BANCA D'ITALIA
EUROSISTEMA

Temi di discussione

(Working Papers)

Real-time inequalities and policies during the pandemic in the US

by Luisa Corrado, Daniela Fantozzi and Simona Giglioli

December 2022

Number 1396

BANCA D'ITALIA
EUROSISTEMA

Temi di discussione

(Working Papers)

Real-time inequalities and policies during the pandemic in the US

by Luisa Corrado, Daniela Fantozzi and Simona Giglioli

Number 1396 - December 2022

The papers published in the Temi di discussione *series describe preliminary results and are made available to the public to encourage discussion and elicit comments.*

The views expressed in the articles are those of the authors and do not involve the responsibility of the Bank.

ISSN 2281-3950 (online)

Designed by the Printing and Publishing Division of the Bank of Italy

REAL-TIME INEQUALITIES AND POLICIES DURING THE PANDEMIC IN THE US

by Luisa Corrado* Daniela Fantozzi* and Simona Giglioli*

Abstract

We investigate the effects of different policies implemented during the pandemic on real-time spatial inequalities in the US. We use a novel database built using anonymized data from the private sector, which enables us to compute daily measures of spending inequality at the county level. Using a narrative approach combined with high-frequency data to identify the shocks, we evaluate the impact of monetary policy in a VAR framework. The main findings show that consumption spending inequality rose during the pandemic and Fed's policies did not mitigate such increase. Indeed, although these measures had a positive effect on spending for both richer and poorer counties, consumption was stimulated more for the former than for the latter ones. We distinguish two kinds of interventions: those regarding federal funds rate, Repo agreements and QE programs ("purely monetary") and those concerning subsidized lending facilities to support credit and avoid mass layoffs ("quasi-fiscal"). Our evidence suggests a greater contribution in the short run by the latter type in stimulating consumption spending of the upper-income counties.

JEL Classification: D31, E21, E52, E58.
Keywords: monetary policy, inequality, high-frequency data, Covid-19.
DOI: 10.32057/0.TD.2022.1396

Contents

* University of Rome Tor Vergata.
** Italian National Institute of Statistics (Istat).
*** Bank of Italy, Economic Research and International Relations.

1 Introduction[1]

The Covid-19 pandemic has drastically changed our daily life. Aside from the terrible health consequences, it has resulted in an unparalleled economic crisis, which countries all over the world have been attempting to address since March 2020. In the United States, the pandemic led to a large and immediate decline in aggregate spending and a sharp increase in unemployment. The response of the Federal Reserve (Fed), through a series of monetary stimulus and emergency lending initiatives has, according to many economists (Fleming et al. 2020, Bullard 2020, Crouzet 2020, among others) prevented the pandemic from causing a financial crisis and a much deeper and more prolonged recession. In this paper we investigate whether the measures that the Fed has taken in response to the pandemic had any effect on consumption spending inequality. Indeed, although disparities in the United States have been under attention for the past few decades, during Covid-19 the situation has dramatically worsened: inequality in the US has reached record levels since mid-March 2020, when tens of millions of Americans across the country started losing their jobs as a result of the economic fallout.

Two main streams of the literature are at the basis of this work. The first one is related to the effects of Covid-19 on consumption inequality using high-frequency data. Several studies have analysed this aspect for different countries: Aspachs et al. (2021) find that spending inequality increased in Spain; for UK, Gathergood et al. (2021) document a growth in regional inequalities in spending and similarly do Chronopoulos et al. (2020), while Hacıoğlu-Hoke et al. (2021) find that low-income households reduced their consumption spending by less than high-income ones; Andersen et al. (2020) find for Denmark a larger drop in spending for those individuals with a higher exposure to the adverse consequences of the crisis in the form of job loss, wealth destruction, severe disease and disrupted consumption patterns; finally, for US, Bachas et al. (2020) use bank account data at the household level to show that after the pandemic consumption rebounded more rapidly for low income individuals (the misalignment between their findings and our results can be attributed to the different source and aggregation of the data used), Cotton et al. (2021) analyse heterogeneity in spending across several demographic household characteristics and Finck and Tillmann's (2022) analysis of credit- and debit-card data reveals a rise in consumption inequality.

The second stream concerns the empirical analysis of the effects of monetary policy on inequality. The debate on the topic is still open, and the empirical literature is sometimes ambiguous. Most studies exploit survey data on household income: for the US, Montecino and Epstein (2015) use quarterly household survey data to investigate the effect of monetary policy on inequality. They find that an expansionary monetary policy, mainly

[1]We would like to thank A. Rosolia, S. Federico, C. Giordano and M. Bernardini (Bank of Italy), A. Ferrero (University of Oxford) and N. Maffei Faccioli (Norges Bank) for useful comments.

in the form of quantitative easing (QE), contributed to rising inequality. In particular, the dis-equalizing effects of increasing asset returns outweighed the redistributive effects of falling unemployment. For Japan, Saiki and Frost (2014) look at how unconventional monetary policy (UMP) affected inequality after 2008, using micro level data of Japanese households in a VAR framework. Their results show that UMP widened income inequality largely due to higher asset prices. Consequently, wealthy households that tend to save their money in financial assets earn more income from dividends and capital gains. For the euro area, Guerello (2018) constructs measures of income dispersion using survey data and evaluates the effects of both types of monetary policy on income distribution. Focusing on QE, she finds that for several European countries the positive effects of these policies may be offset by a rise in income dispersion. Mumtaz and Theophilopoulou (2016) provide similar evidence for the UK.

Other works reach mixed conclusions. For the US, Coibion et al. (2017) using detailed micro-level data on income and consumption document how contractionary monetary policy increases inequality in labor earnings, total income, consumption and total expenditures. Lenza and Slacalek (2018) evaluate the impact of quantitative easing on income and wealth of individual euro area households. Finally for Italy, Casiraghi et al. (2016) and Corrado and Fantozzi (2021) use household data to to investigate the effect of standard and non-standard monetary policy implemented by the ECB on income inequality. The main findings from these works show how QE compresses the income distribution since many households with lower incomes become employed.

In our analysis, with respect to the above mentioned literature, we focus on a different, yet closely connected, dimension of inequality, i.e. inequality across counties[2]. We use daily data on credit and debit card transactions and employment recently released by Chetty et al. (2020) to create daily indices to measure inequality across counties in the US and describe their evolution during the pandemic. Then, we estimate a VAR model augmenting standard Cholesky identification with additional information coming from key policy announcements by the Fed in 2020 and early 2021 in order to measure the impact of Fed's measures in mitigating or reinforcing real-time inequalities.

Our contribution is twofold. Firstly, we use high-frequency data on consumption spending across counties to study the effect of Fed's policies during Covid-19. Secondly, we distinguish between two kinds of interventions in a narrative framework: those regarding the federal funds rate, the Repo agreements and the QE programs, that we call "purely monetary", and those concerning subsidized lending facilities and other tools to provide

[2]To verify the comparability of our results with the above mentioned studies we used available data from BEA and the US Census Bureau and we check for the correlation between consumption expenditure inequality across households and across counties from 1997 to 2016. It is equal to 0.8 when computed with the Gini coefficient and the 90th-10th percentile difference, 0.7 with the Atkinson index and the variance of log consumption. On trends in income inequality across counties, see Gaubert et al. (2021), Ganong and Shoag (2017) and Paarlberg et al. (2017).

support to credit, in order to avoid mass layoffs and a sharp decrease in employment, to which we refer to as "quasi-fiscal" policies. As discussed above, many authors have analyzed the development of consumption spending in the US with similar data, but to the best of our knowledge, the empirical literature linking these trends with Fed's monetary and quasi-fiscal policy interventions is very scarce. Our first main finding shows that the effect of Fed's policies has been to stimulate consumption for all counties along the income distribution, from the richer to the poorer ones. Secondly, we find that consumption inequality rose during the pandemic, since Fed's policies stimulated more consumption of the upper-income counties. In particular, when distinguishing between monetary and quasi-fiscal policies, our evidence suggests a greater contribution by the latter type of intervention in the stimulus of consumption and employment, although more intensely for the top quartile than for the bottom one.

The paper is articulated as follows: Section 2 explains how daily inequality indices are created and describes our identification strategy for the policy shocks. Section 3 shows the evolution of consumption inequality during the pandemic, the empirical analysis through the estimation of a VAR model, and presents the results. Section 4 concludes.

2 Data and methodology

Our aim is to assess whether and how inequality in the United States has evolved during the Covid-19 pandemic, and what has been the role of Fed's policies in this sense. For our analysis we use different types of data. We look at inequality in consumption spending across counties. Many authors have analyzed consumption patterns to study inequalities: according to Blundell and Preston (1998) and Krueger and Perri (2006), the distribution of consumption expenditures gives greater insight into the distribution of household well-being, compared to income distribution. We combine the two measures: first, we look at inequality in consumption spending across all counties. Then, we divide them in four quartiles based on their per capita income, and analyze the response of credit and debit card spending in counties at different quartiles. Differently from the above mentioned literature, we use high-frequency data to provide a real-time dynamic analysis of inequality in consumption spending.

2.1 Real economy data

The database recently released and constantly updated by Chetty et al. (2020) provides daily information on percent changes in credit and debit card expenditure and employment by county in the US from the 14th January 2020[3]. A county is an administrative or political subdivision of a state, and our dataset covers a representative sample of coun-

[3]For details see https://tracktherecovery.org/.

ties[4]. County borders are an artifact of historic or local political idiosyncrasies, and do not necessarily reflect homogeneous sets of households: our analysis is limited in the fact that it ignores within-county heterogeneity. The changes refer to the January 2020 average and our sample period is from 20th January 2020 to 31st March 2021, with daily data. Series on consumption spending are divided with respect to the corresponding week in 2019, to control for seasonality. Data on employment are not seasonally adjusted by Chetty et al. (2020) because of incomplete 2019 data, but seasonal fluctuations in employment are an order-of-magnitude smaller than those in spending, hence unlikely to substantially affect our results.

This database is built using anonymized data from several private companies. Consumer expenditure changes are measured using data on credit and debit card spending collected by Affinity Solutions Inc, which capture nearly 10% of debit and credit card spending in the US[5]. Since we are working with card spending data, we miss cash transactions[6] in our analysis, as well as other transactions that are made, for example, through other agents such as insurance companies. This dataset, nonetheless, provides satisfactory information about spending on retail, some service expenditures, and some durable goods. Moreover, the Affinity spending series closely tracks the Advance Monthly Retail Trade Survey (MARTS), which is one of the main inputs used to construct the national accounts (the correlation between the two is equal to 0.88). In the Affinity data provided by Chetty et al. (2020), daily changes in card spending are available at the county level, where the county is determined by the card holder's residence. In order to be able to divide the counties in four quartiles based on per capita income, we use data on 2019 per capita income by county from the US Bureau of Economic Analysis (BEA).

For employment, Chetty et al. (2020) provide a representative picture of private non-farm employment in the United States by combining different data sources to obtain information on employment and earnings: payroll data from Paychex and Intuit, worker-level data from Earnin, and time sheet data from Kronos. The series is compared with survey-based measures, in particular the Current Employment Statistics, which is a survey of businesses, and the Current Population Survey, which is a survey of households. The payroll-based series generally falls between estimates obtained by the two surveys. As for consumption data, also data on employment are provided as percent changes with

[4]The total number of US counties is 3,007. The dataset released by Chetty et al (2020) provides data for 1,681 counties. Due to missing data for employment, our analysis is made on a sample of 856 counties, which nonetheless is representative of 90.6% of GDP and 87.0% of total population (according to 2019 data from BEA).

[5]According to Fulford (2015), more than 70% of the US population has a credit card at any given time, and a larger fraction has a credit card at some point in life. The total card spending accounted for 51% of consumption spending in 2018, according to the 2019 Federal Reserve Payments Study and data by the World Bank.

[6]Chetty et al. (2020) compare credit card spending with aggregate cash spending using receipt data sourced by CoinOut. They find similar trends between the two series, indicating that aggregate fluctuations in card spending were not offset by opposite-signed changes in cash spending.

respect to the January 2020 average.

However, in our analysis we are interested in working with economic data in levels and not in percent changes. To transform percent change data into level data we combine the database by Chetty et al. (2020) on daily percent changes in consumption spending and employment with annual 2019 data in levels on per capita consumption (at constant prices) and employment from the BEA. While data on employment are available by county, 2019 per capita consumption spending in level is only available by state. We then use the distribution of counties by per capita income (from BEA) to estimate the consumption spending for all counties. In details, our estimate for the county daily per capita consumption expenditure is given by:

$$PPexp_{cs} = \left\{ \frac{PPinc_{cs}}{\frac{1}{N_s}\sum_{i=1}^{N_s} PPinc_{is}} \cdot PPexp_s \right\}$$

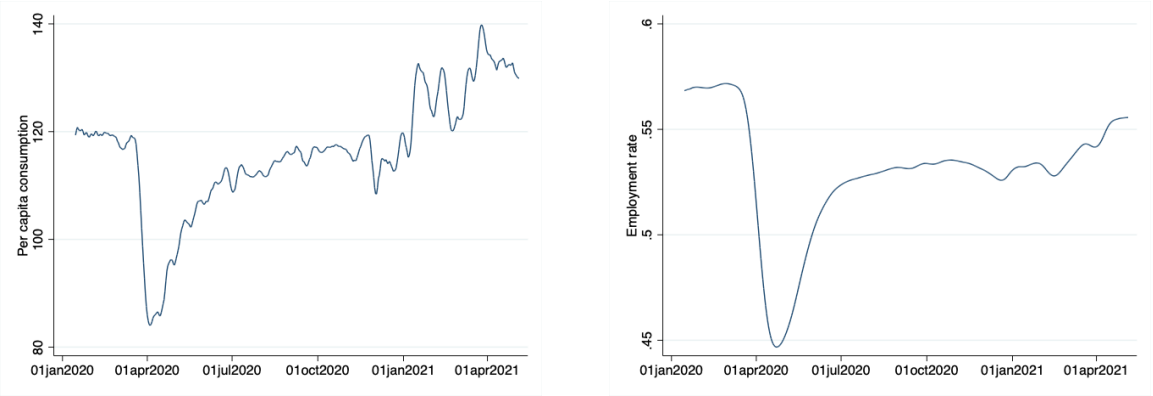
where c and s indicate the county and state, respectively, $PPexp$ is the daily per capita expenditure, $PPinc$ is the per capita income and N_s is the number of counties in state s. In computing the daily data in levels starting from the annual data for 2019, our assumption is that annual 2019 data are a good proxy for the situation in January 2020, to which data in percent changes refer to. In this way, we have a measure in levels of daily per capita consumption and employment throughout 2020 and for the first three months of 2021. Finally, we needed to remove weekend days from the sample to be able to merge all data[7]. We end up with a dataset of 310 observations for each variable. To the best of our knowledge, we are the first who perform an analysis of consumption inequality using this dataset with the described arrangements, to study disparities across US counties and to assess Fed's role in the evolution of inequality.

