply the Synthetic Indexes of Reliability (ISA). Following the same logic, the "Agosto", "Ristori Bis" and "Ristori Quater" decrees extended the deadlines and broadened the population of possible beneficiaries. The 2019 IRES balance is identified in the same way used for the 2019 IRAP balance, assuming that the value of the tax due is unchanged

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[11]In case of incomplete information, it is used the average sectoral rate applicable to sales and purchases.

between 2018 and 2019[12]. In order to calculate the 2020 IRES advance payment and determine the taxable base, the historical method (the value of the income that can be found in the 2018 Income Tax Return) and the forecasting method are compared, opting for the less onerous method for the enterprise. Finally, an increase is considered in the calculation of the cash flow for enterprises with a credit related to the 2019 balance and the 2020 first advance payment and it is attributed to June and July. On the other hand, a decrease is calculated for December for enterprises in debt, except for those meeting certain requirements.

3.5   Other measures to support business expenditures

The "Agosto" and "Rilancio" decrees established a tax credit equal to 60% of the real estate rents for non-residential use aimed at businesses with revenues not exceeding EUR 5 million in 2019[13], if they suffered a decrease in turnover for the months of March and May by at least 50% compared to the same months of the previous year. The "Ristori" and "Ristori Bis" decrees operate according to the same logic, but with specific modifications to capture the economic effects of the second wave of the pandemic. The simulation incorporates these interventions by attributing an increase in liquidity. In addition, the "Rilancio" decree allocated EUR 600 million to cover the costs of electricity utilities in order to reduce the financial outlay, spread evenly over 3.7 million businesses, for the months of May, June and July.

3.6   Loan guarantees

In order to outline properly the framework of the measures implemented by the Government, it is worth considering the support provided through the introduction of the "Liquidità" decree in terms of access to credit. The "Cura Italia" and "Liquidità" decrees provided the opportunity for companies to obtain subsidised loans covered by State guarantees. In particular, until 31 December 2020, a free guarantee is provided for new loans of up to EUR 5 million per individual company. The guarantee is granted on loans of up to 6 years and the maximum amount for each individual request must be less than:

- 25% of the turnover of the previous year;

- or double the beneficiary's annual wage bill (including social security charges

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[12]A similar approach was followed for the determination of the IRPEF tax base. The Irpef balance has not been taken into account in this analysis.

[13]For economic activities with ATECO code 55 the measure was also applied to taxpayers with revenues in excess of EUR 5 million.

and the cost of staff working on the company's site but formally on the subcontractors' payroll) in the last tax return.

The amount of the loan may be increased to cover the liquidity needs for working capital and investment costs for the coming 18 months for small and medium-sized enterprises and for the coming 12 months in the case of enterprises with more than 499 employees. The liquidity needs should be established through self-certification by the beneficiary.

Smaller SMEs self-certifying that they are affected by the COVID-19 emergency may apply for new financing with:

- amounts of up to 25% of 2019 revenues and a maximum of EUR 30.000;

- pre-amortisation of 24 months and a maximum duration of 10 years.

The Fund will guarantee 100% of the loan, free of charge and automatically, allowing the lender to disburse the sum without waiting for the final outcome of the Fund's investigation. The bank will charge the financial transaction a maximum interest rate equal to the so-called "Rendistato".

In order to ensure transparency, the Italian Ministry of Economic Development has provided public evidence of the operators that have benefited and are benefiting from the guarantees provided, as well as of the amounts involved [14]. We used this information in our analysis, increasing the liquidity of the companies by the amount of the financing obtained.

4 Main Results

By providing a snapshot of the main results emerging by the analysis, separately for potentially illiquid corporations and partnerships Figures 2 and 3 offer a comparison between the potential and actual liquidity shortage (the lighter grey and orange columns on the right side of the charts respectively) and the aid put in place by the Government through the different measures analyzed (the blue column, one per each measure, on the left side of the charts). In this perspective, firstly it should be noted that support interventions appear to have been quite effective in sustaining businesses during 2020. Indeed, according to our estimate, the potential liquidity deficit of EUR 83.7 billion (75.5 in the case of corporations and 8.2 in the case of partnerships, shown by the lighter grey area) has been reduced by 68.4% through Government intervention. In detail, in the case of corporations, approximately 67.5% of the EUR 75.5 billion

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[14]Information is available at this link https://www.fondidigaranzia.it/

estimated potential deficit has been offset by public support measures, with an actual residual shortage of EUR 24.5 billion (Figure 2); while, in the case of partnerships, around 76.8% of the EUR 8.2 billion estimated potential deficit was offset thanks to the economic support provided by the Government, with an actual residual shortage of EUR 1.9 billion (Figure 3). Moreover, the simulation highlights that, besides enabling illiquid companies to reduce liquidity shortage, the aid measures also sustained potential illiquid companies making them switch from a negative to a positive cash flow at the end of the year, recording a total surplus of 19.2 billion (16.4 billion for corporations and 2.8 billion for partnerships, in this case the darker area of the grey columns in the charts).

