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Dispelling the Shadow of Fiscal Dominance? Fiscal and Monetary Announcement Effects for Euro Area Sovereign Spreads in the Corona Pandemic

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Dispelling the Shadow of Fiscal Dominance? Fiscal and Monetary Announcement Effects for Euro Area Sovereign Spreads in the Corona Pandemic

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Abstract. We use event study regressions to compare the impact of EU monetary versus fiscal policy announcements on government bond spreads of ten euro member countries. Our motivation is to evaluate which of the two players – the ECB or the EU fiscal level – has been more crucial for the stabilization of euro sovereign bond markets in the crisis environment of the pandemic. This question is of substantial relevance to assess potential risks for the effective independence of the ECB in the future. Our key result is that the pandemic monetary emergency measures through the PEPP have been highly effective, whereas fiscal rescue announcements had much less impact. We document a smaller and statistically significant spread-reducing effect only for the announcement of the 'Next Generation EU' program. In contrast, a temporary relaxation of European fiscal rules through the activation of the emergency-escape clause under the Stability and Growth Pact is associated with rising spreads. Our results have an unpleasant implication for the debate on a looming fiscal dominance of the ECB in the presence of rising public debt levels as so far, the stabilization of sovereign bond markets appears to hinge largely on the Eurosystem's role as a massive buyer of high-debt countries' sovereign bonds.

JEL codes: E63, H12, H63, H81
Keywords: Sovereign spreads, monetary policy, fiscal policy, fiscal dominance, event analysis

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1 Introduction

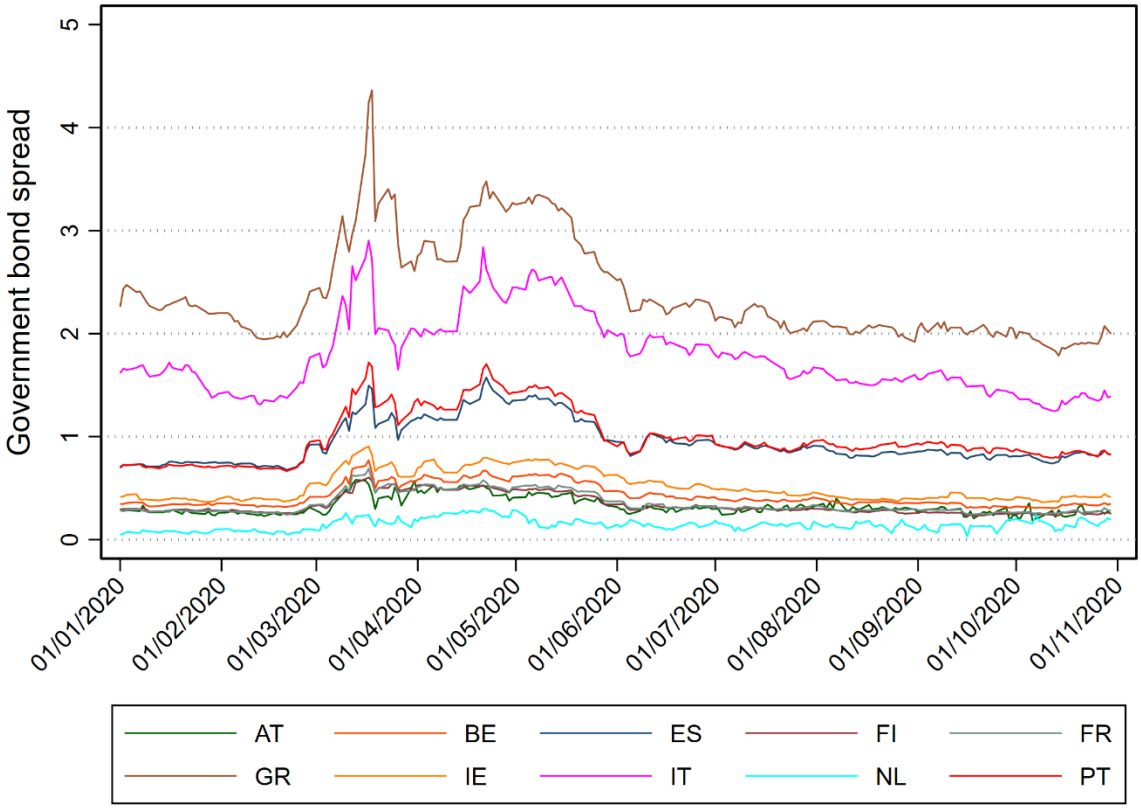
The COVID-19 pandemic has put the public finances of industrial countries under severe stress. The resulting recession has not only led to shortfalls in tax revenues but also to increased public expenditures. National governments have embarked on massive rescue packages to protect citizens and companies against the potentially disastrous health, social and economic consequences of pandemic disruptions. In addition, EU Member States have designed stimulus packages in order to support the economic recovery of affected sectors. For the euro area, the deep economic contraction and the soaring public debt levels have recalled bad memories from the years of the global financial crisis and the subsequent euro area debt crisis. The concern has been that this new and substantial solvency shock could once again trigger a vicious and self-enforcing cycle of rising sovereign bond spreads, a destabilization of the financial sector and a further decline in real economic activity. Subsequently, this could all lead to a new sovereign liquidity crisis similar to the contagion following the Greek government-debt crisis in spring 2010.

The mechanisms that can push even solvent countries into a bad equilibrium with an acute illiquidity have been extensively researched (De Grauwe 2012; De Grauwe and Ji 2013; Lorenzoni and Werning 2019). Two risk factors crucially determine the probability of a debt crisis: first, the fundamental fiscal health of countries that are hit by a sudden solvency shock; and second, the existence and credibility of crisis mechanisms that can serve as lenders of last resort. Both risk factors still make the euro area particularly vulnerable and prone to new crises of confidence. Already before the pandemic hit, several euro countries continued to show weak fiscal fundamentals and a lack of sustainable budgetary trajectories. The European Commission had classified five euro area countries (Belgium, Spain, France, Italy, Portugal) as “high risk” cases for a lack of public debt sustainability over the medium term in its Debt Sustainability Monitor, published on the eve of the pandemic in January 2020 (European Commission 2020a). Consequently, exactly those countries that have particularly suffered from the pandemic shock in 2020, already faced severe fiscal sustainability challenges before. On the risk factor of a missing lender of last resort, the euro area debt crisis has seen the establishment of new fiscal and monetary liquidity facilities that can have a stabilizing function in an unfolding liquidity crisis. The European Stability Mechanism (ESM) has successfully stabilized even a high-debt country such as Greece. The ECB had set up its Outright Monetary Transactions (OMT) program to back-up the ESM liquidity support in cases of emergency. While these liquidity mechanisms were already in place when the coronavirus arrived in Europe, their effectiveness and credibility was arguably limited. The ESM not only suffered from its constrained lending capacity but also its principle of conditionality which has made it a politically controversial instrument, as potential borrowers are afraid of losing their national policy autonomy once they make use of it. Since the OMT program is conditional on ESM support, any rejection of ESM emergency liquidity also leaves the OMT inaccessible.

Although the euro sovereign bond markets were thus clearly vulnerable at the start of the COVID-19 crisis, no serious escalation has occurred so far. Risk spreads of the higher indebted euro countries started to rise briefly with the onset of the pandemic in spring 2020 (Figure 1) but nothing of a critical

development happened similar to the crisis one decade ago. Sovereign spreads already peaked in March and were more or less stable over the course of the year 2020.

Figure 1: Government bond spreads of ten euro area countries in the crisis year 2020



Notes: The figure shows daily government bond spreads of ten euro area countries with the German yield curve functioning as a baseline. The data is fitted as a third-order polynomial yield curve of government bonds with a maturity of ten years. For more information see Section 3.2. Data source: Datastream.

It is our objective to assess the relative importance of European fiscal and monetary crisis support for this remarkable stability in euro area sovereign bond markets. The year 2020 has seen a swift and massive reaction of fiscal and monetary policy at the European level. Already in March 2020, the ECB Council established another securities purchase program, the Pandemic Emergency Purchase Program (PEPP), which contained important changes regarding the rules of sovereign purchases compared to its predecessor the Public Sector Purchase Program (PSPP). Furthermore, European fiscal players also reacted to these changes and modified pre-existing fiscal tools (new credit lines both at the ESM and the European Investment Bank). Moreover, there has been a series of institutional innovations. First, the SURE loan program (temporary Support to mitigate Unemployment Risks in an Emergency) was established. It provides liquidity to EU Member States to fund short-time working schemes and is refinanced from EU borrowing. Second, and more substantial, EU leaders agreed on the fully debt-financed 'Next Generation EU' package, mobilizing 750 billion euros (at 2018 prices) from the EU budget in the coming years to support the recovery.

So far, these consolidated fiscal and monetary efforts have been successful in protecting the euro area sovereign bond markets against a new debt crisis. However, it is unclear which player is the crucial one; the ECB with its PSPP/PEPP support or the EU fiscal level with Next Generation EU and the other newly activated fiscal instruments. Observers conjecture that the stabilization of risk spreads in the pandemic is not only a consequence of the PEPP support but also reflects the new EU fiscal support (Gros 2021). However, as yet any substantive evidence on the relative importance of monetary and fiscal measures since the outbreak of the pandemic is missing. Our event-based study focuses precisely on this question. Thus, we add an important new aspect to the developed literature on the effects of unconventional monetary policy on spreads (surveyed in the next section).

Any evidence to which extent the new fiscal tools already have a measurable impact on spreads is of substantial monetary policy relevance as it may help to assess potential risks for the effective independence of the ECB in the future. If the containment of risk premiums for euro area countries crucially hinges on ECB support, this points to the risk of fiscal dominance (Bordo and Levy 2020). In a regime of fiscal dominance, the ECB is effectively forced to continuously finance euro area countries even if they are close to (or even already in) insolvency in order to prevent a new debt and financial crisis. If, however, the new fiscal instruments already play a decisive stabilizing role, this would signal relief for the ECB from the fiscal players. To the extent that the compression of risk spreads in 2020 already reflects the recent European fiscal innovations, this indicates a development towards a European Fiscal Union in which the protection against liquidity crises is effectively achieved through fiscal instruments. Any such development would help the ECB to take its monetary policy decisions with less consideration of solvency and liquidity challenges in the high-debt euro countries.

Our analytical design addresses the question on the relative importance of fiscal and monetary policy for euro area government bond spreads through an event-analytical study. We identify important announcements with a focus on the pandemic crisis measures and study their effects on the sovereign risk spreads in the euro area. We find that the ECB's PEPP had the largest impact on sovereign spreads and was most successful in establishing more homogeneous financing conditions among the considered euro area countries. The combination of EU level fiscal packages had no measurable spread-reducing effect with the exception of the Next Generation EU program, which also reduced the spreads but to a smaller extent than the PEPP. Finally, a temporary relaxation of European fiscal rules through the activation of the emergency-escape clause under the Stability and Growth Pact is associated with rising spreads.

The paper is structured as follows: Section 2 summarizes the related literature and theoretical considerations. In Section 3, we derive our hypotheses, introduce the data and outline the empirical strategy. The empirical results are discussed in Section 4. Section 5 concludes.