Figure 1 reports the daily average (intended as average across counties) per capita consumption spending and the daily average employment rate in the US during the sample period considered[8]. Looking at the development of the two variables, one can easily notice a similar trend, with the minimum level reached in April 2020 (among others, EarnestResearch 2020 and Alexander and Karger 2020 provide the same evidence). Moreover, while consumption spending returns to pre-pandemic levels (and exceeds them) towards the end of 2020, the employment rate remains significantly lower.

[7]In cases where marginal spending in response to a shock occurs on weekends, dropping weekends loses that variation. To avoid this distortion, we perform a robustness check by taking a 7-day moving average of spending data before dropping weekend observations. In this way we try to effectively smooth the weekend into the previous and subsequent weeks. The analysis gives very similar results.

[8]The correlation between the series constructed by us and the official data on per capita consumption and employment from FRED is 0.94 for consumption and 0.97 for employment.

Figure 1: Consumption and employment trends



(a) Average per capita consumption spending

(b) Average employment rate

Note: the two figures plot the per capita consumption spending (7-day moving average) and the daily employment rate during the sample period considered, averaged across counties in the US.

2.2 Consumption inequality indices

As a first step we are interested in the evolution of consumption spending inequality across counties in the US during 2020 and at the beginning of 2021. We thus construct several indices of credit and debit card spending inequality across counties at daily frequency and compare them. We are here considering our sample of US counties as a whole, without looking at the differences in per capita income across counties. Figure 2 reports four of these indices: the difference between the 90th and the 10th percentile in consumption spending (2a), the variance of the logarithm of consumption (2b), the Gini index (2c) and the Atkinson index (2d). For all these indicators, a higher value signals a higher level of consumption spending inequality across counties. We can notice a common trend in the four plots: it appears that the Covid-19 pandemic had a large and heterogeneous economic impact leading to a higher consumption inequality across US counties in 2020. In particular, a sharper increase is evident around mid-April, which corresponds to the outbreak of the pandemic, and at the beginning of 2021. Similar results were found by Cotton et al. (2021) with an analogous dataset and by Cox et al. (2020), Baker et al. (2020), Karger and Rajan (2020) using different sources of spending data.

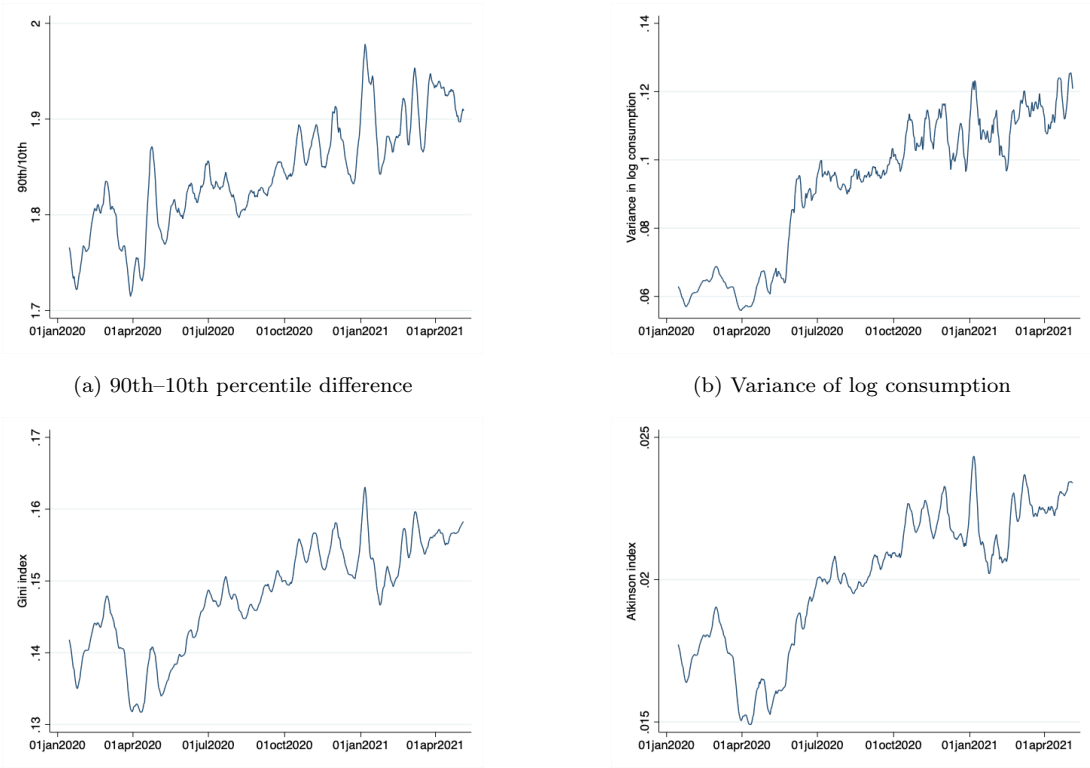
2.3 Monetary policy shock identification and data

As many researchers (Labonte 2021, Clarida et al. 2021, Ferrero and Giglioli 2020, among others) claim, the Fed promoted economic and financial stability throughout the Covid-19 emergency by exploiting its monetary policy and lender of last resort functions. Some of these actions aimed to encourage economic activity by lowering interest rates (traditional monetary policy measures), while others aimed to provide liquidity so that businesses could access required funding. In particular, in 2020, differently from the past,

the Fed has also acted as a lender for non-bank firms and markets by creating a series of emergency lending facilities.

For the scope of our analysis, we examine those announcements that are classified as "Monetary Policy" in the list of press releases on the Fed website (we consider 42 items in total)[9]. We then divide this set into two broad categories. The first, that we call "purely monetary" policies, includes announcements of conventional and unconventional monetary policy actions by the Fed during the Covid-19 emergency and that include federal funds rate, Repo agreements and QE programs.

Figure 2: Consumption spending inequality indices



(a) 90th–10th percentile difference

(b) Variance of log consumption

(c) Gini index

(d) Atkinson index

Note: the panels report the values of four inequality indices for the US during our sample period. For all these indicators, a higher value is a sign for a higher level of consumption inequality across counties

The second group, instead, consists of announcements of liquidity and funding operations, subsidized lending facilities, other tools to provide more direct support to credit, such as under-remunerated reserve requirements and other banking initiatives. This second category contributes to an emergency support to firms in order to avoid mass layoffs and a sharp decrease in employment: they can be easily seen as a complement to fiscal measures in the sense that they indirectly support labour incomes and employees and therefore we refer to them as "quasi-fiscal" policies[10]. As described by Mackenzie and Stella (1996) and

[9] A complete list of the announcements we consider for our analysis is available in Appendix A.

[10] Although quasi-fiscal policies have a direct impact only on Ricardian households, i.e. those who

Gil Park (2015) these are operations that could, in principle, be duplicated by specific budgetary measures in the form of an explicit tax, subsidy, or other direct expenditure, rather than being inherent to central banks.

In order to recognize the shocks, we use an innovative setup combining high frequency (HF) data with a narrative approach for the identification of monetary policy shocks, but with some differences from other authors who used similar strategies such as Kuttner (2001), Gurkayanak et al. (2005), Hamilton (2008), Campbell et al. (2012). First, while they use a narrow time window to maximize the chances that the identified shocks are truly exogenous, due to data availability we do not isolate a 30-minute window around the announcements and assume that no other shock occurs in the same day to change the response of the variables, as in Cochrane and Piazzesi (2002), and perform several robustness checks to validate our results[11]. Second, in line with recent studies such as Lenza and Slacalek (2019) and Inoue and Rossi (2021), we look at the spread between the long-term and the short-term interest rates on Treasury bills (that is, the change in the slope of the yield curve) in the days of Covid-19 related Fed press conferences as a measure for the shock. Indeed, the great majority of actions in 2020 were not based on interest rate increases, but rather on forward guidance and asset purchases. When a central bank gives forward guidance on future monetary policy, it shapes investors' expectations for future policy interest rates, which influence the yield curve. Forward guidance refers to central banks' commitment to keep policy interest rates low for a period of time or until they accomplish a measurable goal (such as an increase in inflation and/or a decrease in unemployment). Hence, the yield curve is predicted to flatten between the short end and the term of the yield curve that corresponds to the guidance's term, and to flatten farther out. Similarly, asset purchases involve the outright purchase of assets by the central bank in the secondary market, including government bonds. By purchasing assets, the central bank adds to demand for them, so their price increases and their yield falls. As

have access to financial markets, there can also be an indirect effect for non-Ricardian, that are those entirely consuming only their labor income, according to the definition of Kaplan et al. (2018). Indeed, quasi-fiscal policies aim at sustaining employment through facilitating credit to firms, therefore avoiding mass layoffs and giving benefits also to non-Ricardian consumers.

[11]We are aware that we cannot exclude the presence of other contemporaneous (in the same day) shocks that can possibly make our results biased (see Miranda-Agrippino and Ricco 2021). However, to control for the possible noise in our measure we perform a series of robustness checks. We try excluding from the timeline of press conferences those days in which important fiscal measures were announced. This robustness check also guarantees that our results are driven by the Fed's measures rather than by the massive fiscal policies implemented by the Government during our sample period. Moreover, to take into account the possibility that market participants react to the Fed's assessment of the economic outlook rather than to policy announcements, we follow the so-called "poor-man's" sign-restriction procedure (Jarociński and Karadi 2020). We use the spread between the long term and the short term treasury bill interest rates as a proxy for monetary policy shocks only in those days in which the change in the spread and the change in stock prices (proxied by NASDAQ100) have opposite sign, setting our policy variable to zero in the remaining days. We use the TB rates spread surprises in the other days as a proxy for central bank information shocks. The results we get are very similar to the ones presented here, which include all dates. For a more detailed discussion on advantages and disadvantages of using a 30-minute window for the identification of monetary policy shocks, see Auer et al. (2021).

a result, asset purchases can change the slope of the yield curve, usually by lowering the additional yield investors require to compensate for the uncertainty that interest rates or inflation could rise in the future (term risk). Therefore, we consider a narrowing of the spread between the long and the short-term interest rates as an indicator of an unconventional expansionary monetary policy intervention (this measure can possibly capture purely monetary interventions better than quasi-fiscal ones) and in days without any relevant announcement, the series takes zero value. Figure 3 shows the constructed shock series[12]. The occurrence of purely monetary and quasi-fiscal policies is different in most of the cases, depending on the day in which they were announced. The former ones were generally announced through FOMC statements, whereas this is not necessarily true for the latter ones. The size of the surprise is similar for the two kinds of shock, suggesting that the nature of the policy announced is not a key determinant of markets' reaction. However, we want to distinguish the two kinds of announcement in order to study their effect on real variables and inequality: what matters for this purpose is to identify the different timing of the press conferences more than the magnitudes of the two shocks. Finally, the two largest surprises have been recorded at the end of the sample period. In particular, one refers to the quasi-fiscal policy announcement of March, 8th 2021 by the Federal Reserve Board of the extension of its Paycheck Protection Program Liquidity Facility. The second occurred after a FOMC press release in which the committee stated to continue QE program and Repo agreement operations. As a robustness check, we repeat the analysis using different measures for the shock, finding similar results[13].

All the data we use to analyze the effects of monetary policy are taken from the FRED database and have a daily frequency. In particular, we use data on the short term (3 month) and long term (10 year) Treasury bill rates. We also include a stock market variable in our econometric model, using the NASDAQ 100 Index, which represents the daily index value at market closing. It includes 100 of the largest domestic and international non-financial securities listed on the NASDAQ Stock Market based on market capitalization. Finally, we construct a timeline of the Fed press conferences with Covid-19 related policy announcements, taking the data from the Fed's public website.

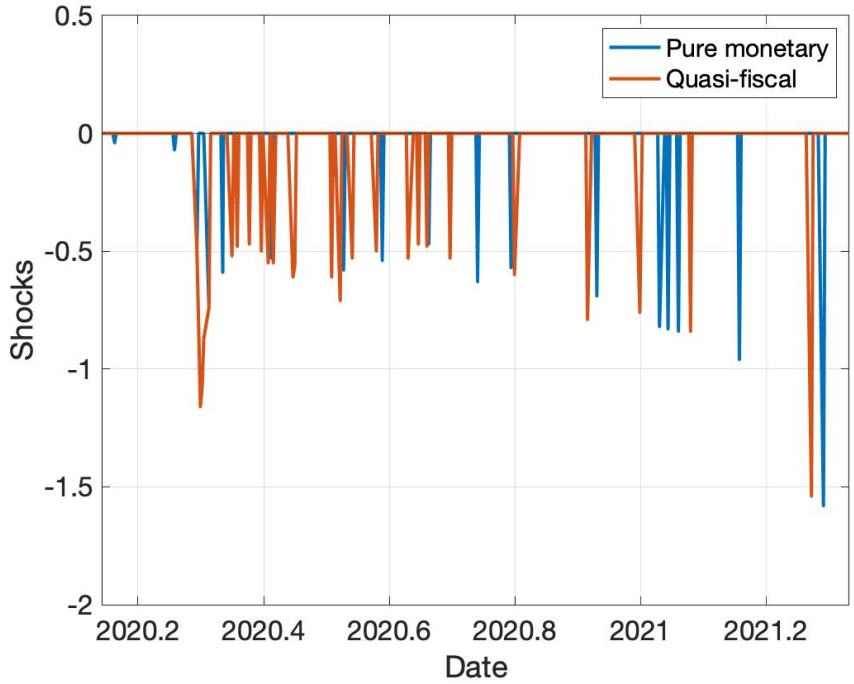
3 Consumption inequality and Fed's policies during the pandemic

In this Section we investigate the effect of Fed's policies on consumption spending inequality in the US from 20th January 2020 to 31st March 2021, and in particular whether there is any difference between pure monetary and quasi-fiscal policies. We do so in two ways.