Eventually, going into depth on the specific measures, the results stress the main impact of those focused on the debt structure and on labor costs. In fact, the analyses show that debt stand still and the extension of the social safety net (the first two blue columns in the charts from the left side of the figures) have guaranteed a total support amounting to EUR 63.0 billion for corporations and EUR 8.2 billion for partnerships. It should also be noted that the debt stand still, which was the major measure in terms of allocated resources, has secured EUR 50.4 billion for corporations and EUR 6.7 billion for partnerships.

Figure 2: Aid by measure versus actual and potential liquidity deficit (Potential illiquid corporations)
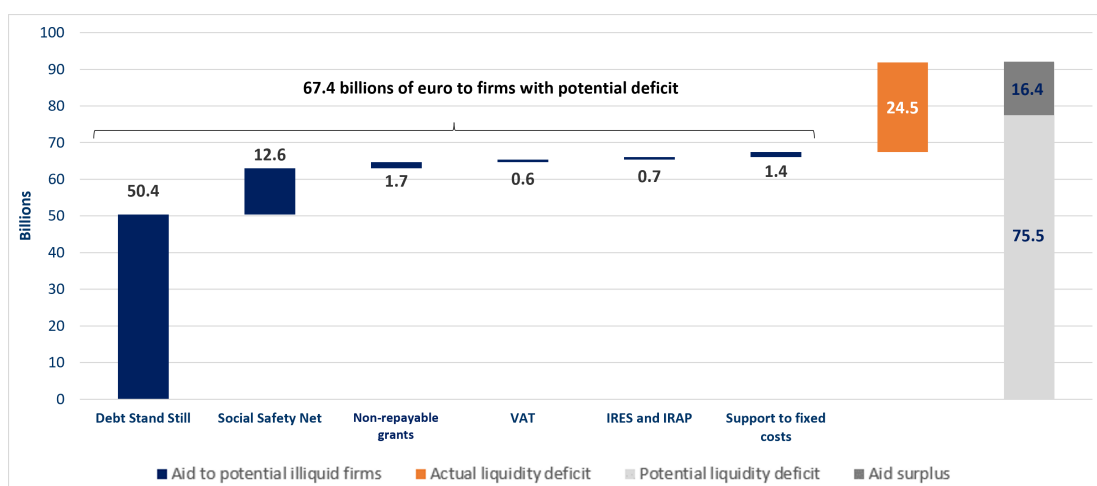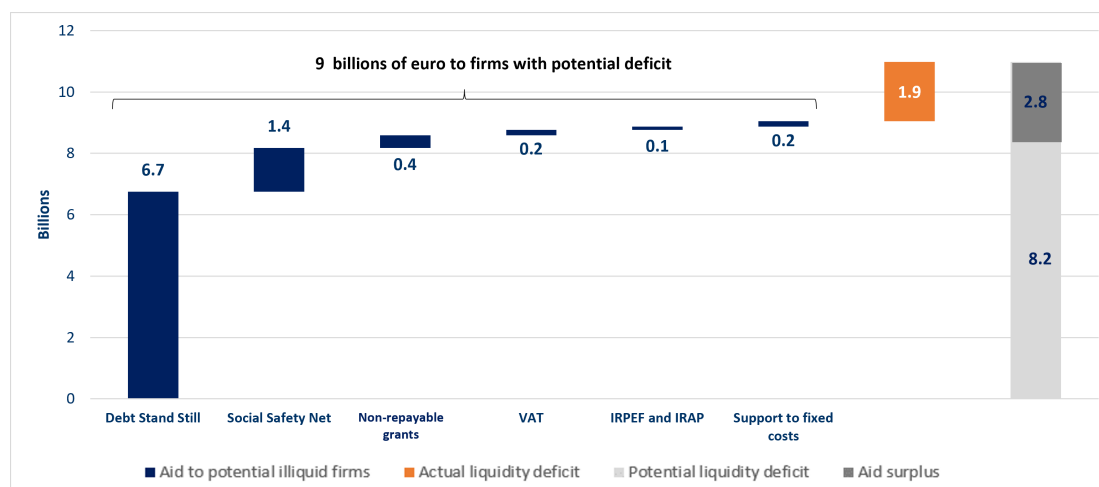

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Figure 3: Aid by measure versus actual and potential liquidity deficit (Potential illiquid partnerships)