2 Literature review

The impact of ECB asset purchases and other unconventional central bank measures on sovereign yields and spreads has been studied within an ever-expanding literature.[1] Box 1 in the Appendix

[1] For an overview of papers studying quantitative easing programs outside of the euro area, see Urbschat and Watzka (2020).

describes these unconventional programs with more details. The first government bond purchase program introduced by the ECB was the Securities Markets Program (SMP) in 2010 following the onset of the sovereign debt crisis in several euro countries. The ECB claimed that this program was necessary to restore the appropriate functioning of the monetary policy transmission channel and "to ensure depth and liquidity in malfunctioning segments of the debt securities markets" (ECB 2010a, p.24). It subsequently came to an end in September 2012. Eser and Schwaab (2016) analyze this program for the countries Ireland, Italy, Greece, Portugal, and Spain between 2010 and 2011, and find a decrease in the yields of about three basis points for purchases of one per mille of outstanding debt. Likewise, Ghysels et al. (2017) find that the SMP was successful in reducing government bond yields temporarily by using data from short 15-minute intervals. Furthermore, De Pooter et al. (2018) estimate that in the long term, purchases of one percent of sovereign debt decrease the liquidity premium (i.e., the liquidity component of the yield spread) by 13 to 17 basis points.

The next purchase program that was announced by the ECB in 2012, but was never activated, is the Outright Monetary Transactions (OMT) program which replaced the SMP. Altavilla et al. (2016) study the announcement of this program and show that the mere announcement of this policy measure reduced Italian and Spanish sovereign bond rates by 200 basis points, while there was no effect on German and French bond rates. They also test for other macroeconomic effects of the announcement of OMTs and find effects on credit and economic growth in Italy and Spain, but again no effect for Germany and France.

Szczerbowicz (2015), Fratzscher et al. (2016), and Ambler and Rumler (2019) employ event studies to evaluate several unconventional monetary policy announcements, among others the SMP and OMT. Szczerbowicz (2015) and Fratzscher et al. (2016) confirm that the programs were most effective for fiscally weaker periphery countries. Moreover, Fratzscher et al. (2016) also analyze the effects of these programs on equity prices and exchange rates and find that both the SMP and OMT as well as LTROs increased equity prices, while the estimated effect of the programs points in the opposite direction for the euro nominal effective exchange rate (euro appreciation for OMT, depreciation for SMP). Ambler and Rumler (2019) conclude that the SMP and OMT announcements had the strongest negative effect on sovereign bond yields and a positive effect on expected inflation among the unconventional monetary policy announcements between July 2008 and March 2016. Fendel and Neugebauer (2020) analyze unconventional monetary policy announcements between 2007 and 2017. They differentiate countries according to their solvency and find that less solvent countries experience stronger sovereign bond yield reductions than solvent countries following announcements of non-standard monetary policies.

In addition to the purchase programs, Szczerbowicz (2015) also investigates exceptional liquidity provisions such as the three-year LTROs and cutting the ECB deposit rate to zero. These measures successfully reduced the tensions on the money market. Finally, Szczerbowicz (2015) looks at two covered bond purchase programs (CBPP1 and CBPP2). An interesting result is that the covered bond purchase programs decreased sovereign bond spreads, although purchases of sovereign bonds also decreased covered bond spreads.

Several studies have investigated the APP and in particular the PSPP. Urbschat and Watzka (2020) estimate the effect of APP program announcements between 2014 and 2016 on government bond yields. They find the strongest reduction in yields for the initial announcement of the PSPP with

decreasing effects for further announcements. Altavilla et al. (2015) confirm the yield-reducing effect with a similar event study. The effect amounts to a decrease of 30 to 50 basis points at ten-year maturity due to an announcement, and even double this size for high-yield countries like Spain and Italy. The authors also find significant spillover effects to other types of assets not targeted by the APP. De Santis (2020) also confirms the result of a big announcement effect on government bond yields by taking into account the discussion intensity of the announcement in the media. Moreover, Bulligan and Delle Monache (2018) explicitly study different time periods to compare the size of the effects and again find the strongest effect on government bonds in the initial phase of the APP. They also find that the APP announcement led to a depreciation of the euro exchange rate against the British pound sterling and the US dollar. In the most recent period of their study, October 2016 to July 2017, inflation expectations appeared to have risen due to the APP. By using a VAR model, Gambetti and Musso (2017) estimate that the APP had positive effects on GDP and HICP inflation in the first two years of the program. Breckenfelder et al. (2016) once again confirm that the announcement of the APP reduced sovereign yields.

A first paper studying the effects of the PEPP on government bond yields is Hartley and Rebucci (2020). However, as they evaluate purchase programs from several central banks around the world, they only analyze German sovereign bond yields in the context of the PEPP and find a decrease of 15 basis points over a three-day window following the announcement of the program.

Summing up, there is comprehensive evidence that the ECB asset purchasing programs have been effective in lowering both sovereign bond yields and spreads, and the first existing study confirms this effect also for the PEPP.

Our study contributes to the literature from a different and new perspective. Our focus is on the relative role of fiscal and monetary policy announcements for government bond spreads in the context of the COVID-19 crisis. The literature that looks at fiscal policy announcements on euro sovereign spreads is very limited. Afonso et al. (2020) study the effect of macroeconomic, monetary and fiscal policy announcements on government bond spreads of ten euro area countries. They analyze the announcements of the excessive deficit procedure (EDP) and find that spreads increase if a country is put under the EDP. Likewise, releases of the European Commission of higher debt increases spreads, whereas better budget balance forecasts lead to lower spreads. Afonso and Strauch (2007) concentrate on fiscal policy events taking place in 2002. They find significant effects for a few events of EDP announcements. They conclude that the European fiscal policy framework can have a decreasing effect on spreads through its credibility in the ability to detain excessive deficits, but also an increasing effect on spreads through the increased information availability via the surveillance. Another study that investigates the effect of EDPs on sovereign bond spreads is Kalan et al. (2018) who conclude that sovereign spreads are higher when countries are placed under an EDP. The authors interpret this as an information signal. Other papers study the effect of fiscal rules on sovereign risk premia with the result that credible and well-designed fiscal rules can decrease risk premia (see Eyraud et al. 2018 for an overview).

However, it is important to note that all these studies with their focus on fiscal surveillance and decisions in the context of the Stability and Growth Pact do not cover the potential impact of new European fiscal support instruments which is our key interest. Box 2 in the Appendix summarizes the fiscal milestones in the pandemic that we cover. The only study close to our approach is Jinjarak et al.

(2020) who analyze the relative importance of pandemic-related indicators and both monetary and fiscal policy responses in the first half of 2020. Using a synthetic control group design, they find that COVID-19 mortality rates had a significant spread-increasing effect for credit default swaps (CDS) which cannot be explained by the fundamentals driving these spreads in normal times. The authors show that national stimulus packages and the resulting indebtedness contributed to a widening of CDS spreads, although the ECB's PEPP announcement in March stopped the widening. They account for EU fiscal announcements through a non-differentiated dummy variable, which is shown to be statistically insignificant. Compared to this study, we apply a finer-grained event-analytical design to appropriately assess the variance of various new European fiscal instruments set up in the pandemic. Moreover, we extend their sample period to also include, e.g., the political agreement on Next Generation EU and focus on spreads of bond yields rather than CDS spreads to also capture the liquidity component in bond yields relative to the benchmark.

This existing literature puts forward several potential mechanisms through which central banks' asset purchase programs could affect sovereign bond yields. A possible first channel views monetary interventions as a signal that a central bank judges yields too high and wants to correct this misalignment in market evaluations through asset purchases. If this improves market expectations, this would result in lower default risk premia. This channel can be also described as a channel of confidence in the overall performance of an economy (Ghysels et al. 2017; Fratzscher et al. 2016).

Regarding the liquidity aspect of sovereign bonds, a key channel that is often found to lower the liquidity risk premium for sovereign bonds is based on central banks' role as an investor of last resort. The entrance of a large new buyer on the bond market makes a counterparty easier to find and therefore reduces liquidity risk premia (Eser and Schwaab 2016; Ghysels et al. 2017).

A mechanism that goes beyond default or liquidity risks is the *portfolio rebalancing channel*. According to Gambetti and Musso (2017, p.7), central bank asset purchases "will lead sellers of those assets to rebalance their portfolio towards other assets''. As a consequence of this rebalancing, the prices of these other assets increase as well, thereby stimulating economic activity and raising inflation expectations. Next, there is the *credit channel* that describes how asset purchases lead to higher reserves at central banks for commercial banks, so that these banks can provide more loans to firms and households (Fendel and Neugebauer 2020; Altavilla et al. 2015). Finally, *the signaling channel*, which is not easily separable from the *portfolio rebalancing channel*, implies lower expected monetary policy rates in the future, which instantaneously decreases long-term yields (Bauer and Rudebusch 2014; Eser and Schwaab 2016).

As for the impact of EU fiscal instruments on sovereign yields, the channels affecting the default risk premia and those influencing the overall market confidence in the economy that benefits from fiscal support are expected to be of major importance. We do not expect a direct liquidity effect of the fiscal interventions since unlike central bank programs, the fiscal tools do not include secondary market purchases of sovereign bonds. As our interest lies in the comparison of the total monetary vs. fiscal policy impact on spreads, the empirical analysis does not separately consider single mechanisms but instead looks at the combined impact of the discussed transmission channels.

3 Empirical analysis

3.1 Study design and hypotheses

We apply an event-analytical design to identify the relative role of monetary and fiscal policy decisions to contain euro area sovereign spreads. Our key interest is the crisis response of the ECB and EU in the pandemic. However, we include a longer time period, going back in some specifications as far as November 2014, in order to validate our approach and compare the results with established findings from the literature.

We have clear hypotheses and sign predictions for most of the monetary and fiscal events. In line with the overwhelming evidence of the literature, we expect that the monetary policy announcements on both conventional and unconventional expansions will compress spreads. We also expect that the spread compressing effect should be more pronounced for the fiscally weaker countries for which the support is more crucial to guarantee their liquidity. For the monetary purchase programs, we expect a stronger effect from the PEPP compared to the PSPP as the ECB has explicitly relaxed the commitment to the ECB capital key (and other constraints such as minimum credit rating or issue and issuer limits) for the former (see Box 1 in the Appendix). Similarly, if European fiscal liquidity support and transfers have an effect, this should lead in the same direction and lower spreads as it improves the liquidity and – in the case of transfers – even the solvency of beneficiary countries. We expect a stronger effect for a program that includes actual transfers (as it is the case for Next Generation EU, see Box 2 in the Appendix) compared to pure loan programs (e.g., the SURE program) whose support is limited to liquidity assistance and a possible slight advantage from preferential interest rates.

We do not have a clear sign expectation for the relaxation of EU fiscal rules as there are counteracting possible effects. On the one hand, markets may welcome the relaxation as a growth-supporting move that enables EU Member States to embark on a more effective counter-cyclical fiscal policy that will alleviate and shorten the recession. In this case, the relaxation could lower spreads. On the other hand, investors may take the relaxation as a signal for a less sustainable fiscal trajectory. This negative credibility effect could then increase spreads in line with the empirical findings that weaker fiscal rules tend to damage fiscal credibility and to increase sovereign spreads (Feld et al. 2017; Heinemann et al. 2014; Iara and Wolff 2014).