[12]The daily change in the spread between the long-term and the short-term interest rates on Treasury bills, and the related autocorrelation function, can be found in Appendix B.

[13]More details on this robustness check are presented in Appendix C1.

Figure 3: The policy surprise series



Note: the figure reports the daily change in the spread between the long-term (10-year) and the short-term (3-month) interest rates on Treasury bills in the days of press conferences.

First, we compute the Gini index of consumption spending by weighting each county by its per capita income in 2019. Our intention is to see not only if consumption spending concentration increases after Fed's policies, but also whether this concentration concerns poor or rich counties. Indeed, *ceteris paribus*, the index increases with a higher concentration of expenditure in richer counties. We include this measure in a VAR framework to study the response of the consumption spending Gini[14] coefficient to a policy shock. It is described by the model:

$$Y_t = B_0 + B_1 Y_{t-1} + B_2 Y_{t-2} + \cdots + B_p Y_{t-p} + e_t \qquad e_t \sim \mathcal{N}(0, \Sigma) \tag{1}$$

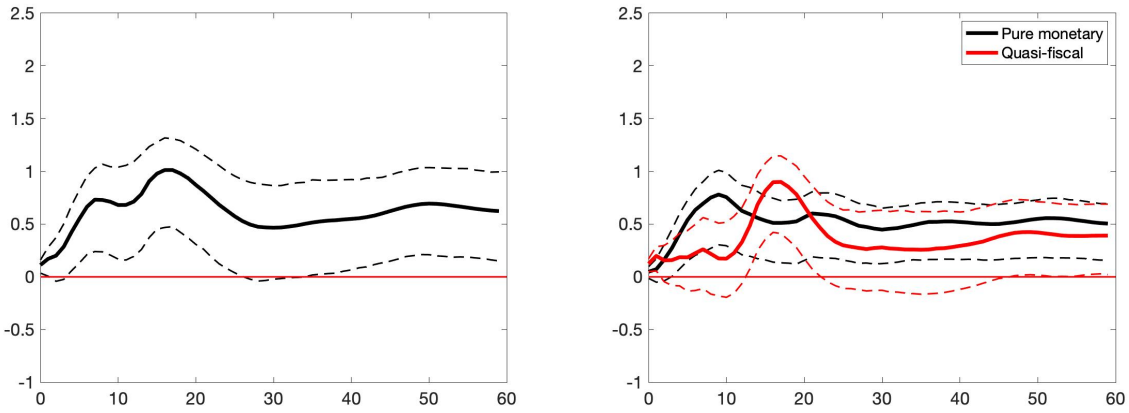
where Y_t is a vector of variables entering the VAR in the following order: average consumption across all counties, average employment rate, our narrative-HF shock, a stock market variable represented by the NASDAQ 100 index and the Gini index computed on consumption spending. The ordering of the variables in the VAR guarantees that consumption and employment do not respond contemporaneously to the shock, but with one lag[15]. Consumption (in dollars per day), the employment rate, the stock market variable

[14] As a robustness check, we perform the analysis using different measures of inequality: the variance of the logarithm of consumption, the difference between the 90th and the 10th percentile of the distribution of consumption and the Atkinson index. The results, are shown in Appendix C2.

[15] To validate the robustness of our results, we performed the analysis with different orderings of the variables: firstly, by inverting the order of consumption and employment and leaving the other ones as

and the weighted Gini coefficient (as indices) are expressed as deviations from the 20-day centered moving average to be de-trended, and are stationary according to the Augmented Dickey–Fuller (ADF) test and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test. p is the number of lags, chosen as to cover two weeks of observations (10 working days)[16], Bs are matrices of coefficients and e is a vector of normally distributed errors. We estimate the model twice: in the first estimate we consider the total policy shock, thus considering the whole series of Covid-19 related Fed's press conferences. Then, we distinguish between purely monetary shocks and quasi-fiscal shocks, therefore including two shock variables in the VAR. The purely monetary shock is placed before the quasi-fiscal one in the vector of variables, but robustness checks inverting the ordering of the two shocks give very similar results. Figure 4 shows the resulting cumulative impulse response functions (IRFs), together with the 68% confidence intervals. Considering the whole set of policies in Panel (a), inequality grows at first, and then decreases, but still remains above the initial level. Panel (b) then decomposes the coefficient's reaction to purely monetary shocks and quasi-fiscal ones. We can see that after both shocks inequality increases, with a peak in the response of the weighted Gini coefficient to quasi-fiscal policies around 20 days from the shock. In both cases, the increase in inequality is persistent[17].

Figure 4: Consumption spending inequality's response to shocks



(a) Total shock

(b) Pure monetary and quasi-fiscal shocks

Note: the two panels report the impulse response functions of the Gini coefficient (weighted for counties' per capita income) to the total shock, the purely monetary and the quasi-fiscal shock, together with the 68% confidence intervals.

they are described above; secondly, by moving the shock variable as the first one, thus allowing all the others to contemporaneously respond to the policy. In both cases, we get very similar results.

[16]We also repeated all the analyses by setting p as to cover one month of observations (approximately 23 working days) and by setting it equal to the average of the optimal lag lengths according to BIC and AIC criteria. Results are very similar in both cases.

[17]To confirm our findings, we did a similar exercise constructing a VAR in which the vector of variables contains, in the following order: the Gini index of consumption, the Gini index of employment, the shock and the stock market variable. By looking at the response of the first variable to the shock, we get similar results to the ones presented in Figure 4.

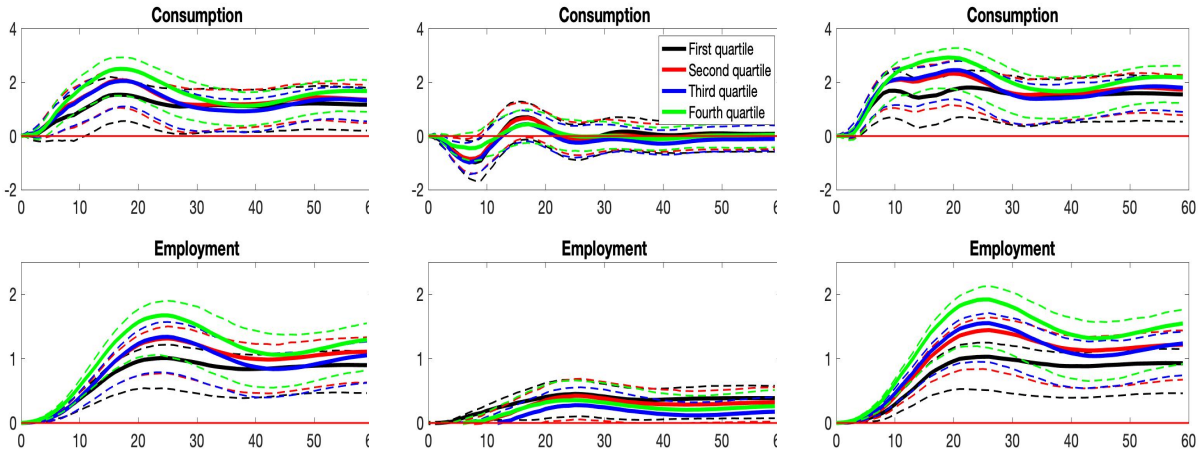
Then, given the above results, we ask ourselves whether poorer and richer counties responded differently to the shocks. To answer this question, we estimate another VAR for the four quartiles of the income distribution separately, again once for the total shock and once including both shocks (pure monetary and quasi-fiscal) in the VAR. We look at the differences in the responses of the quartiles. The specification is the same as above, but in this case Y_t is a vector of variables containing: quartile-specific consumption, quartile-specific employment rate, our narrative-HF shock (total or divided between purely monetary and quasi-fiscal) and a stock market variable represented by the NASDAQ 100 index[18]. The lag length is again chosen as to cover two weeks of observations. Figure 5 reports the cumulative impulse response functions of consumption and employment to the total shock (a), then decomposed into the pure monetary policy shock (b) and the quasi-fiscal shock (c) for the four quartiles of the income distribution of counties, together with the 68% confidence intervals[19]. We focus on the cumulative effect (by looking at the area underneath the impulse response; see Ramey 2016) to control for the possibility that Fed's measures have an effect on different counties with a different timing in a given period. Moreover, it is a simple way to smooth out from the impulse responses the volatility of our daily data. The responses are reported in percentage of the average value of the variable during the sample period: that is, for example, a value for the IRF of consumption spending equal to 2 means that, at that particular horizon following a decrease of one percentage point in the spread, spending increased by 2% with respect to the average. The Fed's intervention had an overall positive impact on consumption, which is in line with the literature on the effects of expansionary monetary policy measures on consumption spending (among others, Casiraghi et al. 2013). Then, looking at the extreme quartiles of the income distribution, we can see from Panel (a) that they had a greater impact on consumption and employment for the fourth quartile (i.e. the richer counties) than for the first (the poorest), so Fed's policies did not have any redistributive effect in the tails. The response of the second quartile (the lower-middle income households) is equal to the one of the third quartile (the upper-middle income counties), suggesting a mitigating effect in the rise in inequality at the center of the distribution. The same reasoning applies when we look at the response of employment to the shock. When distinguishing between those interventions that are purely monetary and the quasi-fiscal ones, the inter-quartile differences are much more pronounced for the second type than for the first, for the responses of both consumption and employment. Again, credit and debit card expenditure is mostly stimulated for the top quartile, less for the bottom one, and in an almost equal way for the second and the third quartiles. In comparison to the results of Figure 4, consumption's response to the quasi-fiscal shock

[18] Also in this case we tried to invert consumption and employment ordering and to move the shock as the first variable, finding very similar results.

[19] It should be noted that results reported in Panels (b) and (c) can also be considered as counterfactual excercises in which quasi-fiscal and purely monetary policies, respectively, were not implemented.

are in line with consumption spending inequality's response, since the IRFs of the richest quartiles (green solid line) exceed that of the poorest ones. Differently from the consumption response to a pure monetary shock, that is ambiguous and around zero, the corresponding response of consumption spending inequality in Figure 4 (black solid line) shows on impact a sharp increase. Differently from the existing literature on the effects of monetary policy on consumption and employment, we are here using daily data to assess consumers' reaction within a short period of time, simulating the movements of real variables for approximately two months after the policy is implemented.

Figure 5: Consumption and employment responses to shocks



(a) Total shock (b) Pure monetary shock (c) Quasi-fiscal shock

Note: the three panels report the cumulative impulse response functions of consumption and employment to the total shock, the pure monetary policy shock and the quasi-fiscal shock for the four quartiles of the income distribution by counties, together with the 68% confidence intervals. Responses are in percentage of the average value of the variable during the sample period.

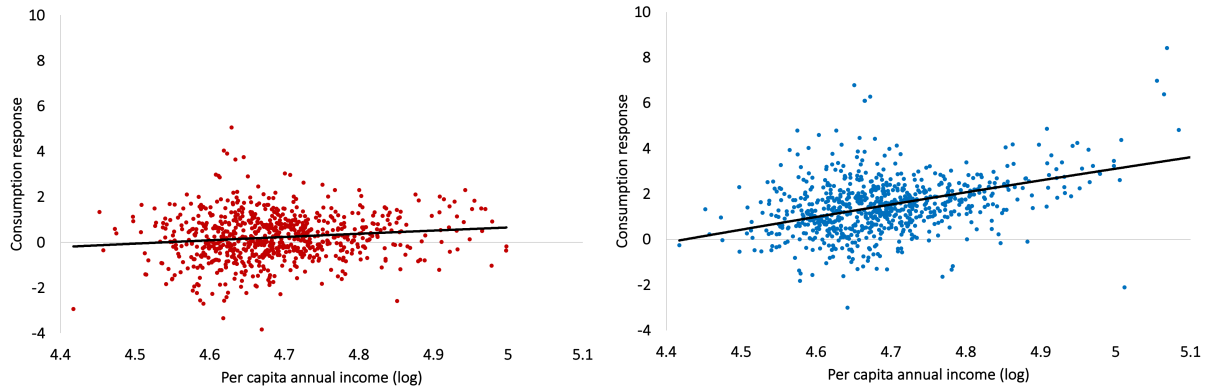
Since actual income is more rigid than consumption, we can easily imagine that the increase in consumption is based on an adjustment of consumers' expectations about future income (and therefore a decrease in precautionary savings). Indeed, as Lewis et al. (2020) report, the reaction of consumers' confidence is evident after a few days following the policy announcement (although stronger for rate changes than for asset purchases and forward guidance). In a similar analysis, Karger and Rajan (2020) look at the response of consumption to stimulus payments in US during Covid-19, finding that the reaction is evident already in the two weeks following the measure.

To see the differences in the consumption response to the shock along the whole distribution, so without aggregating by quartiles, we correlate the response of a county's consumption expenditure at a 30-day horizon with its 2019 annual per capita income in logarithm. The results, shown in Figure 6, are in line with the impulse response functions analysed above. Indeed, richer counties experience a higher semielasticity of consumption

spending to the shock after 30 days, relative to poorer ones. This positive correlation is not significant for a purely monetary policy shock, while it is more pronounced for quasi-fiscal ones.

We can imagine two channels through which Fed's policies (in particular quasi-fiscal ones) boosted consumption spending. The first acts through a wealth effect: asset prices increase following an announcement, enriching those counties in which asset holding is higher and stimulating consumption expenditure. The second is through the labor income: quasi-fiscal policies have been designed to mitigate the negative impact of the pandemic on employment, contributing to support firms and preventing sharp decreases in personal income, thus giving incentives for consumption spending.

Figure 6: Counties' consumption spending response to shocks and logarithm of per capita income



(a) Pure monetary policy shock

(b) Quasi-fiscal shock

Note: each dot corresponds to a county. The two panels report the correlation between the card spending IRF value at 30 day-horizon following a policy shock and the county's per person annual income in dollars in 2019. On the y-axis, responses are in percentage of the average value of consumption spending during the sample period.