The distributional effects of the measures adopted to cope with the crisis show how the financial support aid provided by debt stand still and by some measures supporting business expenditures have proved to be particularly effective measures, in that they have benefited companies in a situation of liquidity deficit at the end of 2020 or which would have become illiquid in the absence of any intervention. In particular, with reference to corporations (Figure 4), approximately 71.5% of the resources used for debt stand still reached companies that were in the aforementioned situation (a percentage that drops to 66.4% in the case of partnerships, see Figure 5). With reference to corporations, around EUR 1.3 billion of the 2 billions allocated as support to some fixed costs was allocated to companies that would have suffered from a lack of liquidity. A similar allocation was recorded in the case of partnerships (with EUR 0.2 billion out of the EUR 0.3 billion allocated for companies in potential distress). The level of effectiveness of tax suspension or exemption measures that benefited companies with a positive taxpaying capacity (primarily associated with higher liquid funds) was lower. In the context of corporations with reference to the suspension of VAT, only 30.8% of the resources reached companies with a potential liquidity deficit (0.7 billion out of a total of 2.1 billion), while with reference to the suspension/exemption of IRES and IRAP only 24.9% of the resources reached companies with a potential liquidity deficit (0.7 billion out of a total of 2.8 billion). A similar impact can also be seen with reference to partnerships.

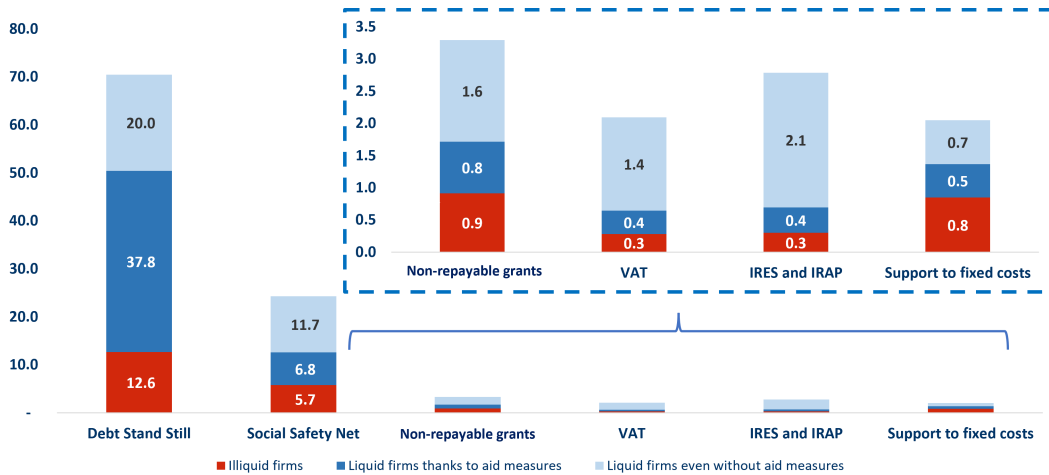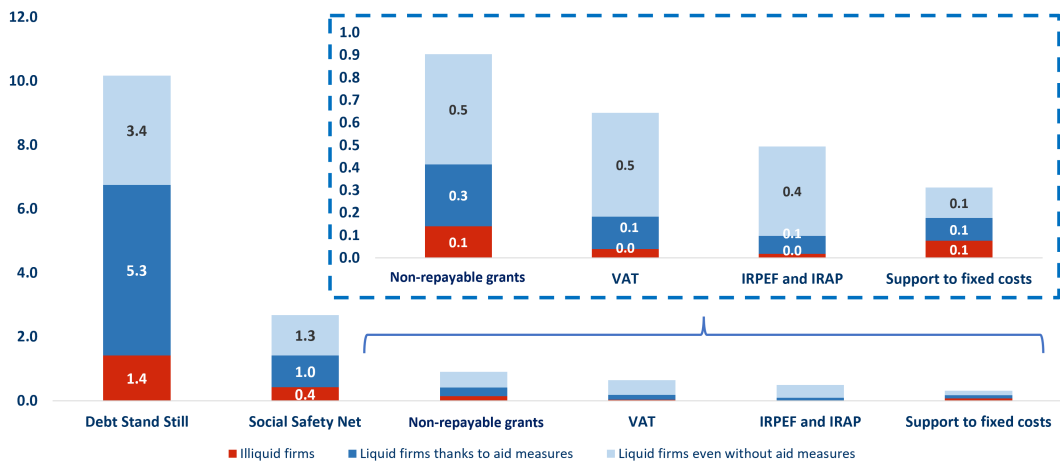Figure 4: Aid by intervention area and type of beneficiary (corporations)

Figure 5: Aid by intervention area and type of beneficiary (partnerships)

An overview of the impact of the measures introduced to deal with the emergency in relation to the contribution of each sector to the economy is presented in Figure 6, which shows by macro-sector the potential liquidity needs in the absence of public support measures and the residual gap after interventions. In the sectors most affected by the restrictions, the effects of the crisis were significantly contained by the interventions: in the "Tourism and Entertainment" sector, for example, the liquidity requirement was reduced from EUR 8.2 to 2.9 billion, in the Construction sector from 9.9 to 2.4 billion and in the Wholesale and retail trade sector from EUR 6.2 to 2.9 billion.