In our definitions of “events”, we evaluate the announcement rather than the actual implementation through asset purchases or fiscal disbursements. According to economic theory, we should expect the market reactions to occur immediately after the announcement of the total intended purchases (“stock effect”) due to updated expectations among trading agents, and not of the subsequent implementation over time (“flow effect”), which does not provide any additional news. In line with this argumentation, contributions from the literature identified the announcement effects of ECB purchase programs to be responsible for the largest share of the overall program impact (Altavilla et al. 2015; Urbschat and Watzka 2020). Moreover, for the pandemic-related fiscal instruments there are very long time lags between the first announcements and the actual flow of resources. For example, the European Commission announced at the end of May 2020 its intention to set up the Next Generation EU package, from which the first payments are not made before mid-2021.

3.2 Data on government bond spreads and policy events

This paper employs daily data on government bond yields for eleven Euro area countries (Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Portugal, Spain). The data captures end-of-day-courses for all working days. It is fitted as a third-order polynomial yield curve of government bonds with a maturity of ten years. The largest data sample that we employ for our analysis ranges from November 2014 to October 2020.[2] As the major aim of the paper is to track changes in sovereign spreads, we transform the yield data into spreads, using the German data series as a benchmark. We thus calculate the government bond spreads for each country by subtracting the German bond yield. This leaves us with a sample of ten countries. The composition of these countries is driven by the availability of data.

For the identification of events, we employ two main sources. Each source provides event dates on either monetary policy announcements or fiscal policy announcements. First, we scanned all ECB press releases[3] concerning monetary policy decisions from 2015 onwards to identify adjustments to the key interest rates and announcements of non-standard policy measures. Included programs are the PEPP and PSPP as part of the APP as well as the various longer-term refinancing operations (LTRO, TLTRO, PELTRO). Most of the relevant policy changes are announced through the press releases and the press conferences following the regular monetary policy meetings of the ECB Governing Council. Extraordinary and urgent measures, such as the introduction of the PEPP, are usually published in additional press releases. Second, for comparing effects of monetary policy decisions to fiscal policy decisions, we handpicked announcements of measures to fight the impact of the COVID-19 pandemic taken by the EU. A timeline of EU actions was published by the European Commission on their website and serves as the second main source for events.[4] From this list, we selected all announcements concerning the implementation of innovative fiscal instruments and new joint debt instruments.

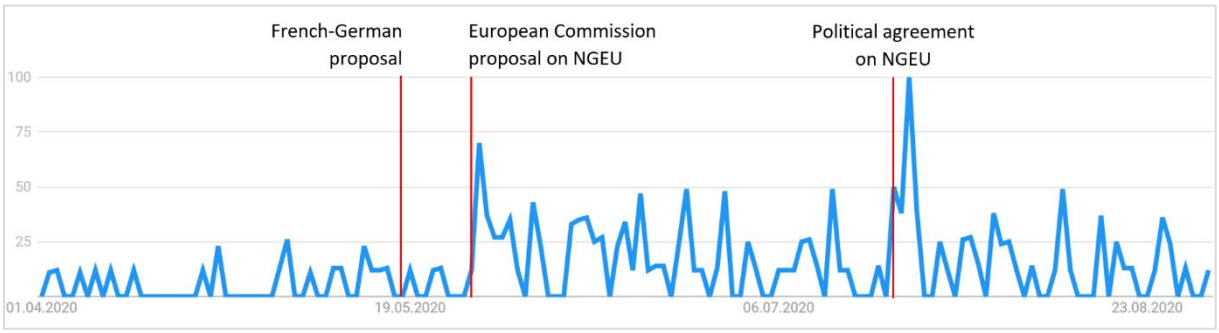
A potential concern regarding these fiscal policy announcements might be that they contain only little new information to market participants as the negotiations before such important EU-level decisions are usually well covered in the media. In contrast, monetary policy decisions are not the result of a political debate and are decided upon behind closed doors. Whereas we can assume (in line with the extensive event-analytical literature on monetary policy announcements) that ECB monetary policy announcements entail news to the market, the publication of fiscal policy decisions might trigger only minor market reactions if some of the communicated information could already be factored-in before the announcement. We are confident this should not be a major issue in our context of the far-reaching European fiscal decisions in the pandemic.

First, a closer scrutiny of the EU's pandemic fiscal decisions indicates that events such as the publication of the French-German proposal or the Next Generation EU proposal indeed contained significant news. Figure 2 shows the trend in google searches for terms related to the Next Generation EU program (as the most important fiscal program at the EU level to fight the economic consequences of the pandemic). Whereas it is natural to observe few searches for terms associated with this program

[2] Data on bond yields is taken from Datastream and is available from 1996 onwards (see https://www.refinitiv.com/en/products/datastream-macroeconomic-analysis). We restrict the sample period because of our selection of events, the first event being observed in 2015.
[3] ECB press releases: https://www.ecb.europa.eu/press/pr/activities/mopo/html/index.en.html.
[4] EU actions: https://ec.europa.eu/info/live-work-travel-eu/coronavirus-response/timeline-eu-action_en.

before it was proposed by the European Commission on May 27, 2020 (i.e., when this terminology was first introduced), this argument does not hold for the final announcement of the program. The peak in online searches after the political agreement on July 21, 2020, suggests that this announcement offered new information that was not available before the press release.

Figure 2: Trend index for Google searches during the weeks around the Next Generation EU announcements



Notes: Worldwide trend in Google searches for the terms 'Next Generation EU', 'NGEU', 'French-German proposal', 'Wiederaufbauplan', and 'Fonds de Relance' to capture the commonly employed terminology used to describe the policy proposals. Source: Google Trends.

Second, we scanned various national and international newspaper articles which suggest that the announcements represented real news and that the political discussions were considered anything but foreseeable.[5] In fact, the news surrounding the final summit from July 17 to July 21 suggest that not only the content of the proposal and the size of the budget were still extensively discussed but also that the summit's success was uncertain until the very end. It was only in the evening of the day before the official announcement when crucial breakthroughs regarding the new joint debt instrument and the rule of law conditionality were achieved.[6] First press reports on the confirmation of these breakthroughs were published after 6pm. As our daily yield data represents the trading courses until 6pm for each day, the yields for this day should be unaffected by these news and only the yield data for the following day (i.e., the day of the official announcement of Next Generation EU) should capture the news on the success of the summit.[7] In combination, these arguments and pieces of evidence leave

[5] On the French-German proposal and the European Commission proposal, see, e.g., The Guardian (26/05/2020, https://www.theguardian.com/world/2020/may/26/franco-german-plan-for-european-recovery-will-face-compromises), politico (27/05/2020, https://www.politico.eu/article/kurz-cautious-on-commissions-750b-recovery-blueprint-coronavirus-covid19-mff-budget/), politico (28/05/2020, https://www.politico.eu/article/recovery-fund-everything-depends-on-what-happens-next/).

[6] On the final summit, see, e.g., BR24 (20/07/2020, https://www.br.de/nachrichten/deutschland-welt/eu-sondergipfel-kommt-nun-doch-der-kompromiss,S5Hytj1), Manager Magazin (21/07/2020, https://www.manager-magazin.de/politik/coronavirus-eu-einigt-sich-auf-historisches-corona-paket-a-5b771ac9-1f68-4708-89a4-4a05b457b19f), New York Times (20/07/2020, https://www.nytimes.com/2020/07/20/world/europe/eu-stimulus-coronavirus.html), BR24 (21/07/2020, https://www.br.de/nachrichten/ deutschland-welt/corona-hilfen-eu-sondergipfel-erringt-etappensieg,S5JIVVX), Der Standard (21/07/2020, https://www.derstandard.de/story/2000118877971/eu-ratspraesident-michel-verkuendet-einigung-auf-1-8-billionen-euro).

[7] In addition to these considerations, it can be argued that also the monetary policy decisions in the unfolding pandemic were preceded by public debates and statements of European central bankers. Hence, the actual decision in the ECB Council were just the last step of a reflection phase that was public and extensively covered

us confident that the EU fiscal policy announcements did not include less news to the market than ECB press releases so that a comparative event analysis is warranted.

As we are interested in the average effect of different types of monetary and fiscal interventions, we combine all announcements for one type of instrument into one dummy.[8] To clarify this approach, we consider the PEPP. As shown in Table 1, there were two announcements regarding this ECB program, first at its implementation (March 18, 2020) and second on the increase of its envelope (June 4, 2020). Instead of including two separate dummies for these two event dates, we use one single dummy named "PEPP expansion'', which is equal to 1 on these two dates and 0 otherwise. By doing so, we identify an overall number of five monetary policy event dummies as shown in Table 1. These capture twelve event dates on which one or more policy announcements were made. In addition, we include two fiscal policy event dummies, capturing eight announcements. The two distinct fiscal dummies refer to the crisis-related relaxation of EU fiscal rules and the establishment of new European financial instruments that provide financial resources to Member States. We follow Fendel and Neugebauer (2020) and do not weigh the events such that each event is considered equally relevant.

3.3 Identification and estimation

To estimate the effects of the EU monetary and fiscal policy announcements on government bond spreads of selected EU countries we first employ a panel regression. As our main specification, we estimate the following event-based model:

$$\Delta y_{i,t} = \alpha + \beta_1 Event_t + \beta_2 \Delta y_{i,t-1} + \beta_3 \Delta Corp\_spread_t + \beta_4 \Delta CESI_t + \alpha_i + \alpha_d + \varepsilon_{i,t}, \qquad (1)$$

where $y_{i,t}$ is the government bond spread in country *i* on day *t with* $i = 1, \dots, 10$ (ten countries relative to Germany) and $t = 1, \dots, 2189$ (with November 3, 2014 being the first and October 30, 2020 being the last trading day in the longest sample). Our main variable of interest is $Event_t$ which denotes all events of a certain event group as a dummy. Figure 1 in the introduction plots the country-specific spreads and suggests that the data is non-stationary. A unit root test for panel data, proposed by Levin et al. (2002), confirms this speculation. We therefore use first differences of the data (denoted by Δ). To control for other factors affecting government bond spreads, we include three commonly employed control variables. First, as yield changes are likely to depend on previous changes, we include the government bond spread with a lag of one day (Urbschat and Watzka 2020). Second, the corporate bond spread is included to capture general risk sensitivity in the euro area. We follow Eser and Schwaab (2016) and define the corporate bond spread as the difference between BBB and AAA rated corporate bond yields to maturity of bonds with a maturity of ten and more years, covering the whole euro area. Third, to control for macroeconomic surprises other than announcements of monetary or fiscal policy measures, we make use of the Citigroup Economic Surprise Index (CESI) (Fendel and Neugebauer 2020). The CESI index is calculated on a daily basis as a rolling average over the last three

by financial media. Therefore, it is difficult to argue that monetary policy decisions in the crisis were in principle less predictable than fiscal policy decisions.

[8] The alternative would be to include dummies for every single event rather than grouping the announcements by policy program. We make use of a similar approach in a small excursion when analyzing the changing effects of the PSPP over the considered period.