In order to investigate these channels, we regress the response of credit and debit card expenditure to a policy shock on the weight of income from dividends, interests and rent on total personal income for each county (sourced by the US BEA), as a proxy for asset holding, and on the amount of loans granted through the Paycheck Protection Program Liquidity Facility (PPPLF) (sourced by the US Small Business Administration, SBA). The Paycheck Protection Program (PPP) provides loans to small businesses so that they can keep their workers on the payroll. The PPPLF, implemented by the Fed, extends credit to eligible financial institutions that originate PPP loans, taking the loans as collateral at face value. We estimate the following equation:

$$C_{pc} = \alpha + \beta_1 I_c + \beta_2 PPPLF_c + \beta_3 X_c + \epsilon_c$$

where C is the consumption response after 30 days in county c to policy p, $p \in \{PM, QF\}$, I is the income coming from assets, $PPPLF$ is the amount of loans granted through the

PPPLF program, and X is a set of control variables that includes each county's employment in leisure and hospitality (two of the most affected sectors during the pandemic, sourced by the US Bureau of Labor Statistics), debt-to-income ratio and population-weighted total Covid-19 cases during the sample period considered. All variables are in logarithm. The results of the OLS regression are reported in Table 1: the dependent variable is the response of counties' consumption expenditure to a policy shock after 30 days (in percentage of the average value of consumption spending during the sample period). Columns (1), (3) and (5) refer to the reaction to a pure monetary shock, while (2), (4) and (6) to a quasi-fiscal one. The first two columns consider the whole set of counties. The coefficient for the weight of income from dividends, interests and rent on total personal income (the first variable in the list of independent ones) is positive and statistically significant for the quasi-fiscal shock consumption response. This suggests that there is actually a wealth effect: after a policy stimulus, asset value increases, enriching those counties in which asset holding is higher, and consequently increasing consumption in these counties. Indeed, a higher stimulus to stock market prices is given by quasi-fiscal measures rather than pure monetary ones, as shown in Figure 7. Moreover, the weight of income from dividends, interests and rent positively correlates with per capita annual income at the county level, as shown in Figure 8: in richer counties the weight of financial earnings is higher. This partly explains the higher reaction of the fourth quartile's consumption spending to quasi-fiscal shocks. To account also for the total income effect, we repeat the analysis by splitting the sample and considering rich (the top two quartiles) and poor (the bottom two) counties separately. Results are shown in columns (3)-(6): the coefficient of the weight of income from assets is positive for both, but higher for rich counties, although not statistically significant for poor ones.

Table 1: OLS regression results

	(1) PM	(2) QF	(3) PM	(4) QF	(5) PM	(6) QF
Income from assets	-0.00205	0.136***	0.0275	0.106*	-0.154	0.0274
	(-0.05)	(3.31)	(0.74)	(2.13)	(-1.17)	(0.41)
PPPLF loans	0.0146**	0.0177***	0.00960*	0.0189***	0.0189	-0.0125
	(3.25)	(3.89)	(2.45)	(3.78)	(1.44)	(-1.93)
Leisure&hospitality	0.0184	-0.0273**	0.0148	-0.0135	0.0376	-0.0211
	(1.75)	(-2.67)	(1.18)	(-1.01)	(1.82)	(-1.43)
Debt-to-inc. ratio	-0.0413	-0.00324	-0.0329	-0.0114	-0.0474	0.0111
	(-1.43)	(-0.16)	(-1.66)	(-0.45)	(-0.72)	(0.41)
Covid-19 cases	0.0242	-0.0337	0.0369	-0.0229	-0.00673	-0.0394
	(0.92)	(-1.38)	(1.22)	(-0.72)	(-0.13)	(-1.12)
Median age	0.335*	-0.104	0.159	-0.141	0.473	-0.131
	(2.18)	(-1.48)	(1.83)	(-1.54)	(1.71)	(-1.30)
Observations	714	714	426	426	288	288
Counties	All	All	Rich	Rich	Poor	Poor

t statistics in parentheses

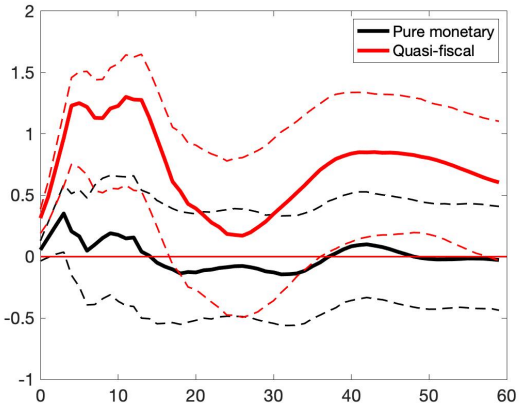
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note: all variables are at the county level. The dependent variable in columns (1), (3) and (5) is the response of consumption expenditure to a pure monetary policy shock after 30 days, while in columns (2), (4) and (6) it is the response to a quasi-fiscal one. The independent variables are: the weight of income from asset on total income, the amount of PPPLF loans granted, the employment in leisure and hospitality, the debt-to income ratio, the population-weighted number of Covid-19 cases and the median age. All variables are in logarithm and regressions are made using robust standard errors. The sample consists of the whole set of counties in columns (1) and (2), the two richest quartiles of counties in columns (3) and (4), and the poorest two quartiles in columns (5) and (6). Data refer to an average of 2019 and 2020 for the weight of income from assets, for employment in leisure and hospitality and for debt-to-income ratio, and to the sample period for PPPLF loans and Covid-19 cases.

Then we consider the relationship between the amount of PPPLF loans granted in each county (the second regressor in Table 1) and consumption spending response to quasi-fiscal policies, which is positive: counties that received more loans with the PPPLF program as a support for employment reacted more strongly, in terms of consumption spending, to quasi-fiscal Fed's policies. Also in this case the more intense reaction coming from richer counties can be explained by the larger amount of loans granted in counties belonging to the top quartile of the distribution rather than the other three quartiles[20]. Moreover, this latter evidence can also explain the reaction of employment to a quasi-fiscal shock in the bottom panel of Figure 5c: it is stronger for richer counties than for poorer ones. Again, this result holds when we consider rich and poor counties separately, although the coefficient is significant only for the former.

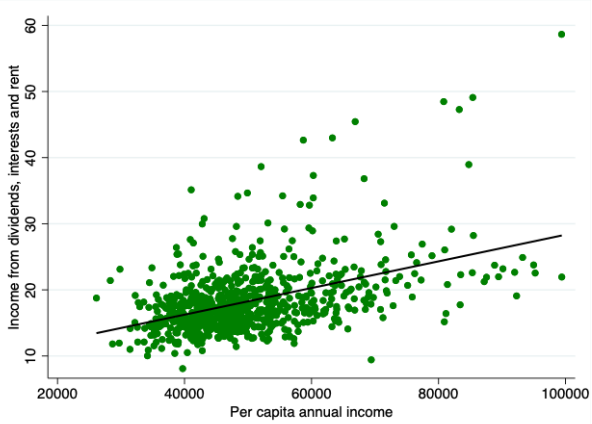
[20]More details on this can be found in Appendix D.

Figure 7: Stock markets' reaction to Fed's pure monetary and quasi-fiscal policies



Note: the graph reports NASDAQ100 index' impulse responses, in percentage of the average value of the index during the sample period.

Figure 8: Weight of income coming from assets and per capita annual income



Note: each dot corresponds to a county. Variables are in dollars on the x-axis and in percent on the y-axis.

Finally, it is interesting to notice that the impact of the median age is positive for pure monetary policies, while negative (although not statistically significant) for quasi-fiscal ones. This suggests that, ceteris paribus, counties with an older population reacted more rapidly, in terms of consumption spending, to changes in interests rates or announcements of QE programs, while they reacted less intensely than younger counties to quasi-fiscal measures.

4 Conclusion

In this paper, we investigate the development of consumption spending inequality across counties in the US during Covid-19 pandemic, and the effect of Fed's policies on such inequality. Our main contribution, relative to previous works on monetary policy and inequality, is the use of recently released high-frequency (daily) data from credit card transactions, that allow us to compute inequality measures at a daily frequency, combined with a narrative approach, to evaluate the impact of the central bank's monetary and quasi-fiscal policies. To the best of our knowledge, we are the first to assess the effect of monetary policy on consumption and employment using daily data.

Two limitations of our work must be highlighted before jumping to the conclusions. Firstly, our analysis is focused on a limited period of time, and for the moment these results cannot be generalized to a longer horizon. Secondly, we consider only a subset of policies that the Fed has implemented during the pandemic, that are those classified as "Monetary Policy" in the Fed's website.

We find that Fed's policies have stimulated consumption spending for all counties along the income distribution, thus helping both richer and poorer counties during the

initial phase of the crisis. Moreover, inequality in consumption spending as measured by the Gini coefficient has increased following Fed's policies, because richer counties have responded more strongly than poorer ones. This is mainly due to a wealth effect: such policies made asset prices increase and favoured those counties in which income coming from dividends, interests and rent has a higher weight on total personal income. When distinguishing between purely monetary and quasi-fiscal policies, we find that the effect of latter ones has been more intense. In other words, subsidized lending programs, facilities to support credit to businesses and programs to avoid mass layoffs indirectly supported labour income and employees, thus increasing consumption in the first quartile of counties. At the same time, the reaction of the top quartile has been more intense through the wealth effect, thus increasing consumption spending inequality across counties.

References

[1] Alexander, D. and Karger, E. *Do Stay-at-Home Orders Cause People to Stay at Home? Effects of Stay-at-Home Orders on Consumer Behavior*. FRB of Chicago Working Paper No. 2020-12, 2020

[2] Andersen, A., Hansen, E. and Sheridan, A., *Consumer Responses to the COVID-19 Crisis: Evidence from Bank Account Transaction Data*. Covid Economics, 7: 88–114, 2020

[3] Aspachs,O., Durante, R., Graziano, A., Mestres, J,. Reynal-Querol, M,. and Montalvo, J.G., *Tracking the impact of COVID-19 on economic inequality at high frequency*. PLoS ONE, 2021

[4] Auer,S., Bernardini, M. and Cecioni, M., *Corporate leverage and monetary policy effectiveness in the euro area*. European Economic Review, Volume 140, 2021

[5] Bachas, N., Ganong, P., Noel, P.J., Vavra, J.S., Wong, A., Farrell, D. and Greig, F.E., *Initial Impacts of the Pandemic on Consumer Behavior: Evidence from Linked Income, Spending, and Savings Data*. NBER Working Paper Series 27617, 2020

[6] Baker, S. R., Farrokhnia, R.A., Meyer, S., Pagel, M., and Yannelis, C., *How Does Household Spending Respond to an Epidemic? Consumption During the 2020 COVID-19 Pandemic*. Working Paper 26949, National Bureau of Economic Research, 2020

[7] Blundell, R. and Preston, I., *Consumption Inequality and Income Uncertainty*. Quarterly Journal of Economics, 113(2), 1998

[8] Bullard, J., *Monetary Policy and Fiscal Policy Responses to the COVID-19 Crisis*. Federal Reserve Bank of St. Louis' Regional Economist, Fourth Quarter 2020, 2020

[9] Campbell, J.R., Evans, C.L., Fisher, J.D.M. and Justiniano, A., *Macroeconomic effects of federal reserve forward guidance*. Brookings Papers on Economic Activity 42 (1), 2012

[10] Casiraghi, M., Gaiotti, E., Rodano, L., and Secchi, A., *The Impact of Unconventional Monetary Policy on the Italian Economy During the Sovereign Debt Crisis*. Bank of Italy's Questioni di Economia e Finanza (Occasional Papers) n.203, 2013

[11] Casiraghi, M., Gaiotti, E., Rodano, L., and Secchi, A., *A "reverse Robin Hood"? The distributional implications of non-standard monetary policy for Italian households*. Bank of Italy's Temi di discussione (Working Papers) n.1077, 2016

[12] Chetty, R., Friedman, J., Hendren, N., Stepner, M. and the Opportunity Insights Team, *The Economic Impacts of COVID-19: Evidence from a New Public Database Built Using Private Sector Data*. Harvard University Working Paper, 2020

[13] Chronopoulos, D.K., Lukas, M., and Wilson, J.O., *Consumer Spending Responses to the COVID-19 Pandemic: An Assessment of Great Britain*. Covid Economics (34), 2020

[14] Clarida, R., Duygan-Bump, B. and Schotti, C. *The COVID-19 Crisis and the Federal Reserve's Policy Response*. Finance and Economics Discussion Series 2021-035. Washington: Board of Governors of the Federal Reserve System, 2021

[15] Cochrane, J.H. and Piazzesi, M., *The Fed And Interest Rates - A High-Frequency Identification*. American Economic Review, v. 92, 2002

[16] Coibion, O., Gorodnichenko, Y., Kueng, L. and Silvia, J. , *Innocent bystanders? Monetary policy and inequality*. Journal of Monetary Economics, 88(C), 2017

[17] Corrado, L. and Fantozzi, D., *Micro level data for macro models: the distributional effects of monetary policy*. CEIS Research Paper from Tor Vergata University No 491, 2021

[18] Cotton, C.D., Garga, V., Rohan, J. , *Consumption spending and inequality during the Covid-19 pandemic*. Covid Economics, CEPR Press, Issue 83, 2021

[19] Cox, N., Ganong, P., Noel, P., Vavra, J., Wong, A., Farrell, D., Greig, F., and Deadman, E., *Initial Impacts of the Pandemic on Consumer Behavior: Evidence from Linked Income, Spending, and Savings Data*. Brookings Papers on Economic Activity, 2020

[20] Crouzet, N., *Unpacking the Federal Reserve's Aggressive Response to COVID-19*, KelloggInsight, 2020

[21] EarnestResearch, *Where States Stand: Measuring the Reopenings One Step at a Time*. https://www.earnestresearch.com/insights/where-states-stand-measuring-the-reopening-one-step-at-a-time, 2020

[22] Ferrero, A. and Giglioli, S., *How did central banks respond to the coronavirus crisis?*. Economic Observatory, 2020

[23] Finck, D. and Tillmann, P., *Pandemic Shocks and Household Spending*. Oxford Bulletin of Economics and Statistics, Volume84, Issue2, 2022

[24] Fleming, M., Sarkar, A. and Van Tassel, P. , *The COVID-19 Pandemic and the Fed's Response*. Federal Reserve Bank of New York Liberty Street Economics, 2020

[25] Fulford, S. L., *How Important is Variability in Consumer Credit Limits?*. Journal of Monetary Economics 72, 2015

[26] Ganong, P. and Shoag, D.V., *Why Has Regional Income Convergence in the U.S. Declined?*. NBER Working Paper No. 23609, 2017