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Figure 6: Potential and actual liquidity deficit by Industry
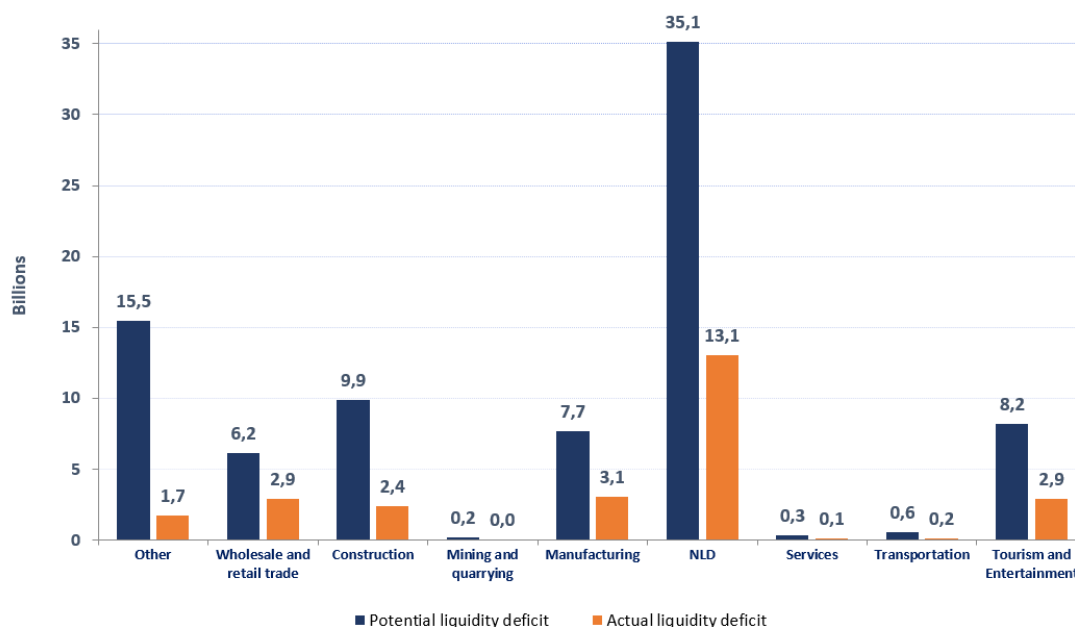
Figures 7 through 13 show the intensity of support measures by macro sector as the ratio of the share of public resources absorbed by each macro sector and the corresponding share of overall liquidity needs (bubble size). In each figure the macro-sectors are ordered according to the liquidity index defined by relating the potential deficit in terms of the turnover of each macro-sector to the total liquidity deficit in terms of the overall turnover (x-axis) and according to the indicators relevant to the various measures (y-axis). The following indicators were constructed: the relative economic weight of each macro-sector on the economy's total value added and gross profit; the incidence of fixed costs and labor costs on total costs; the incidence of value added on revenues; leverage.

Figure 7 shows that total resources have been allocated to macro-sectors, both those affected by the lockdown and those excluded (NLD), in roughly proportion to sectoral needs except for a slight preponderance for Manufacturing, which is a major contributor to the country's value added, as reflected in the relatively uniform size of the bubbles.