Table 1: Policy events and coding scheme

Event type	Event coding	Date	Announcement
Monetary policy	Interest rate decrease	03.12.2015	Decrease of the interest rate on the deposit facility by 10 basis points to -0.30%
		10.03.2016	Decrease of the interest rate on the main refinancing operations by 5 basis points to 0.00%, of the interest rate on the marginal lending facility by 5 basis points to 0.25% and of the interest rate on the deposit facility by 10 basis points to -0.40%
		12.09.2019	Decrease of the interest rate on the deposit facility by 10 basis points to -0.50%
	(T)LTRO	22.01.2015	Change in pricing of targeted longer-term refinancing operations, in the way that the interest rate applicable to future TLTRO operations is equal to the rate on the Eurosystem's main refinancing operations: Removal of the 10 basis point spread over the MRO rate that applied to the first two TLTROs
		10.03.2016	Launch of new series of four longer-term refinancing operations
		07.03.2019	Launch of new series of quarterly longer-term refinancing operations
		12.03.2020	Application of more favorable terms in TLTRO III to support bank lending to small and medium sized enterprises which are affected most by the Covid-19 pandemic and conduction of additional longer-term refinancing operations
		30.04.2020	Launch of new series of seven pandemic longer-term refinancing operations (PELTRO)
	PSPP expansion	22.01.2015	Introduction of PSPP
		03.12.2015	Extension of APP until March 2017 and inclusion of further debt instruments issued by regional and local governments in the list of eligible assets
		10.03.2016	Expansion of APP to €80 billion monthly
		12.09.2019	Restart of APP at a monthly pace of €20 billion
		12.03.2020	Addition of a temporary envelope of net asset purchases in the amount of €120 billion until the end of the year
	PEPP expansion	18.03.2020	Launch of PEPP with an envelope of €750 billion
		04.06.2020	Expansion of PEPP by €600 billion
	PSPP reduction	08.12.2016	Decrease of PSPP purchases to €60 billion monthly and decrease of the minimum remaining maturity for eligible securities in PSPP from two years to one year
		26.10.2017	Decrease of PSPP purchases to €30 billion monthly
		14.06.2018	Decrease of PSPP purchases to €15 billion monthly until the end of 2018 and then ending of purchases under APP
Fiscal policy	Relaxation of EU fiscal rules	13.03.2020	European Commission makes first announcement that it considers the activation of the SGP escape clause
		20.03.2020	Formal proposal by European Commission to activate SGP escape clause
	EU fiscal corona packages	13.03.2020	Mobilization of EU budget flexibility to increase cohesion spending
		01.04.2020	Proposal of SURE (Support to mitigate Unemployment Risks in an Emergency)
		09.04.2020	Agreement by EU finance ministers on 540 billion package including SURE, EIB and ESM
		18.05.2020	French-German proposal that paved the way towards Next Generation
		27.05.2020	European Commission Proposal of Next Generation EU with various surprises compared to German-French model
		21.07.2020	Political agreement on Next Generation EU in the European Council

months and captures unexpected changes in a series of economic indicators.[9] Summary statistics are reported in Table A1 in the Appendix.

[9] More precisely, the index is calculated as the difference between the released economic indicators and the respective Bloomberg survey median (to capture market expectations). The individual economic indicators (e.g., GDP, manufacturing production, retail sales, purchasing manager index, private sector credit, unemployment,

Finally, we include country fixed effects (α_i) to control for unobserved country characteristics. In our baseline specification we also include working-day fixed effects (α_d) to allow for a possible weekly pattern in trading activities and price movements (Szczerbowicz 2015). To capture general time trends in the spreads, we also run robustness checks with working-day times year fixed effects. However, as these robustness checks in Section 4.2 show, the choice of the time fixed effects structure has very little impact on the coefficient estimates. Moreover, to specify a meaningful comparison period, we restrict the sample period in a way that the sample starts two months before the first event in each event group. Hence, the sample for the monetary policy events starts on 01/11/2014 as the first announcement is observed for 22/01/2015.[10] The fiscal policy events took place much later in 2020. Their sample starts in December 2019. Further robustness checks in Section 4.2 show how differences in the definition of the sample period affect the conclusion regarding the announcement impacts of some event types. This concerns in particular the interest rate decreases, (T)LTROs, and PSPP expansions. Their impact changes over the years and the results speak for an equalizing effect on sovereign spreads only in the earlier years of the ECB programs. In all regressions, we use robust standard errors.

In a second step, we estimate the effects for every single country using the following model:

$$\Delta y_t = \alpha + \beta_1 event_t + \beta_2 \Delta y_{t-1} + \beta_3 \Delta CESI_t + \beta_4 \Delta corp\_spread_t + \alpha_d + \varepsilon_t. \quad (2)$$

An augmented Dickey-Fuller test suggests that the country-specific data is non-stationary such that we again use first differences. The separate regressions for each country include the same control variables as our panel regression except the country fixed effects. Summary statistics for the variables are provided in Table A1 in the Appendix.

4 Results

4.1 Baseline panel regressions

In this section, we discuss our main results. Moreover, we present three types of robustness checks and two types of extensions to the analysis to develop a better understanding of the drivers behind the findings. Table 2 shows the main results from the panel model in Equation (1). We discuss the results separately for each event group (i.e., monetary policies and fiscal policies).

Monetary policy events For the conventional monetary policy instruments in the first two columns of the table, we find rather small and statistically insignificant announcement effects on government spreads of the selected group of EU countries. Contrary to expectations, the announcements of longer-term refinancing operations even tend to have a positive effect on the sovereign spreads. The results regarding the non-standard monetary policies in columns (3) to (6) are more in line with expectations.

fiscal balance) are weighted using their announcement impact on exchange rates in the past. In addition, data points from the more distant past receive smaller weights. The mechanics of the index are such that a value above (below) zero marks a more positive (negative) realization of the economic indicators, relative to consensus expectations (Maveé et al. 2016).

[10] An exception is the monetary policy program PEPP, which was announced only in 2020. The baseline results for this policy measure are based on a sample starting on 01/01/2020.

Here, we further categorize the events and differentiate between expansionary and restrictive monetary policy announcements. As shown in column (3) of Table 2, announcements to expand the ECB's purchase programs tend to have a negative effect on government spreads. However, this effect is solely driven by the new PEPP, for which we estimate an effect with high statistical significance. The announcement of a PEPP expansion correlates with an average reduction of government bond spreads by 6.6 basis points. The effect appears to be small but it represents an average effect across all countries including those with a top credit rating. We turn to the country-specific effects below. The PSPP also appears to affect sovereign yields with the expected sign, at least when reductions in purchase volumes are taken into consideration, as shown in column (6). The result that the PEPP's yield-compressing effect is more pronounced than for the PSPP is equally in line with our expectations. The PEPP as the less constrained program can provide a more targeted support to specific countries with weak fiscal fundamentals and is thus more effective to decrease spreads.

Fiscal policy events Turning to the fiscal policy announcements, the estimated coefficients for the two event dummies that capture the relaxation of EU fiscal rules and the various EU fiscal packages to fight the economic consequences of the COVID-19 pandemic exhibit different signs. As expected, the announcements of fiscal support measures correlate with a reduction in sovereign spreads even though this effect is rather small and statistically insignificant for the combination of all announced fiscal crisis measures (encompassing the various measures like EIB, SURE, and Next Generation EU support). As explained above (3.1) we would expect a particularly strong effect from Next Generation EU as this is not only the largest but also the only fiscal tool that includes a significant transfer component. For this reason, we separately estimate the announcement effect for Next Generation EU. These results in column (8) of Table 2 show that the Next Generation effect, in contrast to the insignificant combined fiscal events, is measured with statistical precision. Events such as the Commission Proposal or the European Council agreement on Next Generation EU, on average, reduce the spreads by 2.7 basis points. Importantly, even this effect does not at all reach the magnitude of the PEPP announcement effect. The Next Generation EU effect is less than half as large as the PEPP effect. Turning to our second type of fiscal events that cover relaxations of EU fiscal rules we find a spread increasing effect, albeit with marginal significance. Hence, our results do not provide any evidence that the activation of the Stability Pact's escape clause is seen as a positive message for the growth perspective and fiscal outlook of high-debt countries. Rather, we find weak evidence that the activation of the escape clause is taken as unfavorable news for these countries' fiscal reputation.

Overall, we observe statistically significant coefficient estimates for the PEPP and much smaller but also statistically significant effects for Next Generation EU. In contrast the relaxation of EU fiscal rules as a measure to influence government bond spreads is less clear, coefficient estimates are calculated with less statistical precision, and results rather point to a negative reputation effect. We find no evidence for a spread-reducing effect of the more established monetary policy programs and the other EU fiscal packages.

Table 2: Panel regressions

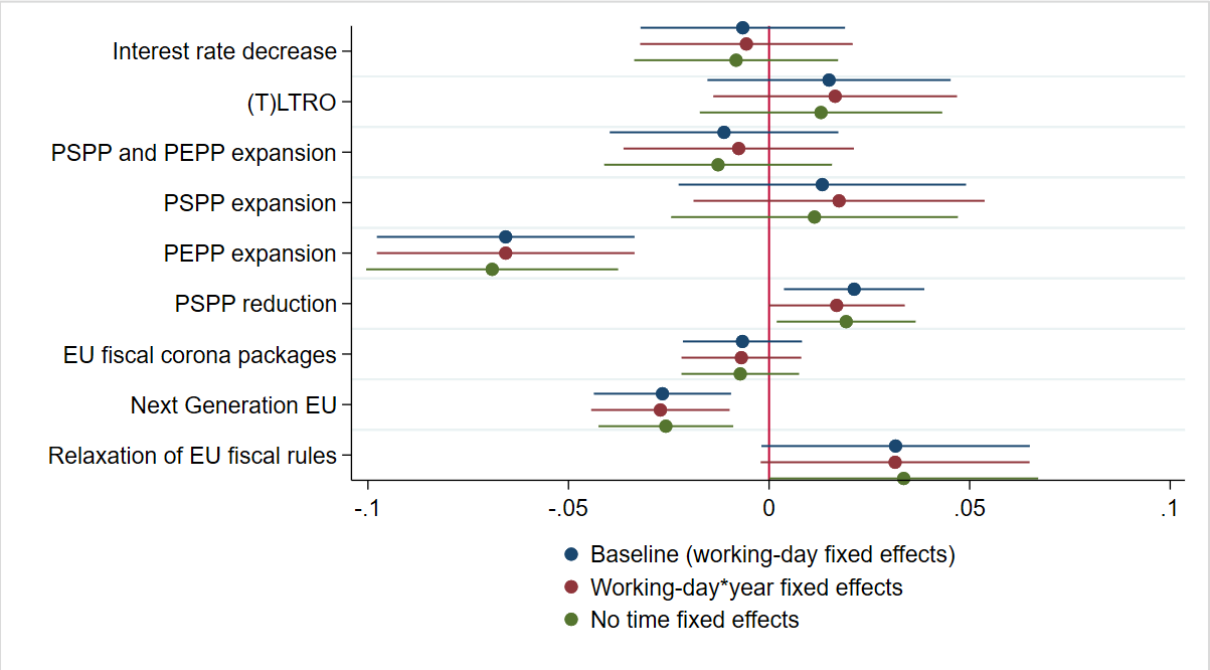
	Dependent variable: government bond spread								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Monetary policy events						Fiscal policy events		
			PSPP and PEPP				EU fiscal corona packages		Relaxation
	Interest rate decrease	(T)LTRO	Expansion (combined)	PSPP expansion	PEPP expansion	PSPP reduction	All packages	Next Generation EU	of EU fiscal rules
Event	-0.0066	0.0150	-0.0112	0.0133	-0.0657***	0.0212**	-0.0066	-0.0266***	0.0315*
	(0.0130)	(0.0155)	(0.0145)	(0.0183)	(0.0164)	(0.0089)	(0.0076)	(0.0087)	(0.0171)
Lagged government bond spread	0.0598	0.0599	0.0579	0.0599	-0.0014	0.0598	-0.0114	-0.0141	-0.0055
	(0.0587)	(0.0587)	(0.0587)	(0.0587)	(0.0641)	(0.0587)	(0.0620)	(0.0616)	(0.0622)
Economic surprise index (CESI)	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Corporate bond spread	0.5711***	0.5742***	0.5711***	0.5750***	0.5147***	0.5730***	0.5122***	0.5069***	0.5055***
	(0.0758)	(0.0752)	(0.0753)	(0.0755)	(0.1069)	(0.0751)	(0.1095)	(0.1089)	(0.1088)
Constant	-0.0006	-0.0007	-0.0006	-0.0007	-0.0005	-0.0007	-0.0010	-0.0009	-0.0015
	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0012)	(0.0007)	(0.0011)	(0.0011)	(0.0011)
Observations	15,650	15,650	15,650	15,650	2,180	15,650	2,400	2,400	2,400
Adjusted R-squared	0.0193	0.0194	0.0193	0.0193	0.0378	0.0194	0.0285	0.0306	0.0304
Country fixed effects	✓	✓	✓	✓	✓	✓	✓	✓	✓
Working-day fixed effects	✓	✓	✓	✓	✓	✓	✓	✓	✓