[27] Gathergood, J., Gunzinger, F., Guttman-Kenney, B., Quispe-Torreblanca, E., and Stewart, N., *Levelling Down and the COVID-19 Lockdowns: Uneven Regional Recovery in UK Consumer Spending*. Covid Economics 67, 2021

[28] Gaubert, C., Kline, P.M., Vergara, D. and Yagan, D., *Trends in U.S. Spatial Inequality: Concentrating Affluence and a Democratization of Poverty*. NBER Working Paper No. 28385, 2021

[29] Gil Park, S., *Central Banks Quasi-Fiscal Policies and Inflation* . International Journal of Central Banking (39), 2015

[30] Guerello, C., *Conventional and unconventional monetary policy vs. households income distribution: An empirical analysis for the Euro Area*. Journal of International Money and Finance, Elsevier, vol. 85(C), 2018

[31] Gurkayanak, R.S., Brian Sack, B., and Swanson, E.T., *Do Actions Speak Louder than Words? The Response of Asset Prices to Monetary Policy Actions and Statements*. International Journal of Central Banking 1 (1), 2005

[32] Hacıoğlu-Hoke, S., Känzig, D.R. and Surico, P., *The distributional impact of the pandemic*. European Economic Review 134, 2021

[33] Hamilton, J. D., *Daily monetary policy shocks and new home sales*. Journal of Monetary Economics 55 (7), 2008

[34] Inoue, A. and Rossi, B., *A new approach to measuring economic policy shocks, with an application to conventional and unconventional monetary policy*. Quantitative Economics, Volume 12, Issue 4 , 2021

[35] Jarociński, M. and Karadi, P. *Deconstructing monetary policy surprises: the role of information shocks.*. American Economic Journal: Macroecon. 12 (2), 1–43, 2020

[36] Kaplan, G., Moll, B. and Violante, Giovanni L., *Monetary policy according to HANK*. American Economic Review, vol. 108, no. 3, pp. 697-743, 2018

[37] Karger, E. and Rajan, A., *Heterogeneity in the Marginal Propensity to Consume: Evidence from Covid-19 Stimulus Payments*. Tech. Rep. WP 2020-15, Federal Reserve Bank of Chicago, 2020

[38] Krueger, D. and Perri, F., *Does Income Inequality Lead to Consumption Inequality? Evidence and Theory*. Review of Economic Studies, 73, 2006

[39] Kuttner, N.K., *Monetary Policy Surprises and Interest Rates: Evidence from the Fed Funds Futures Market*. Journal of Monetary Economics 47, no. 3: pp. 523-44, 2001

[40] Labonte, M., *The Federal Reserve's Response to COVID-19: Policy Issues*. Congressional Research Service Report, 2021

[41] Lenza, M. and Slacalek, J., *How does monetary policy affect income and wealth inequality? Evidence from quantitative easing in the euro area*. Working Paper Series 2190, European Central Bank, 2018

[42] Lenza, M. and Slacalek, J., *Quantitative easing did not increase inequality in the euro area*. Research Bullettin - No. 54, European Central Bank, 2019

[43] Lewis, J., Makridis, C. and Mertens, K., *Do Monetary Policy Announcements Shift Household Expectations?*. Staff Report Number 897, Federal Reserve Bank of New York, 2020

[44] Miranda-Agrippino, S. and Ricco, G., *The Transmission of Monetary Policy Shocks*. American Economic Journal: Macroeconomics, 13 (3), 2021

[45] Mackenzie, G.A. and Stella, P., *Quasi-Fiscal Operations of Public Financial Institutions*. IMF Occasional Papers, 1996

[46] Montecino, J. and Epstein, G., *Did quantitative easing increase income inequality?*. SSRN Electronic Journal, 2015

[47] Mumtaz, H. and Theophiopoulou, A., *The Impact of Monetary Policy on Inequality in the UK. An Empirical Analysis*. Queen Mary University of London School of Economics and Finance Working Paper, 2016 (783), 2016

[48] Paarlberg, L., Hoyman, M. and McCall, J., *Heterogeneity, Income Inequality, and Social Capital: A New Perspective*. Social Science Quarterly, 2017

[49] Ramey, V.A., *Macroeconomic shocks and their propagation*. in: Taylor, J.B., Uhlig, H. (Eds.), Handbook of Macroeconomics, Vol. 2A. Elsevier, pp. 71–162, 2016

[50] Saiki, A. and Frost, J., *Does unconventional monetary policy affect inequality? Evidence from Japan*. Applied Economics, vol. 46, issue 36, pp. 4445-4454, 2014

APPENDIX

A Selected Covid-19 related Fed interventions

The press conferences considered for the construction of our shock series are the ones under the classification *Monetary Policy* on the Fed's website[21] during our sample period (between 20th January 2020 and 31st March 2021), only removing those dates in which the minutes of past meetings were released. We consider announcements of "purely monetary" interventions those related to changes in federal funds rates, Repo agreements and quantitative easing programs. Viceversa, announcements of tools to provide more direct support to credit, such as under-remunerated reserve requirements and facilities, are classified as "quasi-fiscal". Table A1 reports the list of press conferences we used to construct the series of shocks, indicating whether they are considered purely monetary or quasi-fiscal.

[21] https://www.federalreserve.gov/newsevents/pressreleases.htm.

Table A1: List of a selection of Fed press conferences and interventions related to the Covid-19 crisis. One asterisk (*) indicates that the announcement is considered purely monetary, two asterisks (**) that the announcement is quasi-fiscal and three (***) that it is included in both classifications.

Date	**Main measures taken**
*January 29, 2020	• FOMC statement: the target range for the federal funds rate maintained at 1-1/2 to 1-3/4 percent.
*March 3, 2020	• FOMC statement: the target range for the federal funds rate lowered by 1/2 percentage point, to 1 to 1-1/4 percent in light of the risks posed by coronavirus.
***March 15, 2020	• FOMC statement: target range for the federal funds rate lowered to 0 to 1/4 percent. The Committee expects to maintain this target range until it is confident that the economy has weathered recent events and is on track to achieve its maximum employment and price stability goals. • QE program: announced purchase of $500 billion in US Treasuries and $200 billion in mortgage-backed securities. • Expanded overnight and term repurchase agreement operations. • Discount window: lowered the primary credit rate by 150 basis points to 0.25 percent and enlarged lending period to 90 days, prepayable and renewable by the borrower on a daily basis. • Banks are encounraged to use their capital and liquidity buffers as they lend to households and businesses who are affected by the coronavirus. • Reserve requirement ratios are lowered to zero percent, effective on the beginning of the next reserve maintenance period on March 26th. This action eliminates reserve requirements for thousands of depository institutions and helps to support lending to households and businesses. • The Bank of Canada, the Bank of England, the Bank of Japan, the European Central Bank, the Federal Reserve, and the Swiss National Bank agreed to lower the pricing on the standing U.S. dollar liquidity swap arrangements by 25 basis points, so that the new rate will be the U.S. dollar overnight index swap (OIS) rate plus 25 basis points.
**March 17, 2020	• Announced establishment of a Primary Dealer Credit Facility (PDCF) to support the credit needs of households and businesses. • Announced establishment of a Commercial Paper Funding Facility (CPFF) to support the flow of credit to households and businesses. • Provided banks additional flexibility to support households and businesses.
**March 18, 2020	• Broadened program of support for the flow of credit to households and businesses by establishing a Money Market Mutual Fund Liquidity Facility (MMLF).

**March 19, 2020	• Federal Reserve Board encouraged by increase in discount window borrowing to support the flow of credit to households and businesses. • Announced the establishment of temporary U.S. dollar liquidity arrangements with other central banks. These facilities are designed to help lessen strains in global U.S. dollar funding markets, thereby mitigating the effects of these strains on the supply of credit to households and businesses, both domestically and abroad[22]. • Federal bank regulatory agencies issue interim final rule for Money Market Liquidity Facility.
**March 20, 2020	• Federal Reserve Board expands its program of support for flow of credit to the economy by taking steps to enhance liquidity and functioning of crucial state and municipal money markets. • Coordinated central bank action to further enhance the provision of U.S. dollar liquidity.
***March 23, 2020	• FOMC statement: expanded QE program to an unlimited amount and included purchase of commercial mortgage-backed securities. • Expanded overnight Repo program. • Allowed banks to decrease capital. • Established the Primary Market Corporate Credit Facility (PMCCF) and the Secondary Market Corporate Credit Facility (SMCCF) to support corporate-bond lending. • Revived the Term-Asset Backed Securities Loan Facility (TALF) to support credit for asset-backed loans (such as student loans, credit cards, SBA loans). • Expanded the Money Market Mutual Fund Liquidity Facility (MMLF) to support municipal bonds. • Announced that a Main Street Business Lending Program (MSBLP) will be created to support lending to SMEs.
*March 31, 2020	• Federal Reserve announces establishment of a temporary FIMA Repo Facility to help support the smooth functioning of financial markets.
**April 6, 2020	• Federal Reserve will establish a facility to facilitate lending to small businesses via the Small Business Administration's Paycheck Protection Program (PPP) by providing term financing backed by PPP loans.

[22]Since swaps with other central banks are different from the other quasi-fiscal measures here considered, for their aim of international financial stability, we also performed a rubstness check by eliminating this date from the list of press conferences, finding very similar results.

**April 9, 2020	Additional actions to provide up to $2.3 trillion in loans to support the economy: • bolstering the effectiveness of the Small Business Administration's Paycheck Protection Program (PPP) by supplying liquidity to participating financial institutions through term financing backed by PPP loans to small businesses.Moreover, the Paycheck Protection Program Liquidity Facility (PPPLF) will extend credit to eligible financial institutions that originate PPP loans, taking the loans as collateral at face value; • ensuring credit flows to small and mid-sized businesses with the purchase of up to $600 billion in loans through the Main Street Lending Program; • increasing the flow of credit to households and businesses through capital markets, by expanding the size and scope of the Primary and Secondary Market Corporate Credit Facilities (PMCCF and SMCCF) as well as the Term Asset-Backed Securities Loan Facility (TALF). These three programs will now support up to $850 billion in credit backed by $85 billion in credit protection provided by the Treasury; • helping state and local governments manage cash flow stresses caused by the coronavirus pandemic by establishing a Municipal Liquidity Facility that will offer up to $500 billion in lending to states and municipalities. The Treasury will provide $35 billion of credit protection to the Federal Reserve for the Municipal Liquidity Facility using funds appropriated by the CARES Act.
**April 16, 2020	• Federal Reserve announces its Paycheck Protection Program Liquidity Facility is fully operational and available to provide liquidity to eligible financial institutions.
**April 23, 2020	• Federal Reserve announces it is working to expand access to its Paycheck Protection Program Liquidity Facility (PPPLF) for additional SBA-qualified lenders as soon as possible. • Federal Reserve Board announces temporary actions aimed at increasing the availability of intraday credit extended by Federal Reserve Banks.
**April 27, 2020	• Federal Reserve Board announces an expansion of the scope and duration of the Municipal Liquidity Facility. The new population thresholds allow substantially more entities to borrow directly from the MLF than the initial plan announced on April 9.
*April 29, 2020	• FOMC announced it was committed to using its full range of tools to support the economy. • Target range for the federal funds rate maintained at 0 to 1/4 percent.
**April 30, 2020	• Federal Reserve expands access to its Paycheck Protection Program Liquidity Facility (PPPLF) to additional lenders, and expands the collateral that can be pledged. • Federal Reserve Board announces it is expanding the scope and eligibility for the Main Street Lending Program.
**May 11, 2020	• Federal Reserve publishes updates to the term sheet for the Municipal Liquidity Facility.

**May 12, 2020	• Federal Reserve publishes updates to the term sheet for the Term Asset-Backed Securities Loan Facility (TALF) and announces information to be disclosed monthly for the TALF and the Paycheck Protection Program Liquidity Facility.
**June 3, 2020	• Federal Reserve Board announces an expansion in the number and type of entities eligible to directly use its Municipal Liquidity Facility.
**June 8, 2020	• Federal Reserve Board expands its Main Street Lending Program to allow more small and medium-sized businesses to be able to receive support.
*June 10, 2020	• Target range for the federal funds rate maintained at 0 to 1/4 percent.
**June 15, 2020	• Federal Reserve Board announces it will be seeking public feedback on proposal to expand its Main Street Lending Program to provide access to credit for nonprofit organizations. • Federal Reserve Board announces updates to Secondary Market Corporate Credit Facility (SMCCF), which will begin buying a broad and diversified portfolio of corporate bonds to support market liquidity and the availability of credit for large employers. • Federal Reserve Board announces it will resume examination activities for all banks, after previously announcing a reduced focus on exam activity in light of the coronavirus response.
**June 29, 2020	• Federal Reserve Board releases new term sheet for the Primary Market Corporate Credit Facility, adding pricing and other information.
*July 2, 2020	• FOMC announces its tentative meeting schedule for 2021.
**July 17, 2020	• Federal Reserve Board modifies Main Street Lending Program to provide greater access to credit for nonprofit organizations such as educational institutions, hospitals, and social service organizations.
**July 23, 2020	• Federal Reserve Board announces expansion of counterparties in the Term Asset-Backed Securities Loan Facility, Secondary Market Corporate Credit Facility, and Commercial Paper Funding Facility.
**July 28, 2020	• Federal Reserve Board announces an extension through December 31 of its lending facilities that were scheduled to expire on or around September 30.

*July 29, 2020	• FOMC said it would use its full range of tools until it is "confident that the economy has weathered recent events and is on track to achieve its maximum employment and stability goals". • Federal Reserve Board announces the extensions of its temporary U.S. dollar liquidity swap lines and the temporary repurchase agreement facility for foreign and international monetary authorities (FIMA repo facility) through March 31, 2021. • Target range for the federal funds rate maintained at 0 to 1/4 percent.
**August 11, 2020	• Federal Reserve Board announces revised pricing for its Municipal Liquidity Facility.
*August 27, 2020	• FOMC announced updates to its statement on longer-run goals and monetary policy strategy: it will focus more on addressing unemployment than on containing inflation; it will allow inflation >2% if that will help ensure maximum employment.
*September 16, 2020	• FOMC statement: target range for the federal funds rate maintained at 0 to 1/4 percent. • Continued QE program and Repo agreement operations.
**September 18, 2020	• Federal Reserve Board updates frequently asked questions to clarify the Board and Department of Treasury's expectations regarding lender underwriting for the Main Street Lending Program.
**October 30, 2020	• Federal Reserve Board adjusts terms of Main Street Lending Program to better target support to smaller businesses that employ millions of workers and are facing continued revenue shortfalls due to the pandemic.
*November 5, 2020	• FOMC statement: target range for the federal funds rate maintained at 0 to 1/4 percent. • Continued QE program and Repo agreement operations.
**November 30, 2020	• Federal Reserve Board announces extension through March 31, 2021, for several of its lending facilities that were generally scheduled to expire on or around December 31.
*December 11, 2020	• Federal Reserve releases illustrative examples of new charts that will be included in the Federal Open Market Committee's quarterly Summary of Economic Projections (SEP).
*December 16, 2020	• FOMC statement: target range for the federal funds rate maintained at 0 to 1/4 percent. • Continued QE program and Repo agreement operations.