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Figure 7: Intensity of aid differentiated by Industry
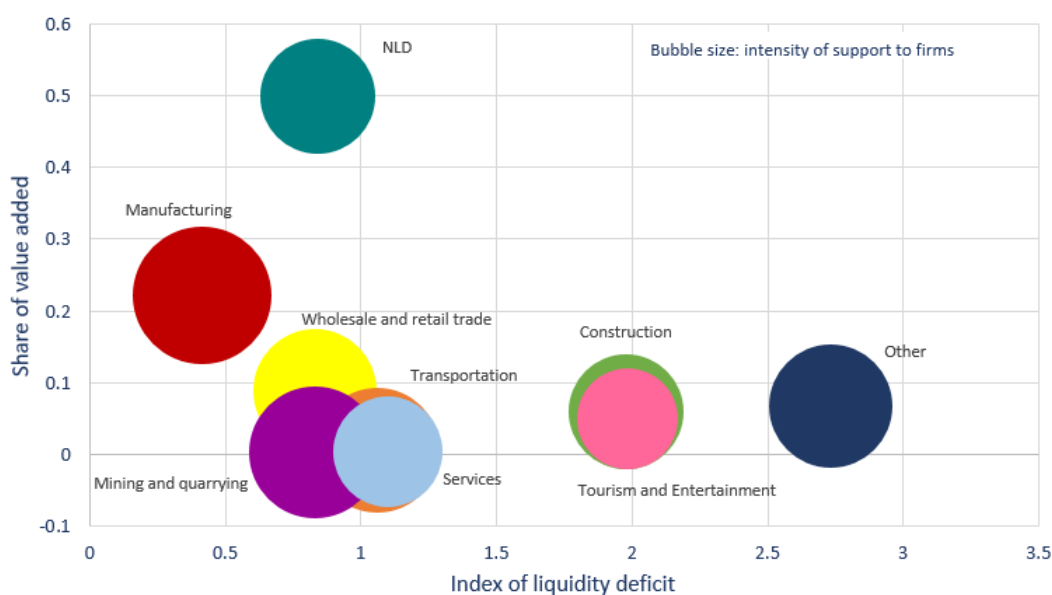
The analysis of the intensity indicator relating to non-repayable grants shows, as can be seen from Figure 13, that relatively greater amounts have been provided to the "Tourism and Entertainment" sectors (which have recorded one of the worst liquidity crises), "Mining and quarrying" and "Wholesale and retail trade" sectors. The "Tourism and Entertainment" sector, together with "Transportation" and "Personal Services", have also benefited from important support through the restoration of some business expenditures, as can be seen in Figure 12. The most substantial intervention, that is, debt stand still, was relatively more concentrated on two sectors characterized by a high level of leverage as well as a more severe liquidity crisis ("Construction" and "Other sectors") and on extractive industry companies, as can be seen in Figure 8. The extention of the social safety net supported above all the manufacturing, transportation and personal services sectors, which, despite recording lower-than-average liquidity problems as a result of the pandemic, are characterized by a higher incidence of labor costs, as shown in Figure 9. It is worth emphasizing that for this measure - adopted from the beginning of the emergency, together with the freeze on layoffs to guarantee, first and foremost, the country's socio-economic stability and the protection of labor - support for liquidity is qualified as a secondary objective. With reference to the suspension of taxes, Wholesale and retail trade and Transportation seem to have benefited most from the VAT deferrals (Figure 10); on the other hand, the Manufacturing sector is affected most by the IRES and IRAP deferrals together with the exemption from an IRAP payment (Figure 11). These results essentially reflect the specific structure of the value chain in the different sectors.

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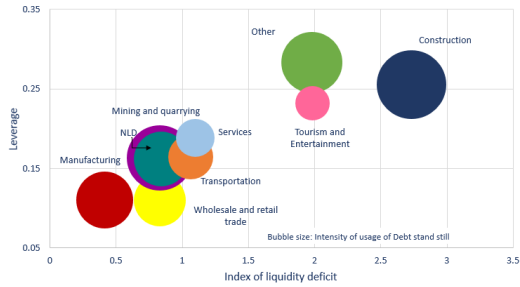Figure 8: Intensity of use of debt standstill

Figure 9: Intensity of use of social safety net
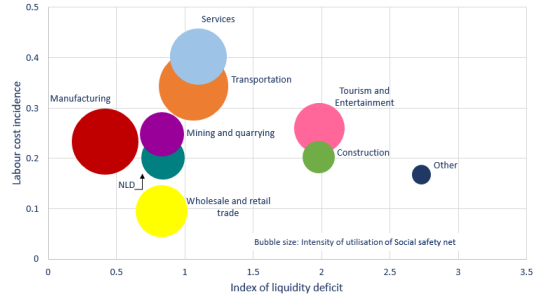

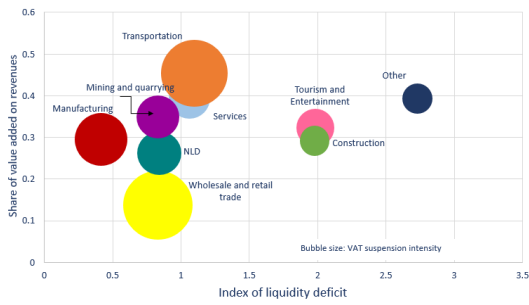Figure 10: Vat suspension intensity

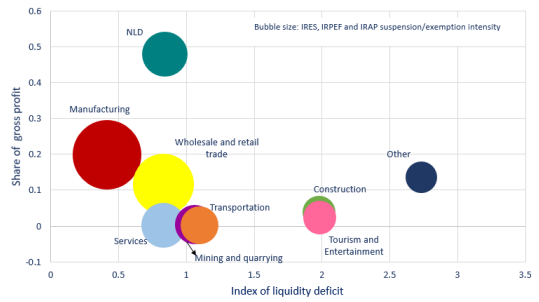Figure 11: Ires/Irpef, Irap suspension/ exemption intensity

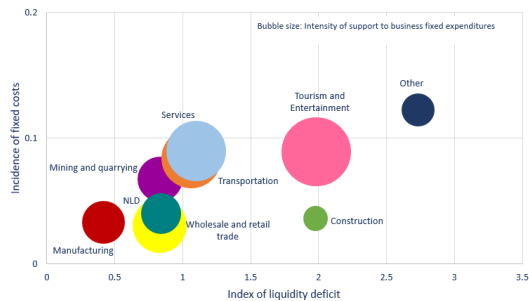Figure 12: Intensity of support to business fixed expenditures