Notes: OLS regressions. Results correspond to Equation (1). The dependent variable captures the government bond spread of ten euro area countries with the German spread functioning as the benchmark. Robust standard errors in parentheses. Significance levels: *** p<0.01, ** p<0.05, * p<0.1.

4.2 Robustness checks

To test the sensitivity of the main results in Table 2, we present three types of robustness checks. Figure 3 visualizes the effects in a graph to support an easy-to-grasp impression regarding the relative size of the program-specific announcement impacts. The largest effects are found for announcements regarding the PEPP and EU fiscal rules. Whereas the negative impact of a PEPP expansion on government bond spreads is statistically highly significant, the positive announcement effect of relaxing EU fiscal rules is measured with less statistical precision. Methodology-wise, Figure 3 also shows the effect of running alternative model specifications with respect to the included time fixed effects. Whereas the baseline specification only controls for working-day effects, the first alternative specification includes working-day times year fixed effects. With a long time period and the natural trends in sovereign spreads which are unrelated to the events, the model might mistakenly pick up such trends as an event effect. This is precluded when using an interaction with year dummies. The third specification abstains from including time fixed effects altogether.

Figure 3: Alternative time fixed effects structures for the estimation models



Notes: Coefficient estimates and 95% confidence intervals for each event type. Results correspond to Equation (1) (baseline effect). Coefficient estimates in red and green are based on alternative time fixed effects structures as explained in the legend.

Overall, the results are very robust to these modifications and confirm the markedly negative effects of the PEPP and the smaller effect for the Next Generation EU announcement. In turn, positive effects of announcement events are found for reductions of the PSPP and, with less statistical precision, for the relaxation of EU fiscal rules.

The second robustness check addresses a similar concern as the first one; that differences in the sample periods might have an effect on the results. In addition to mistakenly picking up year of

working-day trends in sovereign spreads that are unrelated to the events (addressed in Figure 3), the announcement of a monetary or fiscal policy might have a different effect, depending on the fiscal and economic environment in which it is made. A related finding from the literature suggests that the ECB's purchase programs had a significant impact in the beginning when being newly introduced, but less so once they were already well established (Urbschat and Watzka 2020). Similarly, the more recent announcements to tackle the challenges related to the COVID-19 pandemic might have a stronger impact because there is more volatility and uncertainty in the spreads. In line with this view, the existing literature identifies a higher effectiveness of central bank asset purchases in environments with particularly high sovereign risk (Altavilla et al. 2015). We therefore re-estimate the models and shorten the sample period for the monetary policy announcements to align it with the sample period for the fiscal policy events and vice versa.

This assures that our evaluation of the effectiveness of EU monetary vs. fiscal policy is based on the same sample period, which levels the playing field. Importantly, a coefficient can only be estimated if an announcement concerning a certain policy program was made during the respective sample period. For example, there were no interest rate reductions in or after December 2019, such that Panel (a) of Figure 4 only contains a coefficient for the longer sample period for this policy instrument.

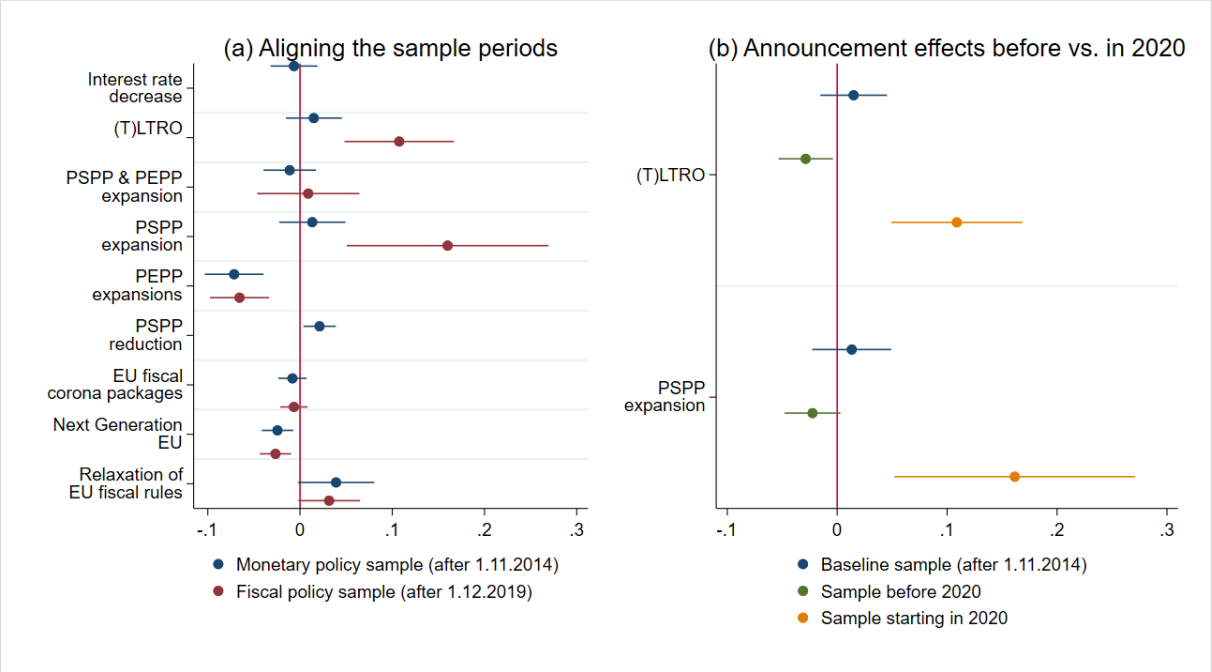
As Panel (a) of Figure 4 shows, aligning the underlying sample periods has relatively little impact on most coefficient estimates. Surprisingly, however, we estimate very large and statistically significant positive effects of (T)LTROs and PSPP expansions when reducing the sample period to the later years. This result stands in contrast to findings from the previous literature which documents a negative effect of both programs on sovereign spreads (see, e.g., Szczerbowicz (2015) for LTRO effects and Altavilla et al. (2015) and Urbschat and Watzka (2020) for effects of the PSPP/APP). However, these contributions only use data on policy announcements until mid-2016. Most importantly, the robustness check confirms the finding that, among the various instruments, it is the PEPP, which most clearly has reduced sovereign spreads.

To explore whether the unexpected positive effects from PSPP and (T)LTROs is specific for the crisis environment of the COVID-19 pandemic, Panel (b) of Figure 4 estimates the effect of (T)LTRO and PSPP expansion announcements before 2020 and in 2020 separately. The results confirm the negative effect of (T)LTROs and PSPP expansions on government bond spreads prior to 2020, as identified in previous contributions. Moreover, they also show that the average positive effect of both programs is driven by 2020 announcements. This finding is more in line with Bulligan and Delle Monache (2018) who similarly study different time periods for this unconventional monetary policy instrument to compare the size of the effect over time. Their sample extends from 2014 to 2017 and suggests the strongest negative effect on government bonds in the initial phase of the APP.

From a market perspective, the fact that the PSPP (and (T)LTRO) announcements had a positive effect on sovereign bond spreads in the evolving pandemic is consistent with a view that markets were disappointed by these measures. In this regard, the results confirm our hypothesis, that the different rules of the PSPP and PEPP should be important (Havlik and Heinemann 2020). For the PSPP, the ECB Council is committed to allocating purchases across euro countries according to the ECB capital key. Even though the Eurosystem's actual PSPP purchases have been increasingly diverging from this measure, the rule raises questions to which extent PSPP is suitable for targeted support for countries

in a particularly critical pandemic situation. These program features provide a possible explanation for the striking sign differences for the PSPP and PEPP announcements in 2020.

Figure 4: The role of the considered sample period for the effect of policy announcements



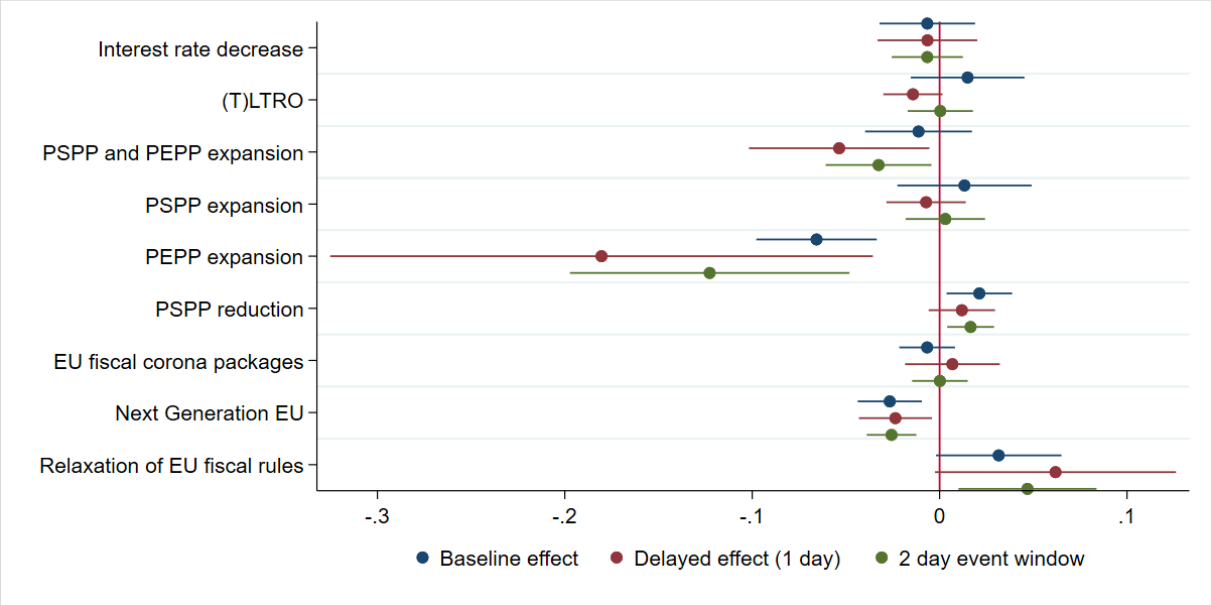
Notes: Coefficient estimates and 95% confidence intervals for each event type. Results correspond to Equation (1) but are based on different sample periods (see legend). For Panel (b) we concentrate on the two monetary policy instruments where our results deviate from the existing literature.