*December 22, 2020	• Federal Reserve Board invites public comment on proposed amendments to Regulation D and issues final rule amending Regulation D with regard to reserve requirement ratios on transaction accounts.
**December 29, 2020	• Federal Reserve extends termination date of Main Street Lending Program facilities.
*January 27, 2021	• FOMC statement: target range for the federal funds rate maintained at 0 to 1/4 percent. • Continued QE program and increased purchased to $80 billion per month of US Treasuries and $40 billion per month of mortgage-backed securities. • Promised to continue until inflation >2% and long-term inflation expectations well anchored at 2%. • Expect ST interest rates to remain at current levels for two or three years.
**March 8, 2020	• Federal Reserve Board announces it will extend its Paycheck Protection Program Liquidity Facility.
*March 17, 2021	• FOMC statement: target range for the federal funds rate maintained at 0 to 1/4 percent. • Continued QE program and Repo agreement operations.

B Monetary policy announcements and the spread

Figure B1 shows the daily change in the spread between the long-term and the short-term interest rates on Treasury bills, and the related autocorrelation function. Vertical lines in the top panel indicate the days of Fed's announcements: red lines refer to purely monetary policy interventions, while blue ones are for quasi-fiscal policies. We can see a higher volatility of the series in the days of press conferences. Moreover, there is little evidence that the series is serially correlated.

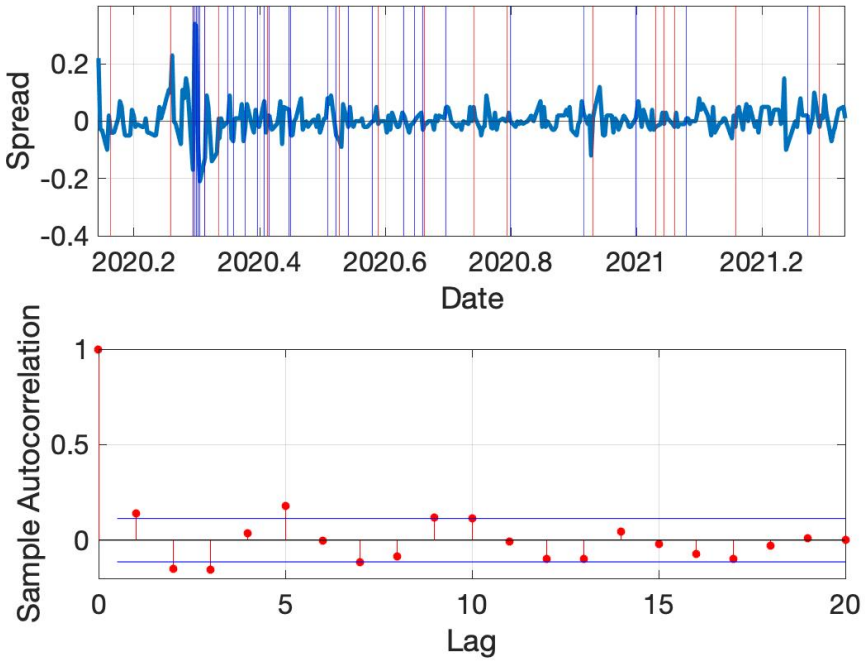
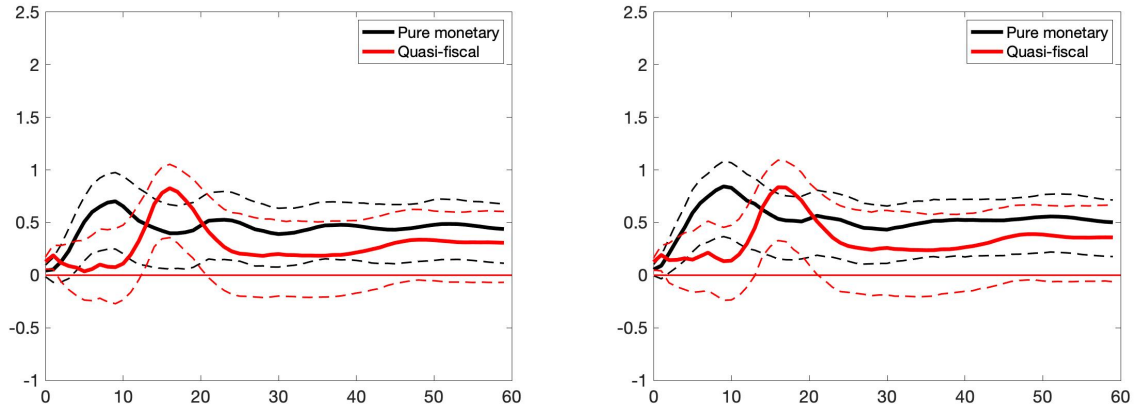


Figure B1: The policy surprise series and the autocorrelation function; Note: the two panels report the daily change in the spread between the long-term (10-year) and the short-term (3-month) interest rates on Treasury bills, and the related autocorrelation function.

C Robustness checks

C.1 Other measures for the shock

As a robustness check, we evaluate the response of the Gini coefficient to a purely monetary policy shock and a quasi-fiscal policy shock using two different measures for the shock: the spread between the 10-year and the 2-year Treasury bills and the spread between the 10-year Treasury bill and the federal funds rate. The lag length is again chosen to cover two weeks of observations. The ordering of the vector of variables is the same as our main exercise, and the implicit restrictions behind this ordering imply that consumption and the employment rate do not simultaneously respond to the shock, while the latter measure responds contemporaneously to innovations in consumption and employment. This scheme allows us to disentangle monetary shocks from demand shocks but not vice-versa. The distinction between purely monetary policies and quasi-fiscal policies is given, also in this case, by the nature of the announcement in the Fed's press release (see Appendix A for the list of announcements we consider). Finally, the inequality index is assumed to be weakly exogenous to the model and, hence, to not affect contemporaneously all the other variables as in Saiki and Frost (2014). Figure C1 shows the results: as in Figure 6 of the paper, the effect of both shocks is to first increase inequality. Following the quasi-fiscal policy shock, the inequality level persistently decreases, while it remains higher than the initial level after the pure monetary shock.



(a) 10-year TB minus 2-year TB

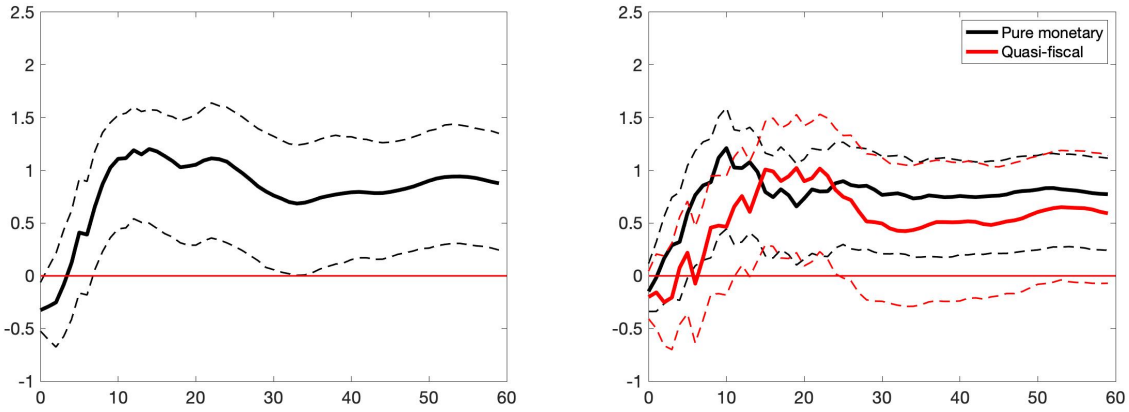
(b) 10-year TB minus federal funds rate

Figure C1: Inequality's response to shocks measured by different spreads; Note: the two panels report the impulse response functions of the Gini coefficient to a pure monetary and a quasi-fiscal shock. The shock is measured as the spread between the 10-year Treasury bill rate on one side and the 2-year one (left panel), and the the federal funds rate (right panel) on the other.

C.2 Other inequality measures

As a further check, we perform the analysis shown in Figure 4 of the paper using different measures of inequality: the variance of the logarithm of consumption, the difference

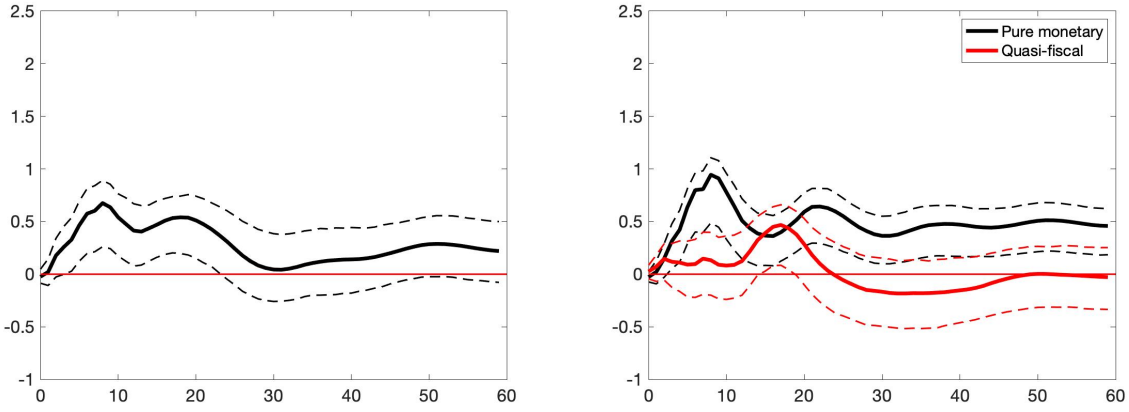
between the 90th and the 10th percentile of the distribution of consumption and the Atkinson index. The lag length is 10, so as to cover two weeks of observations. Our findings are shown in Figures C2, C3 and C4: the inequality index initially grows following both shocks. Although the initial stimulus is similar when we look at all indices, there are some differences in the persistence of the effects of the two shocks, due to the different structure of the indicators. Moreover, in the cumulative IRFs plotted in Figure C4 the higher medium-term effect of quasi-fiscal policy on the weighted Gini is due to the particularly high initial stimulus.



(a) Total shock

(b) Pure monetary and quasi-fiscal shocks

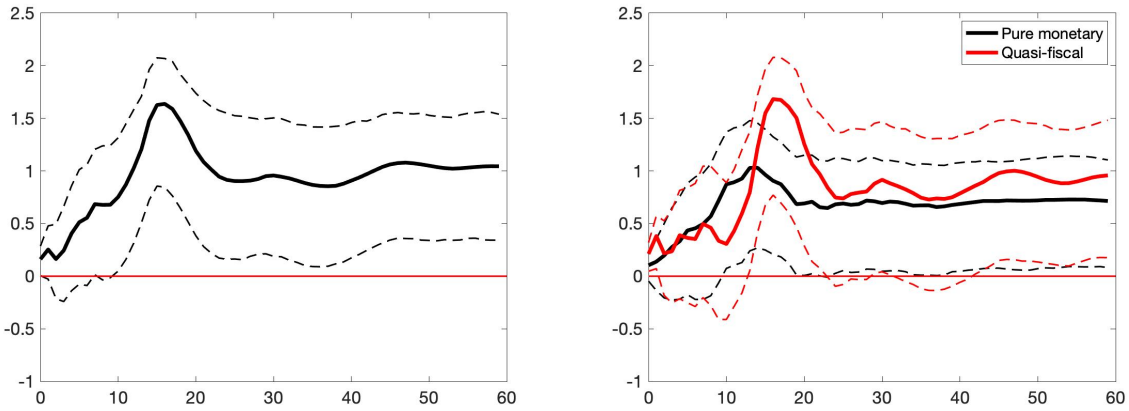
Figure C2: Variance of logarithm consumption response to policies; Note: the graph shows the impulse response function of the variance of the logarithm of consumption (weighted for counties' per capita income) to a monetary policy shock, then decomposed into pure monetary and quasi-fiscal policy shock, with the 68% confidence intervals. Responses are in percentage of the average value of the variable during the sample period.



(a) Total shock

(b) Pure monetary and quasi-fiscal shocks

Figure C3: 90th-10th percentiles' difference response to policies; Note: the graph shows the impulse response function of the difference between the 90th percentile and the 10th percentile of the distribution of counties (weighted for counties' per capita income) to a monetary policy shock, then decomposed into pure monetary and quasi-fiscal policy shock, with the 68% confidence intervals. Responses are in percentage of the average value of the variable during the sample period.