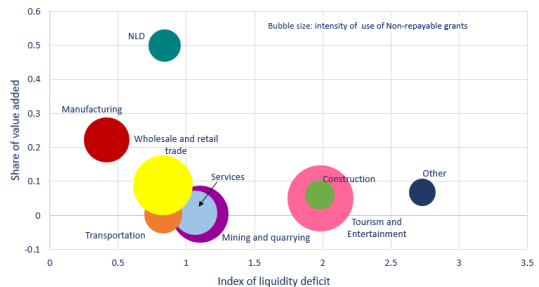Figure 13: Intensity of use of Non-repayable grants

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Table 1 gives an overview of the liquidity needs and the opportunities for access to credit created by the "Liquidità" decree, distinguishing between companies which, even before the Covid-19 crisis, showed a negative operating cash flow and those with a positive cash flow. Without taking into account the arrangements relating to access to credit provided by the "Liquidità" decree, the residual liquidity deficit estimated for the companies under study would stand at EUR 26.5 billion. If the analysis were to include support for business liquidity, provided trough the "Fondo di Garanzia", resources totaling EUR 8 billion would be recovered and, consequently, the deficit would be reduced to EUR 18.5 billion. That means that more than 51,000 illiquid companies have been converted to liquid status. However, it should be noted that if all eligible firms had benefited from the fund, around 115,000 (the eligible firms according to the "Liquidità" decree criteria among the 186,849 illiquid firms following public support measures) would have moved from illiquid to liquid status and the residual need would have been around 7.7 billion. This evidence shows that the measure was not used to its full potential. Had the measure been fully utilised, it would have ensured an additional reduction in requirements of more than 10 billion. Nonetheless, in this perspective it should be also considered that the firms could not have used more extensively the opportunity offered by the measure because of the risk of solvency problems linked to the worsening of their leverage caused by the pandemic crisis. To this effect, we can recall also Draghi et al. (2020) concerning the restructuring of corporations after Covid-19, which highlighted how the first phase of the pandemic could have been followed by a subsequent one in which the liquidity problem would have turned into a more severe solvency problem.

Table 1: Liquidity deficit estimate pre- and post- public aid

Operating Cash flow at 31/12/t-1	Company group	Number of firms	Potential liquidity deficit (counterfactual: without public support measures)			Actual liquidity deficit (after public support measures)				Actual liquidity deficit (after public support measures and public guarantee schemes provided trough the "Fondo di Garanzia")		
			N. of illiquid firms	% of illiquid firms on total n. of firms	Amount (billion euros)	N. of illiquid firms	% of illiquid firms on total n. of firms	Amount (billion euros)	% liquidity deficit offset by measures	N. of illiquid firms	% of illiquid firms on total n. of firms	Amount (billion euros)
Positive	Partnerships	195,520	48,545	24.8%	5.7	11,595	5.9%	1.0	81.5%	7,412	3.8%	0.7
	Corporations	550,954	160,555	29.1%	37.3	58,821	10.7%	10.0	73.3%	36,004	6.5%	6.2
Negative	Partnerships	33,400	21,842	65.4%	2.5	12,429	37.2%	0.89	64.9%	10,608	31.8%	0.7
	Corporations	246,270	159,620	64.8%	38.2	104,004	42.2%	14.6	61.8%	81,350	33.0%	10.8
Total	Partnerships	228,920	70,387	30.7%	8.2	24,024	10.5%	1.94	76.3%	18,020	7.9%	1.5
	Corporations	797,224	320,175	40.2%	75.5	162,825	20.4%	24.5	67.5%	117,354	14.7%	17.0
	Total	1,026,144	390,562	38.1%	83.7	186,849	18.2%	26.5	68.4%	135,374	13.2%	18.5

Table 2 includes the results of the analysis of liquidity requirements by company size and shows that public support measures have proved very effective for small businesses. In particular, with reference to companies with a turnover up to EUR 2 million, around 76.0% of the estimated potential deficit was compensated by the measures put in place, a percentage that is higher than the average compensation for all companies of 68.4%. On the contrary, the guarantees for access to credit provided for by the "Liquidità" decree appear to have been more beneficial for larger companies.