As a third and final robustness test, we study the announcement effects for alternative definitions of the event windows. We follow the existing literature and consider potential lagged effects of policy announcements (e.g., Fendel and Neugebauer 2020) as well as an extended event window of two days rather than just taking into account the day of the announcement itself. A number of possible reasons could explain the existence of lagged announcement effects. These include: (i) slow market reactions (a relevant group among investors are pension funds and insurance companies who might first need to get official approval for adjustments to their portfolio), (ii) events taking place later in the day such that end-of- the-day courses do not yet fully capture the change in expectations or (iii) a time lag due to the delayed dissemination of the announcements via the media which takes some time.

Figure 5 replicates the previous results based on event dummies equal to 1 on the day of a policy announcement and 0 otherwise (baseline effect). In addition to this, the figure plots the coefficient estimates when using a lagged event dummy to show market reactions one day after the announcement (delayed effect). Finally, it shows the combined effect of the announcement day and the day after (2 day event window). Similar to Fendel und Neugebauer (2020), we find slightly stronger market reactions for government bonds one day after an announcement for most policy programs. This indicates that there is a rather slow reaction of market participants. Overall, the previous conclusions are confirmed. Yet, in the more complete picture of Figure 5, the positive coefficient for the dummy that captures the relaxation of EU fiscal rules is now larger than in the preceding regressions and also statistically significant at conventional levels (when taking into account market

reactions one day after an announcement). Nevertheless, when it comes to our key question of the pandemic fiscal and monetary policy measures and their relative importance, the finding of a larger importance of the PEPP is even strengthened. For the extended event window of two days, we find a larger and statistically highly significant negative effect for the PEPP, associated with an average reduction in the spreads of 12.2 basis points (18.0 basis points for the day after the announcement). The much smaller effect of Next Generation EU is robust but it does not increase with the extension of the event window.

Figure 5: Delayed effects of policy announcements?



Notes: Coefficient estimates and 95% confidence intervals for each event type. Results correspond to Equation (1) (baseline effect). Coefficient estimates in red and green are based on the same model but with a different coding of events. First, the event dummy is replaced by a dummy equal to 1 one day after the announcement (delayed effect). The second alternative coding uses a two-day event window such that the event dummy is equal to 1 for the day of the announcement and the day after.

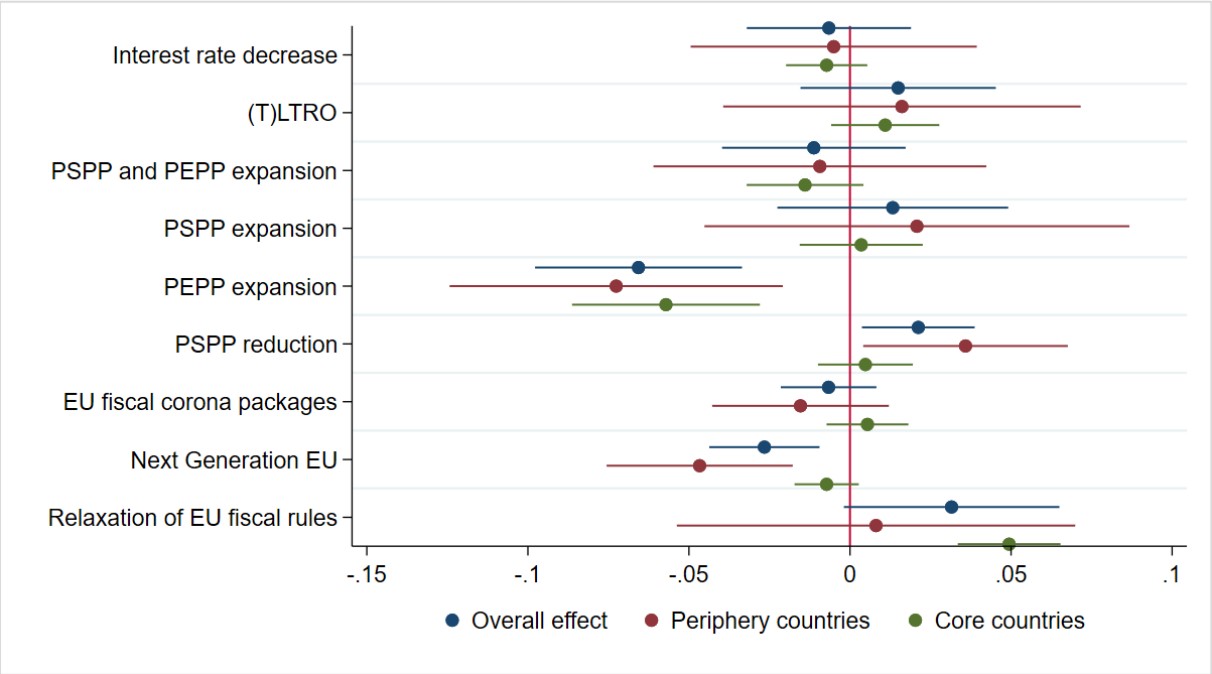
4.3 Extension and by-country analysis

In this section, we consider two conceptual extensions to the previous analysis by (i) considering the effects separately for core vs. periphery countries (Fendel and Neugebauer (2020) identify important differences in yield reactions to monetary policy announcements between these two groups of countries) and by (ii) analyzing heterogeneous effects with respect to single countries.

The first extension investigates whether the effect size differs by the fiscal strength of a country. As hypothesized above (3.1), countries with a lower borrower reputation are likely to experience a larger reduction in sovereign spreads after an expansionary monetary or fiscal support announcement. We distinguish fiscally weaker from stronger countries on the basis of their credit ratings. We compare the core countries that receive an “Aa” rating (Moody’s) or better (Austria, Belgium, Finland, France, the Netherlands) to periphery countries with a rating “A” or worse (Greece, Italy, Spain, Portugal,

Ireland).[11] Figure 6 documents the results. In line with expectations, expansionary policy measures correlate in particular with a reduction in government bond spreads for the less solvent countries. The coefficients for the PEPP expansions and Next Generation EU announcements are particularly large and negative in this group of countries. Somewhat unexpected, a relaxation of EU fiscal rules is a particularly unfavorable message for the group of core countries, possibly because they gain more fiscal freedom to take on new debt compared to already highly-indebted countries with limited capacities to incur much further debt on the market.

Figure 6: Event effects by country groups (core vs. periphery countries)



Notes: Coefficient estimates and 95% confidence intervals for each event type. Results correspond to Equation (1) but show the event effect separately for (i) all 10 countries, (ii) the periphery countries (Spain, Greece, Ireland, Italy, Portugal), and (iii) the core countries (Austria, Belgium, Finland, France, the Netherlands).

As a second and final extension, we consider the announcement effects on the individual countries' spreads (Table 3 to Table 6). They confirm the large empirical relevance of the PEPP, the smaller effect of Next Generation EU, and the disinterest of market participants in the smaller European fiscal rescue announcements, which do not include a significant transfer component. However, the separate country regressions reveal a particularly strong PEPP effect for Italy (16.9 basis points) which is more than double of other larger country effect sizes. Next Generation EU had the largest effect on Spain (4.1 basis points), Portugal (4.2 basis points), and Greece (5.3 basis points) as shown in Table 5.

[11] Historical government bond ratings from Moodys can be found under the following link (registration required): https://www.moodys.com/researchandratings/market-segment/sovereign-supranational/-/005005?tb=0&type=Methodology.

Table 3: Country-specific effects – PEPP expansion

	Dependent variable: Government bond spread									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Core countries					Periphery countries				
Country	Austria	Belgium	Finland	France	Netherlands	Spain	Greece	Ireland	Italy	Portugal
PEPP expansion	-0.0735**	-0.0802**	-0.0383***	-0.0787**	-0.0290	-0.0602***	0.0035	-0.0667***	-0.1685***	-0.0713***
	(0.0340)	(0.0398)	(0.0086)	(0.0353)	(0.0256)	(0.0201)	(0.0345)	(0.0226)	(0.0482)	(0.0183)
Constant	0.0143**	-0.0015	-0.0006	0.0021	-0.0104*	-0.0001	0.0157	-0.0002	0.0044	0.0023
	(0.0067)	(0.0025)	(0.0017)	(0.0023)	(0.0054)	(0.0055)	(0.0177)	(0.0030)	(0.0137)	(0.0062)
Observations	218	218	218	218	218	218	218	218	218	218
Adjusted R-squared	0.1430	0.1185	0.0875	0.1520	0.0610	0.0756	0.0527	0.1517	0.0457	0.0894
Control variables	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Working-day fixed effects	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Notes: OLS regressions. Results correspond to Equation (2). Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 4: Country-specific effects – EU fiscal corona packages

	Dependent variable: Government bond spread									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Core countries					Periphery countries				
Country	Austria	Belgium	Finland	France	Netherlands	Spain	Greece	Ireland	Italy	Portugal
EU fiscal corona packages	-0.0075	-0.0028	0.0241	-0.0017	0.0120	-0.0195	0.0290	0.0022	-0.0616	-0.0268
	(0.0192)	(0.0104)	(0.0154)	(0.0094)	(0.0112)	(0.0168)	(0.0389)	(0.0153)	(0.0399)	(0.0209)
Constant	0.0135**	-0.0013	-0.0009	0.0017	-0.0100**	-0.0009	0.0103	-0.0009	0.0052	0.0013
	(0.0061)	(0.0023)	(0.0017)	(0.0022)	(0.0050)	(0.0048)	(0.0159)	(0.0029)	(0.0120)	(0.0055)
Observations	240	240	240	240	240	240	240	240	240	240
Adjusted R-squared	0.1219	0.0327	0.0943	0.0509	0.0592	0.0699	0.0560	0.0868	0.0312	0.0837
Control variables	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Working-day fixed effects	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Notes: OLS regressions. Results correspond to Equation (2). Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 5: Country-specific effects – Next Generation EU