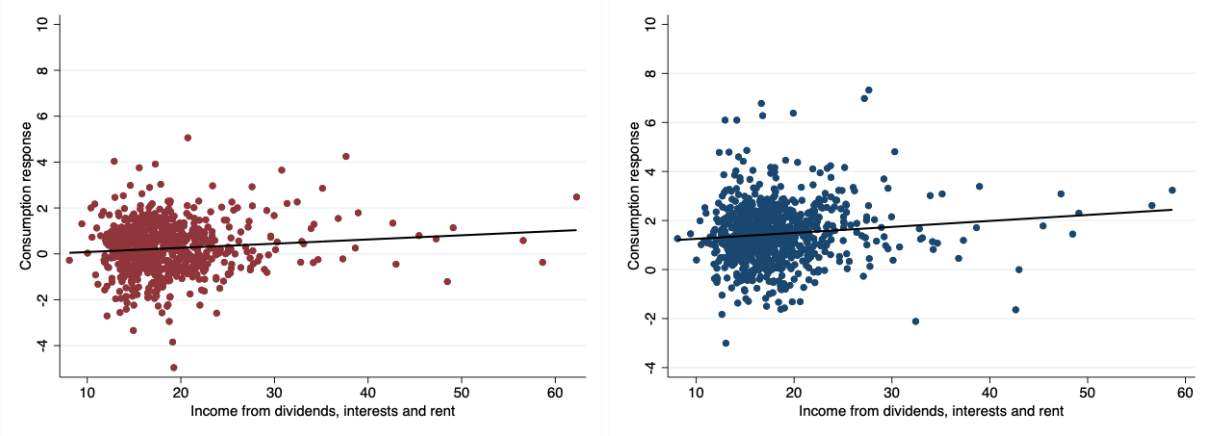
(a) Total shock

(b) Pure monetary and quasi-fiscal shocks

Figure C4: Atkinson index' response to policies; Note: the graph shows the impulse response function of the Atkinson index (weighted for counties' per capita income) to a monetary policy shock, then decomposed into pure monetary and quasi-fiscal policy shock, with the 68% confidence intervals. Responses are in percentage of the average value of the variable during the sample period.

D Wealth and labor income effects: additional plots

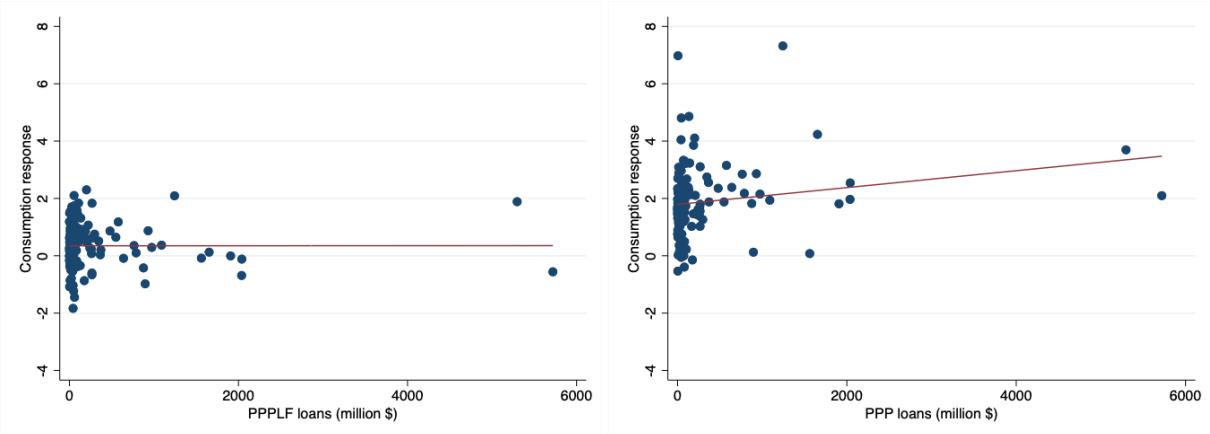
As explained in Section 3, the main drivers of the higher consumption response coming from richer counties than from poorer ones are a wealth effect and a greater stimulus to labor income. Figure D1 illustrates the former: with both shocks, and in particular with quasi-fiscal ones, there is a positive relationship between the weight of income coming from dividends, interests and rent, and the consumption response to the policy. Together with Figures 7 and 8 in Section 3, which show that asset value increased following Fed's policies and assets are normally held in richer counties, this explains the stronger reaction of these counties in terms of consumption spending.



(a) Pure monetary policy shock (b) Quasi-fiscal shock

Figure D1: Counties' consumption spending response to shocks and weight of income coming from dividends, interests and rent on total personal income; Note: each dot corresponds to a county. The two panels report the correlation between the card spending IRF value at 30 day-horizon following a policy shock and the county's value for the weight of income coming from dividends, interests and rent on total personal income in 2019. On the x-axis data are in percent shares of the total personal income. On the y-axis, responses are in percentage of the average value of consumption spending during the sample period.

Concerning the labor income effect, Figure D2 shows the correlation between the amount of loans granted through the PPPLF in a county and its response to policy shocks. As illustrated in Panel (b), this is positive for quasi-fiscal measures, implying that counties that received larger amounts through this facility have been more stimulated in terms of consumption spending. This suggests that employment was more sustained in those counties, therefore avoiding sharp decreases in consumption expenditure. Finally, Figure D3 explains why this effect was stronger for richer counties: a larger amount of loans was granted to the ones belonging to the top quartile of the distribution.



(a) Pure monetary policy shock (b) Quasi-fiscal shock

Figure D2: Counties' consumption spending response to shocks and loan amount from PPP program; Note: each dot corresponds to a county. The two panels report the correlation between the card spending IRF value at 30 day-horizon following a policy shock and the amount of loans received through the PPP program. On the y-axis, responses are in percentage of the average value of consumption spending during the sample period.

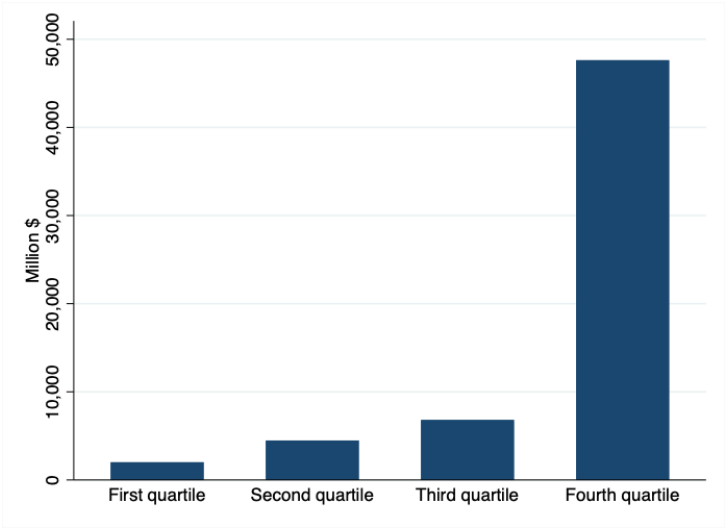


Figure D3: Amount of loans granted to US counties through PPPLF, by quartile of income per capita.

RECENTLY PUBLISHED "TEMI" (*)

N. 1375 – *New facts on consumer price rigidity in the Euro Area*, by Erwan Gautier, Cristina Conflitti, Riemer P. Faber, Brian Fabo, Ludmila Fadejeva, Valentin Jouvanceau, Jan-Oliver Menz, Teresa Messner, Pavlos Petroulas, Pau Roldan-Blanco, Fabio Rumler, Sergio Santork, Elisabeth Wieland and Hélène Zimmer (July 2022).

N. 1376 – *Connecting to power: political connections, innovation, and firm dynamics*, by Ufuk Akcigit, Salomé Baslandze and Francesca Lotti (July 2022).

N. 1377 – *"Green" fiscal policy measures and non-standard monetary policy in the Euro Area*, by Anna Bartocci, Alessandro Notarpietro and Massimiliano Pisani (July 2022).

N. 1378 – *Firm liquidity and the transmission of monetary policy*, by Margherita Bottero and Stefano Schiaffi (July 2022).

N. 1379 – *The impact of Covid-19 on the european short-term rental market*, by Elisa Guglielminetti, Michele Loberto and Alessandro Mistretta (July 2022).

N. 1380 – *An analysis of objective inflation expectations and inflation risk premia*, by Sara Cecchetti, Adriana Grasso and Marcello Pericoli (July 2022).

N. 1381 – *The role of central bank communication in inflation-targeting Eastern European emerging economies*, by Valerio Astuti, Alessio Ciarlone and Alberto Coco (October 2022).

N. 1382 – *The heterogeneous effects of bank mergers and acquisitions on credit to firms: evidence from Italian macro-regions*, by Silvia Del Prete, Cristina Demma, Iconio Garrì, Marco Piazza and Giovanni Soggia (October 2022).

N. 1383 – *Bank lending to small firms: metamorphosis of a financing model*, by Paolo Finaldi Russo, Valentina Nigro and Sabrina Pastorelli (October 2022).

N. 1384 – *MMacroeconomic effects of growth-enhancing measures in the euro area*, by Alessandro Cantelmo, Alessandro Notarpietro and Massimiliano Pisani (October 2022).

N. 1385 – *Revisiting the real exchange rate misalignment-economic growth nexus via the across-sector misallocation channel*, by Claire Giordano (October 2022).

N. 1386 – *Labor market spillovers of a large plant opening. Evidence from the oil industry*, by Matteo Alpino, Irene Di Marzio, Maurizio Lozzi and Vincenzo Mariani (October 2022).

N. 1387 – *Unburdening regulation: the impact of regulatory simplification on photovoltaic adoption in Italy*, by Federica Daniele, Alessandra Pasquini, Stefano Clò and Enza Maltese (October 2022).

N. 1388 – *Liberalizing the opening of new pharmacies and hospitalizations*, by Andrea Cintolesi and Andrea Riganti (November 2022).

N. 1389 – *Mediation Analysis Synthetic Control*, by Giovanni Mellace and Alessandra Pasquini (November 2022).

N. 1390 – *The effects of partial employment protection reforms: evidence from Italy*, by Diego Daruich, Sabrina Di Addario and Raffaele Saggio (November 2022).

N. 1391 – *The role of majority status in close election studies*, by Matteo Alpino and Marta Crispino (November 2022).

N. 1392 – *Issuing bonds during the Covid-19 pandemic: is there an ESG premium?*, by Fabrizio Ferriani (November 2022).

N. 1393 – *Economic fundamentals and stock market valuation: a CAPE-based approach*, by Maria Ludovica Drudi and Federico Calogero Nucera (November 2022).

(*) Requests for copies should be sent to:
Banca d'Italia – Servizio Studi di struttura economica e finanziaria – Divisione Biblioteca e Archivio storico – Via Nazionale, 91 – 00184 Rome – (fax 0039 06 47922059). They are available on the Internet www.bancaditalia.it.

2020

ALESSANDRI P. and M. BOTTERO, *Bank lending in uncertain times,* R European Economic Review, V. 128, **WP 1109 (April 2017).**

ANTUNES A. and V. ERCOLANI, *Public debt expansions and the dynamics of the household borrowing constraint,* Review of Economic Dynamics, v. 37, pp. 1-32, **WP 1268 (March 2020).**

ARDUINI T., E. PATACCHINI and E. RAINONE, *Treatment effects with heterogeneous externalities,* Journal of Business & Economic Statistics, , v. 38, 4, pp. 826-838, **WP 974 (October 2014).**

BALTRUNAITE A., C. GIORGIANTONIO, S. MOCETTI and T. ORLANDO, Discretion and supplier selection in public procurement, Journal of Law, Economics, and Organization, v. 37, 1, pp. 134-166, **WP 1178 (June 2018)**

BOLOGNA P., A. MIGLIETTA and A. SEGURA, *Contagion in the CoCos market? A case study of two stress events,* International Journal of Central Banking, v. 16, 6, pp. 137-184, **WP 1201 (November 2018).**

BOTTERO M., F. MEZZANOTTI and S. LENZU, *Sovereign debt exposure and the Bank Lending Channel: impact on credit supply and the real economy,* Journal of International Economics, v. 126, article 103328, **WP 1032 (October 2015).**

BRIPI F., D. LOSCHIAVO and D. REVELLI, *Services trade and credit frictions: evidence with matched bank – firm data,* The World Economy, v. 43, 5, pp. 1216-1252, **WP 1110 (April 2017).**

BRONZINI R., G. CARAMELLINO and S. MAGRI, *Venture capitalists at work: a Diff-in-Diff approach at late-stages of the screening process,* Journal of Business Venturing, v. 35, 3, **WP 1131 (September 2017).**

BRONZINI R., S. MOCETTI and M. MONGARDINI, *The economic effects of big events: evidence from the Great Jubilee 2000 in Rome,* Journal of Regional Science, v. 60, 4, pp. 801-822, **WP 1208 (February 2019).**

COIBION O., Y. GORODNICHENKO and T. ROPELE, *Inflation expectations and firms' decisions: new causal evidence,* Quarterly Journal of Economics, v. 135, 1, pp. 165-219, **WP 1219 (April 2019).**

CORSELLO F. and V. NISPI LANDI, *Labor market and financial shocks: a time-varying analysis,* Journal of Money, Credit and Banking, v. 52, 4, pp. 777-801, **WP 1179 (June 2018).**

COVA P. and F. NATOLI, *The risk-taking channel of international financial flows,* Journal of International Money and Finance, v. 102, **WP 1152 (December 2017).**

D'ALESSIO G., *Measurement errors in survey data and the estimation of poverty and inequality indices,* Statistica Applicata - Italian Journal of Applied Statistics, v. 32, 3, **WP 1116 (June 2017).**

DE BLASIO G., I. DE ANGELIS and L. RIZZICA, *Lost in corruption. Evidence from EU funding to Southern Italy,* Italian Economic Journal / Rivista italiana degli economisti, v. 6, 3, pp. 355–377, **WP 1180 (December 2016).**

DEL PRETE S. and S. FEDERICO, *Do links between banks matter for bilateral trade? Evidence from financial crises,* Review of World Economic, v. 156, 4, pp. 859 - 885, **WP 1217 (April 2019).**

D'IGNAZIO A. and C. MENON, *The causal effect of credit Guarantees for SMEs: evidence from Italy,* The Scandinavian Journal of Economics, v. 122, 1, pp. 191-218, **WP 900 (February 2013).**

ERCOLANI V. and F. NATOLI, *Forecasting US recessions: the role of economic uncertainty,* Economics Letters, v. 193, **WP 1299 (October 2020).**

MAKINEN T., L. SARNO and G. ZINNA, *Risky bank guarantees,* Journal of Financial Economics, v. 136, 2, pp. 490-522, **WP 1232 (July 2019).**

MODENA F., E. RETTORE and G. M. TANZI, *The effect of grants on university dropout rates: evidence from the Italian case,* Journal of Human Capital, v. 14, 3, pp. 343-370, **WP 1193 (September 2018).**

NISPI LANDI V., *Capital controls spillovers,* Journal of International Money and Finance, v. 109, **WP 1184 (July 2018).**

PERICOLI M., *On risk factors of the stock–bond correlation,* International Finance, v. 23, 3, pp. 392-416, **WP 1198 (November 2018).**