Table 2: Liquidity deficit estimate pre- and post- public aid by revenue class

Revenue classes (million euros)	Operating Cash flow at 31/12/t-1	Number of firms	Potential liquidity deficit (counterfactual: without public support measures)			Actual liquidity deficit (after public support measures)				Actual liquidity deficit (after public support measures and public guarantee schemes provided trough the "Fondo di Garanzia")		
			N. of illiquid firms	% of illiquid firms on total n. of firms	Amount (billion euros)	N. of illiquid firms	% of illiquid firms on total n. of firms	Amount (billion euros)	% liquidity deficit offset by measures	N. of illiquid firms	% of illiquid firms on total n. of firms	Amount (billion euros)
<2 positive	positive	651,253	184,777	28.4%	24.0	58,725	9.0%	4.1	82.9%	36,681	5.6%	2.7
<2 negative	negative	257,432	168,537	65.5%	28.1	107,138	41.6%	8.4	70.1%	85,875	33.4%	6.7
2-10 positive	positive	79,442	21,256	26.8%	13.1	9,993	12.6%	4.2	68.1%	5,824	7.3%	2.6
2-10 negative	negative	18,449	11,021	59.7%	8.1	7,842	42.5%	4.1	49.0%	5,159	28.0%	2.8
10-50 positive	positive	15,779	3,067	19.4%	5.9	1,698	10.8%	2.7	53.7%	911	5.8%	1.7
10-50 negative	negative	3,789	1,904	50.3%	4.5	1,453	38.3%	2.9	35.1%	924	24.4%	2.0
Total	<2	908,685	353,314	38.9%	52.0	165,863	18.3%	12.5	76.0%	122,556	13.5%	9.4
Total	2-10	97,891	32,277	33.0%	21.3	17,835	18.2%	8.3	60.8%	10,983	11.2%	5.4
Total	10-50	19,568	4,971	25.4%	10.4	3,151	16.1%	5.6	45.6%	1,835	9.4%	3.7
Total	Total	1,026,144	390,562	38.1%	83.7	186,849	18.2%	26.5	68.4%	135,374	13.2%	18.5

Table 3 shows that the Government's decision to direct some support measures towards smaller companies has proved more effective. In fact, the liquidity needs of the sectors that have suffered most from the crisis are concentrated on companies with turnover of up to EUR 2 million: around 80% in the "Other" and "Construction" sectors; 70% in the "Tourism and Entertainment" sector, which, however, has received less public support.

Table 3: Liquidity deficit estimate pre- and post- public aid by sector and dimension

| Macro-sector | Revenue class (million euros) | N. of firms by revenue class | % of firms by revenue class | Potential liquidity deficit (counterfactual) | | | | Actual liquidity deficit | % of liquidity deficit offset by measures |
| | | | | Illiquid firms | | Liquidity deficit | | | |
				Total amount	%	Total amount (billion euros)	%	Total amount (billion euros)	
Other	<2	166,263	97.5%	65,969	97.8%	12.84	83.0%	1.21	90.5%
	2-10	3,725	2.2%	1,347	2.0%	2.22	14.3%	0.31	86.0%
	10-50	458	0.3%	125	0.2%	0.41	2.7%	0.22	47.9%
	Total	170,446	100.0%	67,441	100.0%	15.47	100.0%	1.74	88.7%
Wholesale and retail trade	<2	106,835	84.1%	36,747	86.7%	2.93	47.4%	1.18	59.7%
	2-10	16,747	13.2%	4,765	11.2%	1.93	31.2%	0.91	53.1%
	10-50	3,487	2.7%	865	2.0%	1.32	21.4%	0.85	35.6%
	Total	127,069	100.0%	42,377	100.0%	6.18	100.0%	2.94	52.5%
Construction	<2	97,871	94.2%	38,861	96.2%	8.07	81.4%	1.71	78.8%
	2-10	5,480	5.3%	1,416	3.5%	1.35	13.6%	0.52	61.1%
	10-50	550	0.5%	133	0.3%	0.50	5.0%	0.19	61.3%
	Total	103,901	100.0%	40,410	100.0%	9.91	100.0%	2.43	75.5%
Mining and quarrying	<2	1,255	80.9%	577	86.4%	0.11	60.4%	0.03	76.9%
	2-10	268	17.3%	86	12.9%	0.06	33.9%	0.02	75.2%
	10-50	29	1.9%	5	0.7%	0.01	5.7%	0.00	56.7%
	Total	1,552	100.0%	668	100.0%	0.18	100.0%	0.05	75.2%
Manufacturing	<2	68,931	74.6%	25,934	79.9%	3.01	39.1%	1.03	65.7%
	2-10	18,756	20.3%	5,502	17.0%	2.73	35.5%	1.07	60.7%
	10-50	4,762	5.2%	1,021	3.1%	1.96	25.4%	0.95	51.7%
	Total	92,449	100.0%	32,457	100.0%	7.70	100.0%	3.05	60.4%
NLD	<2	374,120	86.3%	125,532	86.8%	18.83	53.6%	5.38	71.4%
	2-10	49,339	11.4%	16,537	11.4%	10.84	30.9%	4.67	56.9%
	10-50	9,908	2.3%	2,596	1.8%	5.46	15.5%	3.02	44.7%
	Total	433,367	100.0%	144,665	100.0%	35.13	100.0%	13.07	62.8%
Services	<2	8,526	98.2%	4,334	97.9%	0.25	71.7%	0.09	65.6%
	2-10	142	1.6%	89	2.0%	0.09	25.8%	0.04	56.7%
	10-50	14	0.2%	6	0.1%	0.01	2.5%	0.00	75.4%
	Total	8,682	100.0%	4,429	100.0%	0.34	100.0%	0.13	63.5%
Transportation	<2	2,764	84.7%	1,752	86.3%	0.28	47.6%	0.07	73.6%
	2-10	413	12.7%	245	12.1%	0.22	37.7%	0.05	76.6%
	10-50	86	2.6%	33	1.6%	0.09	14.7%	0.04	57.6%
	Total	3,263	100.0%	2,030	100.0%	0.58	100.0%	0.16	72.4%
Tourism and Entertainment	<2	82,120	96.1%	53,608	95.6%	5.74	70.1%	1.78	68.9%
	2-10	3,021	3.5%	2,290	4.1%	1.84	22.5%	0.75	59.2%
	10-50	274	0.3%	187	0.3%	0.61	7.4%	0.37	39.5%
	Total	85,415	100.0%	56,085	100.0%	8.18	100.0%	2.90	64.6%
Total	<2	908,685	88.6%	353,314	90.5%	52.04	62.2%	12.49	76.0%
	2-10	97,891	9.5%	32,277	8.3%	21.28	25.4%	8.34	60.8%
	10-50	19,568	1.9%	4,971	1.3%	10.36	12.4%	5.64	45.6%
	Total	1,026,144	100.0%	390,562	100.0%	83.7	100.0%	26.5	68.4%