	Dependent variable: Government bond spread									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Core countries					Periphery countries				
Country	Austria	Belgium	Finland	France	Netherlands	Spain	Greece	Ireland	Italy	Portugal
Next Generation EU	-0.0093	-0.0128	-0.0014	-0.0098	-0.0004	-0.0407**	-0.0534**	-0.0098	-0.0872	-0.0417**
	(0.0091)	(0.0105)	(0.0055)	(0.0081)	(0.0082)	(0.0163)	(0.0266)	(0.0107)	(0.0540)	(0.0172)
Constant	0.0135**	-0.0011	-0.0003	0.0019	-0.0097*	-0.0005	0.0123	-0.0006	0.0056	0.0015
	(0.0061)	(0.0022)	(0.0017)	(0.0022)	(0.0050)	(0.0048)	(0.0159)	(0.0028)	(0.0119)	(0.0054)
Observations	240	240	240	240	240	240	240	240	240	240
Adjusted R-squared	0.1218	0.0358	0.0458	0.0531	0.0558	0.0750	0.0569	0.0886	0.0316	0.0853
Control variables	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Working-day fixed effects	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Notes: OLS regressions. Results correspond to Equation (2). Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 6: Country-specific effects – Relaxation of EU fiscal rules

	Dependent variable: Government bond spread									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Core countries					Periphery countries				
Country	Austria	Belgium	Finland	France	Netherlands	Spain	Greece	Ireland	Italy	Portugal
Relaxation of EU fiscal rules	0.0662***	0.0368	0.0810***	0.0130	0.0667***	0.0000	0.1365*	0.0276	-0.0615	-0.0311
	(0.0070)	(0.0241)	(0.0115)	(0.0162)	(0.0065)	(0.0390)	(0.0785)	(0.0313)	(0.0486)	(0.0432)
Constant	0.0134**	-0.0013	-0.0005	0.0017	-0.0095*	-0.0014	0.0112	-0.0008	0.0035	0.0005
	(0.0061)	(0.0023)	(0.0017)	(0.0022)	(0.0049)	(0.0050)	(0.0159)	(0.0029)	(0.0125)	(0.0055)
Observations	240	240	240	240	240	240	240	240	240	240
Adjusted R-squared	0.1412	0.0507	0.2098	0.0534	0.0896	0.0659	0.0624	0.0965	0.0249	0.0804
Control variables	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Working-day fixed effects	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Notes: OLS regressions. Results correspond to Equation (2). Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

The relaxation of EU fiscal rules exhibits a robust positive effect, in particular for the group of core countries. However, the largest coefficient is observed for Greece. To rationalize this finding, one might argue that market participants demand a particularly high risk premium on Greek government bonds when this highly indebted country faces a reduction in the incentives for fiscal discipline. As the coefficient for Greece is only statistically significant at the 10 percent level, this result should, however, be interpreted with caution.

The results for the other event dummies are provided in Table A2 to Table A6 in the Appendix and confirm the previous results.

5 Discussion

European emergency measures have successfully contributed to shielding euro sovereign markets against another downward spiral of rising spreads and increasing market panics. However, our results suggest that most of the European fiscal rescue measures, such as activating the provision of liquidity from the SURE program, EIB, and ESM, have played no crucial role in this respect. The announcements on all jointly analyzed fiscal measures largely passed by without having a measurable impact on the risk spreads of periphery euro area countries.

An exception is the Next Generation EU program, which is associated with a small but significant reduction in sovereign spreads of the ten considered euro area countries. However, compared to this EU fiscal instrument, the ECB's announcements on its pandemic emergency measures have been associated with much more noticeable and robust coefficients, indicating an instantaneous and sizeable spread compression. Measurable monetary policy effects on spreads are largely limited to the PEPP, whereas interest rate decisions and longer-term refinancing operations did not trigger any noticeable reactions in the relative pricing of sovereign bond market segments over the considered period November 2014 to October 2020. The PSPP expansion in early March 2020 even correlates with a spread increase signaling a market disappointment. The contrast between the PSPP and the PEPP effect emphasizes the particular relevance of the latter with its relaxation of purchase constraints including the suspension of the capital key orientation and the end to any issue and issuer limits.

Fiscal announcements on a temporary relaxation of European fiscal rules through the activation of the emergency-escape clause under the Stability and Growth Pact do not contribute to a more optimistic outlook on fiscal sustainability. If anything, these announcements are taken as bad news and are associated with rising spreads. However, this effect is only statistically significant for the more solvent countries or an extended event window of two days.

Our key result that the pandemic monetary emergency measures through the PEPP have been highly effective, whereas fiscal rescue announcements had much less impact (small and statistically significant effect for Next Generation EU, no effect for the combination of all fiscal packages), survives various robustness checks that allow for various definitions of the event window, lengths of sample periods, different types of time fixed effects and country-specific regressions. Thus, in light of our analysis, the ECB and the Eurosystem's emergency measures have played the crucial role in guaranteeing the stability of euro area sovereign bond markets in the deepest post-war recession with the EU fiscal innovations playing a less important role from the perspective of sovereign bond markets.

Overall, our results have an unpleasant implication for the debate on a looming fiscal dominance of the ECB in the presence of rising public debt levels. So far, the stabilization of sovereign bond markets appears to hinge largely on the Eurosystem's role as a massive buyer of high-debt countries' sovereign bonds. Moreover, our differentiated fiscal policy results indicate which type of fiscal instrument has the largest potential to relieve the ECB in future crises. Whereas the loan-based instruments like SURE and EIB facilities did not affect the spreads at all, Next Generation EU with its transfer component exerted a small, but robust effect. Hence, from the perspective of sovereign bond markets, it seems to be the transfer component of EU fiscal instruments that makes the difference.

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Appendix

Box 1: The Eurosystem's non-standard monetary policy measures

LTROs / TLTROs / PELTROs: Longer-term refinancing operations (LTROs) are measures by the ECB to provide additional liquidity to the euro area money markets with a longer maturity than the usual three months. The first time that the ECB provided LTROs with a longer maturity was in March 2008 with six month LTROs. In May 2009, twelvemonth LTROs followed and in December 2011, three-year LTROs were introduced (Fratzscher et al. 2016). **Targeted longer-term refinancing operations** (TLTROs) were introduced in June 2014 and borrowing was linked to the banks' loans to non-financial corporations and households. Further series, TLTRO II and III, were announced in March 2016 and March 2019, respectively (ECB 2021). Finally, in April 2020, the ECB announced **pandemic emergency longer-term refinancing operations** (PELTROs), which would start in May 2020 (ECB 2020b).

SMP: Central bank purchases of sovereigns in the euro area started with the Securities Market Program (SMP) established in May 2010 as a crisis instrument in the evolving euro area debt crisis. At this time, the euro area sovereign bond markets suffered from a lack of market liquidity for the fiscally fragile Member States with a dramatic widening of spreads. The holdings of the Eurosystem under the SMP reached a maximum of €218 billion in September 2012 (Koetter et al. 2017). The SMP was highly selective as the purchases only included the countries most affected by the debt crisis: Italy, Spain, Greece, Portugal, and Ireland.

OMT: Since September 2012, the **Outright Monetary Transaction** (OMT) program offers support for euro area countries that have an agreement with the European Stability Mechanism (ESM). With the establishment of the OMT program, the SMP was terminated. As for the SMP, the ECB Council justified the new program with the aim of safeguarding an appropriate monetary policy transmission and a uniform effectiveness of its monetary policy in all parts of the euro area. So far, the OMT has never been activated and has played no role as an option in the pandemic since 2020.

PSPP: The **Public Sector Purchase Program** (PSPP) started in March 2015 as the most important component of the Asset Purchase Program (APP) and continues until this day, with the exception of a pause in net purchases between January and October 2019. By the end of November 2020, the cumulated PSPP net purchases of the Eurosystem reached €2,445 billion (of which €2,189 billion are national debt and €256 billion supranational). With the PSPP, the Eurozone central banks purchase bonds from all euro members with the exception of Greece. APP net purchases currently amount to €20 billion per month plus purchases from an additional coronavirus crisis-related envelope of €120 billion. PSPP net purchases between September and November amounted to €21.2 billion a month (ECB 2015).

PEPP: With the **Pandemic Emergency Purchase Program** (PEPP), the Governing Council has added a second purchase program that complements the ongoing APP (ECB 2020a). PEPP is an asset purchase program of private and public sector securities. Compared to the PSPP, the PEPP has relaxed or fully abandoned various rules such as issue and issuer limits and the strict orientation of country allocations to the ECB capital key (Havlik and Heinemann 2020). Initially, it was set up with a target of €750 billion

until the end of 2020. However, the ECB Council increased the envelope further in two steps in June and December 2020 to €1,850 billion and extended the horizon for net purchases until at least March 2022. As in the APP, purchases of government bonds are by far the most important item in the PEPP. Under the PEPP, Eurosystem central banks buy bonds from all euro members including Greece. By the end of November 2020, the Eurosystem PEPP holdings of public sector securities amounted to €652 billion, which is 93% of all PEPP purchases. Between September and November 2020, the average monthly PEPP net purchases of public securities reached €67.9 billion.

Box 2: EU fiscal responses to the COVID-19 crisis

European Fiscal Framework Flexibility: On March 13, 2020, the Commission announced its proposal to the European Parliament to activate the general escape clause within the Stability and Growth Pact. The European Parliament then actually proposed it on March 20, 2020. This clause allows the EU Member States to temporarily deviate from their medium-term budgetary objectives and to fulfil the requirements of the excessive deficit procedure at a later point in time, in case they are in the procedure. This flexibility allows the Member States to implement necessary measures such as stimulus packages in their countries to reduce the economic impact of the COVID-19 pandemic (European Commission 2020b; Delivorias 2020).

Mobilizing the EU budget: Equally announced on March 13, 2020 was a guarantee of EUR 1 billion from the EU budget to the European Investment Fund (EIF) in order to help small and medium enterprises (SMEs) and small mid-caps with EUR 8 billion of financing (European Commission 2020b).

Coronavirus Response Investment Initiative: This initiative, likewise announced on March 13, 2020, provides EUR 37 billion to be spent immediately on healthcare, SMEs, and short time work schemes. This money has not yet been spent under the Multiannual Financial Framework (MFF) 2014-20 Cohesion policy. Moreover, the EU Solidarity Fund was announced to be extended to include health aspects. In this fund, EUR 800 million are available in 2020 (European Commission 2020c).

SURE: The instrument **Support to mitigate Unemployment Risks in an Emergency** (SURE) was launched to support Member States in their effort to protect jobs by funding short-time work schemes and similar measures in the form of loans of up to EUR 100 billion in total. The basis of SURE are voluntary guarantees of the Member States, depending on their respective relative share of the EU's gross national income (GNI) (European Commission 2020d). In addition to this, the EU is issuing social bonds to finance SURE (European Commission 2020e). SURE was announced on April 1, 2020. It was agreed upon on April 9, 2020 as part of the EUR 540 billion rescue package (see below).

EUR 540 billion rescue package: On April 9, 2020 the EU Finance ministers decided on a large rescue package with a volume of EUR 540 billion. It contains EUR 240 billion, made available under the ESM, a EUR 25 billion guarantee fund that shall mobilize EUR 200 billion for SMEs by the European Investment Bank (EIB) and EUR 100 billion for SURE (Sandford 2020). All components are based on loans without any grant elements.

French-German Initiative for the European Recovery from the coronavirus crisis: On May 18, 2020 France and Germany made a joint proposal for different policy measures. It included a Recovery Fund of EUR 500 billion within the MFF 2021-27. This fund was proposed to provide additional EU budgetary expenditure for the sectors which are severely hit by the crisis. The proposal included the possibility for the EU to borrow on markets (German Federal Government 2020). It was the foundation of Next Generation EU (see below).