PIETRUNTI M. and F. M. SIGNORETTI, *Unconventional monetary policy and household debt: the role of cash-flow effects,* Journal of Macroeconomics, v. 64, Article 103201, **WP 1142 (October 2017).**

RAINONE E., *The network nature of OTC interest rates,* Journal of Financial Markets, v.47, article 100525, **WP 1022 (July 2015).**

RAINONE E. and F. VACIRCA, *Estimating the money market microstructure with negative and zero interest rates,* Quantitative Finance, v. 20, 2, pp. 207-234, **WP 1059 (March 2016).**

RIZZICA L., *Raising aspirations and higher education. Evidence from the UK's widening participation policy,* Journal of Labor Economics, v. 38, 1, pp. 183-214, **WP 1188 (September 2018).**

RIZZICA L. and M. TONELLO, *Persuadable perceptions: the effect of media content on beliefs about*

corruption, Economic Policy, v. 35, 104, pp. 679–737, **WP 1043 (November 2016).**

SANTIONI, R., F. SCHIANTARELLI and P. STRAHAN, *Internal capital markets in times of crisis: the benefit of group affiliation*, Review of Finance, v. 24, 4, pp. 773-811, **WP 1146 (October 2017).**

SCHIANTARELLI F., M. STACCHINI and P. STRAHAN, *Bank Quality, judicial efficiency and loan repayment delays in Italy,* Journal of Finance, v. 75, 4, pp. 2139-2178, **WP 1072 (July 2016).**

2021

ACCETTURO A., A. LAMORGESE, S. MOCETTI and D. PELLEGRINO, *Housing Price elasticity and growth: evidence from Italian cities,* Journal of Economic Geography, v. 21, 3, pp. 367-396, **WP 1267 (March 2020).**

AFFINITO M. and M. PIAZZA, *Always look on the bright side? Central counterparties and interbank markets during the financial crisis*, International Journal of Central Banking, v. 17, 1, pp. 231-283, **WP 1181 (July 2018).**

ALBANESE G., E. CIANI and G. DE BLASIO, *Anything new in town? The local effects of urban regeneration policies in Italy,* Regional Science and Urban Economics, v. 86, **WP 1214 (April 2019).**

ALBANESE G., G. DE BLASIO and A. LOCATELLI, *Does EU regional policy promote local TFP growth? Evidence from the Italian Mezzogiorno,* Papers in Regional Science, v. 100, 2, pp. 327-348, **WP 1253 (December 2019).**

ALBERTAZZI A., A. NOBILI and F. M. SIGNORETTI, *The bank lending channel of conventional and unconventional monetary policy,* Journal of Money, Credit and Banking, v. 53, 2-3, pp. 261-299, **WP 1094 (Jan 2017).**

ANZUINI A. and L. ROSSI, *Fiscal policy in the US: a new measure of uncertainty and its effects on the American economy*, Empirical Economics, v. 61, 6, pp. 2613-2634, **WP 1197 (November 2018).**

APRIGLIANO V. and D. LIBERATI, *Using credit variables to date business cycle and to estimate the probabilities of recession in real time*, The Manchester School, v. 89, 51, pp. 76-96, **WP 1229 (July 2019).**

AUER S., M. BERNARDINI and M. CECIONI, *Corporate leverage and monetary policy effectiveness in the euro area,* European Economic Review, v. 140, Article 103943, **WP 1258 (December 2019).**

BANERJEE R, L. GAMBACORTA and E. SETTE, *The real effects of relationship lending,* Journal of Financial Intermediation, v. 48, Article 100923, **WP 1133 (September 2017).**

BARONE G., F. DAVID, G. DE BLASIO and S. MOCETTI, *How do house prices respond to mortgage supply?,* Journal of Economic Geography, v. 21, 1, pp.127-140, **WP 1282 (June 2020).**

BARONE G. and S. MOCETTI, *Intergenerational mobility in the very long run: Florence 1427-2011,* Review of Economic Studies, v. 88, 4, pp. 1863–1891, **WP 1060 (April 2016).**BARTOCCI A., L. BURLON, A. NOTARPIETRO and M. PISANI, *Macroeconomic effects of non-standard monetary policy measures in the Euro Area: the role of corporate bond purchases,* The Manchester School, v. 89, S1, pp. 97-130, **WP 1241 (Oct 2019).**

BATINI N., A. CANTELMO, G. MELINA and S. VILLA, *How loose, how tight? A measure of monetary and fiscal stance for the euro area,* Oxford Economic Papers, v. 73, 4, pp. 1536-1556, **WP 1295 (September 2020).**

BENETTON M. and D. FANTINO, *Targeted monetary policy and bank lending behavior,* Journal of Financial Economics, v. 142, 1, pp. 404-429, **WP 1187 (September 2018).**

BUSETTI F., M. CAIVANO and D. DELLE MONACHE, *Domestic and global determinants of inflation: evidence from expectile regression,* Oxford Bulletin of Economics and Statistics, v. 83, 4, pp. 982-1001, **WP 1225 (June 2019).**

BUSETTI F., M. CAIVANO, D. DELLE MONACHE and C. PACELLA, *The time-varying risk of Italian GDP,* Economic Modelling, v. 101, Article 105522, **WP 1288 (July 2020).**

BUSETTI F., S. NERI, A. NOTARPIETRO and M. PISANI, *Monetary Policy strategies in the new normal: a model-based analysis for the Euro Area,* Journal of Macroeconomics, v. 70, Article 103366, **WP 1308 (December 2020).**

CAPOLONGO A. and C. PACELLA, *Forecasting inflation in the Euro Area: countries matter*, Empirical Economics, v. 61, 4, pp. 2477-2499, **WP 1224 (June 2019).**

CARMIGNANI A., G. DE BLASIO, C. DEMMA and A. D'IGNAZIO, *Urbanization and firm access to credit,* Journal of Regional Science, v. 61, 3, pp. 597-622, **WP 1222 (June 2019).**

CORNELI F., *Financial integration without financial development,* Atlantic Economic Journal, v. 49, 2, pp. 201-220, **WP 1120 (June 2017).**

COVA P., P. PAGANO, A. NOTARPIETRO and M. PISANI, *Secular stagnation, R&D, public investment and monetary policy: a global-model perspective,* Macroeconomic Dynamics, v. 25, 5, pp. 1267-1287, **WP 1156 (December 2017).**

DE PHILIPPIS M., *Multitask agents and incentives: the case of teaching and research for university professors,* Economic Journal, v. 131, 636, pp. 1643-1681, **WP 1042 (December 2015).**

DEL PRETE S. and M. L. STEFANI, *Women as "Gold Dust": gender diversity in top boards and the performance of Italian banks,* Economic Notes, Monte dei Paschi di Siena, v. 50, 2, e12183, **WP 1014 (June 2015).**

FERRERO G., M. LOBERTO and M. MICCOLI, *The assets' pledgeability channel of unconventional monetary policy,* Economic Inquiry, v. 59, 4, pp. 1547-1568, **WP 1119 (June 2017).**

FIDORA M., C. GIORDANO and M. SCHMITZ, *Real exchange rate misalignments in the Euro Area,* Open Economies Review, v. 32, 1, pp. 71-107, **WP 1162 (January 2018).**

GAMBACORTA L., G. RICOTTI, S. SUNDARESAN and Z. WANG, *Tax effects on bank liability structure,* European Economic Review, v. 138, Article 103820, **WP 1101 (February 2017).**

HERTWECK M., V. LEWIS and S. VILLA, *Going the extra mile: effort by workers and job-seekers,* Journal of Money, Credit and Banking, v. 54, 8, pp. 2099-2127, **WP 1277 (June 2020).**

LI F., A. MERCATANTI, T. MAKINEN and A. SILVESTRINI, *A regression discontinuity design for ordinal running variables: evaluating central bank purchases of corporate bonds,* The Annals of Applied Statistics, v. 15, 1, pp. 304-322, **WP 1213 (March 2019).**

LOSCHIAVO D., *Big-city life (dis)satisfaction? The effect of urban living on subjective well-being,* Journal of Economic Behavior & Organization, vol. 192, pp. 740-764, **WP 1221 (June 2019).**

LOSCHIAVO D., *Household debt and income inequality: evidence from Italian survey data,* Review of Income and Wealth. v. 67, 1, pp. 61-103, **WP 1095 (January 2017).**

METELLI L. and F. NATOLI, *The international transmission of US tax shocks: a proxy-SVAR approach,* IMF Economic Review, v. 69, 2, pp. 325-356, **WP 1223 (June 2019).**

NISPI LANDI V. and A. SCHIAVONE, *The effectiveness of capital controls,* Open Economies Review, v. 32, 1, pp. 183-211, **WP 1200 (November 2018).**

PAPETTI A., *Demographics and the natural real interest rate: historical and projected paths for the Euro Area,* Journal of Economic Dynamics and Control, v. 132, Article 04209, **WP 1306 (November 2020).**

PEREDA FERNANDEZ S., *Copula-based random effects models for clustered data,* Journal of Business & Economic Statistics, v. 39, 2, pp. 575-588, **WP 1092 (January 2017).**

2022

ANDINI M., M. BOLDRINI, E. CIANI, G. DE BLASIO, A. D'IGNAZIO and A. PALADINI, *Machine learning in the service of policy targeting: the case of public credit guarantees,* Journal of Economic Behavior & Organization, v. 198, pp. 434-475, **WP 1206 (February 2019).**

ANGELICO C., J. MARCUCCI, M. MICCOLI and F. QUARTA, *Can we measure inflation expectations using twitter?,* Journal of Econometrics, v. 228, 2, pp. 259-277, **WP 1318 (February 2021).**

BOTTERO M., C. MINOIU, J. PEYDRÒ, A. POLO, A. PRESBITERO and E. SETTE, *Expansionary yet different: credit supply and real effects of negative interest rate policy,* Journal of Financial Economics, v. 146, 2, pp. 754-778, **WP 1269 (March 2020).**

CANTELMO A., *Rare disasters, the natural interest rate and monetary policy,* Oxford Bulletin of Economics and Statistics, v. 84, 3, pp. 473-496, **WP 1309 (December 2020).**

CARRIERO A., F. CORSELLO and M. MARCELLINO, *The global component of inflation volatility,* Journal of Applied Econometrics, v. 37, 4, pp. 700-721, **WP 1170 (May 2018).**

CIAPANNA E. and G. ROVIGATTI, *The grocery trolley race in times of Covid-19. Evidence from Italy,* Italian Economic Journal / Rivista italiana degli economisti, v. 8, 2, pp. 471-498, **WP 1341 (June 2021).**

FAIELLA I. and A. MISTRETTA, *The net zero challenge for firms' competitiveness,* Environmental & Resource Economics, v. 83, pp. 85-113, **WP 1259 (February 2020).**

GUISO L., A. POZZI, A. TSOY, L. GAMBACORTA and P. E. MISTRULLI, *The cost of steering in financial markets: evidence from the mortgage market,* Journal of Financial Economics, v.143, 3, pp. 1209-1226, **WP 1252 (December 2019).**

LAMORGESE A. and D. PELLEGRINO, *Loss aversion in housing appraisal: evidence from Italian homeowners,* Journal of Housing Economics, v. 56, Article 101826, **WP 1248 (November 2019).**

LI F., T. MÄKINEN, A. MERCATANTI and A. SILVESTRINI, *Causal analysis of central bank holdings of corporate bonds under interference,* Economic Modelling, v.113, Article 105873, **WP 1300 (November 2020).**

MIRENDA L., M. SAURO and L. RIZZICA, *The economic effects of mafia: firm level evidence,* American Economic Review, vol. 112, 8, pp. 2748-2773, **WP 1235 (October 2019).**

MOCETTI S., G. ROMA and E. RUBOLINO, *Knocking on parents' doors: regulation and intergenerational mobility,* Journal of Human Resources, v. 57, 2, pp. 525-554, **WP 1182 (July 2018).**

PERICOLI M. and M. TABOGA, *Nearly exact Bayesian estimation of non-linear no-arbitrage term-structure models,* Journal of Financial Econometrics, , v. 20, 5, pp. 807-838, **WP 1189 (September 2018).**

ROSSI P. and D. SCALISE, *Financial development and growth in European regions,* Journal of Regional Science, v. 62, 2, pp. 389-411, **WP 1246 (November 2019).**

SCHIVARDI F., E. SETTE and G. TABELLINI, *Credit misallocation during the European financial crisis,* Economic Journal, v. 132, 641, pp. 391-423, **WP 1139 (September 2017).**

TABOGA M., *Cross-country differences in the size of venture capital financing rounds: a machine learning approach,* Empirical Economics, v. 62, 3, pp. 991-1012, **WP 1243 (November 2019).**

FORTHCOMING

APRIGLIANO V., S. EMILIOZZI, G. GUAITOLI, A. LUCIANI, J. MARCUCCI and L. MONTEFORTE, *The power of text-based indicators in forecasting Italian economic activity,* International Journal of Forecasting, **WP 1321 (March 2021).**

BRONZINI R., A. D'IGNAZIO and D. REVELLI, *Financial structure and bank relationships of Italian multinational firms,* Journal of Multinational Financial Management, **WP 1326 (March 2021).**

DI ADDARIO S., P. KLINE, R. SAGGIO and M. SØLVSTEN, *It ain't where you're from, it's where you're at: hiring origins, firm heterogeneity, and Wages,* Journal of Econometrics, **WP 1374 (June 2022).**

FERRARI A. and V. NISPI LANDI, *Toward a green economy: the role of central bank's asset purchases,* International Journal of Central Banking, **WP 1358 (February 2022).**

LILLA F., *Volatility bursts: a discrete-time option model with multiple volatility components,* Journal of Financial Econometrics, **WP 1336 (June 2021).**

LOBERTO M, *Foreclosures and house prices,* Italian Economic Journal / Rivista italiana degli economisti, **WP 1325 (March 2021).**

LOBERTO M, A. LUCIANI and M. PANGALLO, *What do online listings tell us about the housing market?,* International Journal of Central Banking, **WP 1171 (April 2018).**

RIZZICA L., G. ROMA and G. ROVIGATTI, *The effects of shop opening hours deregulation: evidence from Italy,* The Journal of Law and Economics, **WP 1281 (June 2020).**

TANZI G. M., *Scars of youth non-employment and labour market conditions,* Italian Economic Journal / Rivista italiana degli economisti, **WP 1312 (December 2020).**