5 Conclusions

The analysis of the effects of the Covid-19 crisis, based on microsimulation at the firm level of operating cash flows, shows that the support measures adopted by the Government allowed companies to significantly offset the liquidity deficit. In particular, the results show that: in the case of corporations, around 67.5% of the estimated potential deficit was offset by measures to deal with the emergency (a deficit of EUR 24.5 billion remains out of a potential deficit of EUR 75.5 billion); in the case of partnerships, around 76.8% of the estimated potential liquidity needs were offset by government support (a deficit of EUR 1.9 billion remains out of a potential deficit of EUR 8.2 billion). These results highlight how effective the government's efforts were in supporting businesses during 2020. This efficacy was particularly relevant for smaller firms, which are most severely affected by the health crisis regardless of their industry and are significantly prevalent in sectors that experienced the most severe liquidity crises.

The analysis carried out in this report has measured the effectiveness of the various intervention measures adopted to mitigate companies' liquidity needs, which have drastically increased as a result of the pandemic crisis. In this regard, the debt stand still, and the other measures to support business expenditures have proved to be particularly effective, i.e., capable of supporting those companies that have actually experienced a liquidity deficit. On the other hand, the tax suspension or exemption measures, which also benefited companies that did not have a liquidity shortage, were less effective and selective. In other words, the ranking of the measures relative to effectiveness shows that less selective interventions, such as tax suspension, can disperse considerable resources with respect to the objective of reducing liquidity deficit, with non-negligible policy implications. Conversely, debt stand still and the relief of certain fixed costs were found to be more effective, at least as far as micro, small and medium-sized enterprises are concerned.

The paper also contains a preliminary analysis of the efficiency of public support measures, assessing their impact for those economic sectors that contribute most significantly to value-added. These results, however, cannot provide conclusive guidance since a rigorous analysis of the efficient use of resources allocated to liquidity support should also incorporate the evaluation of the risk of insolvency. This is necessary in order to analyze the capacity of the different liquidity support measures to sustain companies that are actually able to regain competitiveness and, in this way, contribute to the recovery of the economy. In this regard, it is important to recall the

indications contained in Draghi et al. (2020) for the restructuring of corporations after Covid-19. The report recognizes that the pandemic crisis called for an immediate and generalized response to the liquidity problem but highlights the need to deal differently with the subsequent phase in which the liquidity problem can turn into a more severe solvency problem. To that effect, it is necessary to ensure that public intervention is selective in its choice of priorities and sectors to which incentive measures should be directed to ensure a prospect of stability for all companies that can support the resilience and long-term growth of the economy, keeping the cost to public financing to a minimum. This is all the more important considering that after 2020 the pandemic crises forced the Italian Government to continue to support firms with liquidity problems trying to find a trade-off between efficacy and efficiency of the economic resources provided with the "Decreto Sostegni", "Decreto Sostegni bis" and "Decreto Sostegni ter". In particular, in addition to extending the measures already in force relating to non-repayable grants, the exemption from tax payments and the social safety net, the "Decreto Sostegni bis" also introduces the "Contributo a fondo perduto perequativo" (Article 1, paragraphs 16-27, of Decree no. 73 of May 25, 2021). This is an aid proportionate to the worsening of the 2020 economic result compared to that of 2019, net of the other non-refundable contributions already received for the Covid emergency.

In this perspective, subsequent studies should focus on the impact of the measures implemented since the beginning of 2021, investigating specifically also the insolvency issue.

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