Next Generation EU: On May 27, 2020 the Commission proposed a new recovery plan – Next Generation EU. EUR 750 billion would be added to the MFF 2021-27. The plan consists of three pillars: (i) support for Member States with investments and reforms, i.e., a recovery and resilience facility, additional cohesion and agricultural spending and funds to support the transition to climate neutrality; (ii) incentives for private investments; (iii) measures preparing for future crises including a health program, a civil protection program, research in health, resilience, green and digital transformations and support for global partners. To finance the recovery plan, the own resources ceiling will be temporarily increased to 2% of the EU's GNI to be able to borrow the EUR 750 billion on financial markets. On July 21, 2020 the European Council agreed on Next Generation EU costing EUR 750 billion and the MFF 2021-27, which both amount to EUR 1.8 trillion. The EUR 750 billion are divided into EUR 390 billion to be paid out as grants and EUR 360 billion in the form of loans. The repayment is scheduled until the end of 2058 (European Commission 2020f; European Council 2020). The Commission's program was based on a French-German proposal for an EU recovery plan, published on May 18, 2020. The Commission proposal was discussed during a special European Council from July 17 to July 21, 2020, which ended with the EU-level agreement after four days of intense negotiations.

Table A1: Summary statistics

Variable	Description	N	Mean	SD	Min	Max	Relevant datastream mnemonic
Panel sample		15.650	1,3129	1,9318	0,0324	18,5483	
Δy_t	Ten-year government bond yield spread against German bond (3rd-order polynomial yield curve, first difference)	15.650	-0,0006	0,0911	-5,4185	3,3286	
Δy_{t-1}	One day lag of Δy_t	15.650	-0,0006	0,0912	-5,4185	3,3286	
$\Delta CESI_t$	Citi Bank Economic Surprise Index	15.650	0,0866	8,2635	-170,3000	89,9000	
$\Delta Corp\_spread_t$	Corporate bond spread (difference between BBB and AAA rated corporate bonds)	15.650	0,0002	0,0194	-0,2070	0,1560	
Single countries samples							
$\Delta y_{t,AT}$	Δy_t for Austria	1.565	0,0000	0,0232	-0,1693	0,1656	GVOE03(CM10)
$\Delta y_{t,BE}$	Δy_t for Belgium	1.565	-0,0001	0,0186	-0,1542	0,1484	GVBG03(CM10)
$\Delta y_{t,FI}$	Δy_t for Finland	1.565	0,0000	0,0130	-0,1132	0,1357	GVFN03(CM10)
$\Delta y_{t,FR}$	Δy_t for France	1.565	0,0000	0,0186	-0,2305	0,1603	GVFR03(CM10)
$\Delta y_{t,NL}$	Δy_t for Netherlands	1.565	-0,0001	0,0182	-0,0852	0,1248	GVNL03(CM10)
$\Delta y_{t,ES}$	Δy_t for Spain	1.565	-0,0003	0,0441	-0,3788	0,3264	GVES03(CM10)
$\Delta y_{t,GR}$	Δy_t for Greece	1.565	-0,0036	0,2642	-5,4185	3,3286	GVGR03(CM10)
$\Delta y_{t,IE}$	Δy_t for Ireland	1.565	-0,0005	0,0267	-0,1745	0,2031	GVIR03(CM10)
$\Delta y_{t,IT}$	Δy_t for Italy	1.565	-0,0001	0,0701	-0,7314	0,6156	GVIL03(CM10)
$\Delta y_{t,PT}$	Δy_t for Portugal	1.565	-0,0013	0,0631	-0,4406	0,4436	GVPT03(CM10)
$\Delta y_{t-1,AT}$	Δy_{t-1} for Austria	1.565	0,0000	0,0232	-0,1693	0,1656	
$\Delta y_{t-1,BE}$	Δy_{t-1} for Belgium	1.565	-0,0001	0,0186	-0,1542	0,1484	
$\Delta y_{t-1,FI}$	Δy_{t-1} for Finland	1.565	0,0000	0,0130	-0,1132	0,1357	
$\Delta y_{t-1,FR}$	Δy_{t-1} for France	1.565	0,0000	0,0186	-0,2305	0,1603	
$\Delta y_{t-1,NL}$	Δy_{t-1} for Netherlands	1.565	-0,0001	0,0182	-0,0852	0,1248	
$\Delta y_{t-1,ES}$	Δy_{t-1} for Spain	1.565	-0,0004	0,0441	-0,3788	0,3264	
$\Delta y_{t-1,GR}$	Δy_{t-1} for Greece	1.565	-0,0035	0,2643	-5,4185	3,3286	
$\Delta y_{t-1,IE}$	Δy_{t-1} for Ireland	1.565	-0,0005	0,0267	-0,1745	0,2031	
$\Delta y_{t-1,IT}$	Δy_{t-1} for Italy	1.565	-0,0002	0,0701	-0,7314	0,6156	
$\Delta y_{t-1,PT}$	Δy_{t-1} for Portugal	1.565	-0,0013	0,0632	-0,4406	0,4436	

Notes: Own calculations. Source: Datastream.

Table A2: Country-specific effects – Interest rate decrease

	Dependent variable: Government bond spread									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Core countries					Periphery countries				
Country	Austria	Belgium	Finland	France	Netherlands	Spain	Greece	Ireland	Italy	Portugal
Interest rate decrease	-0.0013	-0.0020	-0.0104*	-0.0032	-0.0196	0.0054	-0.0146	0.0019	-0.0179	-0.0009
	(0.0123)	(0.0116)	(0.0061)	(0.0194)	(0.0176)	(0.0298)	(0.0467)	(0.0044)	(0.0445)	(0.0250)
Constant	0.0017	0.0008	-0.0002	0.0022*	-0.0020**	-0.0020	0.0299*	-0.0023	0.0009	-0.0025
	(0.0013)	(0.0010)	(0.0008)	(0.0012)	(0.0010)	(0.0028)	(0.0174)	(0.0016)	(0.0041)	(0.0040)
Observations	1,565	1,565	1,565	1,565	1,565	1,565	1,565	1,565	1,565	1,565
Adjusted R-squared	0.1011	0.0439	0.0344	0.0487	0.0637	0.0568	0.0478	0.0465	0.0431	0.0747
Control variables	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Working-day fixed effects	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Notes: OLS regressions. Results correspond to Equation (2). Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A3: Country-specific effects – (T)LTRO

	Dependent variable: Government bond spread									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Core countries					Periphery countries				
	Austria	Belgium	Finland	France	Netherlands	Spain	Greece	Ireland	Italy	Portugal
(T)LTRO	0.0119	0.0261	-0.0030	0.0308	-0.0106	0.0083	-0.0186	0.0078	0.0712	0.0035
	(0.0118)	(0.0229)	(0.0069)	(0.0252)	(0.0193)	(0.0312)	(0.0576)	(0.0134)	(0.0995)	(0.0506)
Constant	0.0017	0.0008	-0.0002	0.0022*	-0.0020**	-0.0020	0.0299*	-0.0023	0.0009	-0.0025
	(0.0013)	(0.0010)	(0.0008)	(0.0012)	(0.0010)	(0.0028)	(0.0174)	(0.0016)	(0.0041)	(0.0040)
Observations	1,565	1,565	1,565	1,565	1,565	1,565	1,565	1,565	1,565	1,565
Adjusted R-squared	0.1021	0.0514	0.0334	0.0590	0.0628	0.0570	0.0478	0.0468	0.0468	0.0747
Control variables	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Working-day fixed effects	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Notes: OLS regressions. Results correspond to Equation (2). Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A4: Country-specific effects – PSPP and PEPP expansion

	Dependent variable: Government bond spread									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Core countries					Periphery countries				
	Austria	Belgium	Finland	France	Netherlands	Spain	Greece	Ireland	Italy	Portugal
PSPP and PEPP expansion	-0.0131	-0.0073	-0.0177***	-0.0029	-0.0299**	-0.0021	-0.0412	-0.0111	0.0136	-0.0077
	(0.0199)	(0.0276)	(0.0056)	(0.0294)	(0.0132)	(0.0302)	(0.0485)	(0.0188)	(0.0950)	(0.0466)
Constant	0.0017	0.0008	-0.0002	0.0022*	-0.0020**	-0.0020	0.0299*	-0.0023	0.0009	-0.0025
	(0.0013)	(0.0010)	(0.0008)	(0.0012)	(0.0010)	(0.0028)	(0.0174)	(0.0016)	(0.0041)	(0.0040)
Observations	1,565	1,565	1,565	1,565	1,565	1,565	1,565	1,565	1,565	1,565
Adjusted R-squared	0.1025	0.0446	0.0413	0.0488	0.0734	0.0568	0.0479	0.0472	0.0431	0.0747
Control variables	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Working-day fixed effects	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Notes: OLS regressions. Results correspond to Equation (2). Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A5: Country-specific effects – PSPP expansion

	Dependent variable: Government bond spread									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Core countries					Periphery countries				
	Austria	Belgium	Finland	France	Netherlands	Spain	Greece	Ireland	Italy	Portugal
PSPP expansion	0.0116	0.0217	-0.0094**	0.0273	-0.0320**	0.0190	-0.0453	0.0115	0.0916	0.0181
	(0.0142)	(0.0267)	(0.0037)	(0.0301)	(0.0139)	(0.0385)	(0.0642)	(0.0152)	(0.1154)	(0.0611)
Constant	0.0017	0.0008	-0.0002	0.0022*	-0.0020**	-0.0020	0.0299*	-0.0023	0.0009	-0.0025
	(0.0013)	(0.0010)	(0.0008)	(0.0012)	(0.0010)	(0.0028)	(0.0174)	(0.0016)	(0.0041)	(0.0040)
Observations	1,565	1,565	1,565	1,565	1,565	1,565	1,565	1,565	1,565	1,565
Adjusted R-squared	0.1019	0.0482	0.0348	0.0555	0.0713	0.0574	0.0478	0.0471	0.0483	0.0749
Control variables	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Working-day fixed effects	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Notes: OLS regressions. Results correspond to Equation (2). Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A6: Country-specific effects – PSPP reduction

	Dependent variable: Government bond spread									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Core countries					Periphery countries				
Country	Austria	Belgium	Finland	France	Netherlands	Spain	Greece	Ireland	Italy	Portugal
PSPP reduction	-0.0053	0.0033	0.0056	0.0060	0.0159	0.0012	0.0629**	0.0253	0.0113	0.0735
	(0.0218)	(0.0156)	(0.0094)	(0.0175)	(0.0138)	(0.0260)	(0.0320)	(0.0161)	(0.0309)	(0.0507)
Constant	0.0017	0.0008	-0.0002	0.0022*	-0.0020**	-0.0020	0.0299*	-0.0023	0.0009	-0.0042
	(0.0013)	(0.0010)	(0.0008)	(0.0012)	(0.0010)	(0.0028)	(0.0174)	(0.0016)	(0.0041)	(0.0040)
Observations	1,565	1,565	1,565	1,565	1,565	1,565	1,565	1,565	1,565	1,565
Adjusted R-squared	0.1012	0.0440	0.0335	0.0489	0.0630	0.0568	0.0479	0.0482	0.0430	0.0772
Control variables	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Working-day fixed effects	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Notes: OLS regressions. Results correspond to Equation (2). Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

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