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BACKGROUND PAPER

Sovereign Spreads, Central Bank Collateral Frameworks, and Periphery Premia in the Eurozone

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Executive Summary

This paper studies the emergence of sovereign bond yield spreads in the Eurozone prior to the financial crisis. While spreads were close to zero in European government debt markets until the mid-2000s, they have persistently widened since then in many member states. We employ a difference-in-differences approach to analyze this phenomenon. We find that the Eurosystem's move from unconditional to conditional collateral eligibility of sovereign bonds, as part of the 2005 Single List reform, was the institutional change triggering the emergence of sovereign spreads in the Euro Area. Conditional eligibility becomes effective predominantly through a periphery premium: higher yields have been demanded from countries whose business cycles deviate most from the average Eurozone cycle. In contrast, spreads did not arise in response to adverse macroeconomic and fiscal fundamentals.

#EUROZONE
#SPREADS
#DEBT
#ECB

Outline

1. Introduction

Since the mid-2000s, Eurozone governments have experienced substantial sovereign bond yield spreads. Entailing a measure of sovereign risk, their emergence has inspired a debate on whether Euro Area government debt should be seen as safe or risky (Cœuré 2016). In fact, European sovereign debt markets have seen equilibria of both types, and the surge of sovereign spreads marked the transition from one to the other. In this paper, we analyze why and by which channels sovereign spreads emerged.

It is established that changes in sovereign risk perception may be attributed to variations in macroeconomic and fiscal fundamental data. Consequently, there would be systematic yield differences, with countries running sound fiscal policies benefiting from lower yields, while countries running unsound policies are disciplined via higher yields. This *fundamental channel* undoubtedly explains parts of the evolution of sovereign spreads during and since the financial crisis. However, with regard to the pre-crisis period, there is much uncertainty about its contribution to the emergence of significant spreads in the first place.

This paper establishes a new channel of sovereign risk in the Euro Area. We show that yield differentials emerged in response to the European Central Bank's (ECB) new collateral framework in 2005 – called the Single List – which implied that sovereign bonds were henceforth no longer unconditionally eligible as collateral but had to satisfy eligibility criteria. This institutional shift did not lead to rising spreads for countries with unfavorable macroeconomic fundamentals but simply for those whose business cycles were least aligned with the monetary union's average. Since these member states are commonly grouped under the term *periphery*, as opposed to the more aligned *core* Euro Area, we frame this channel the *periphery premium*.

We provide an empirical analysis of the emergence of sovereign spreads in the Eurozone before the financial crisis. More specifically, we apply difference-in-differences models to a panel of eight euro countries, distinguished along two lines. First, the fundamental distinction compares countries with favorable vs. unfavorable macroeconomic and fiscal fundamentals, including debt levels, budget balances, economic growth, and external trade positions. The second distinction divides the Euro Area into core and periphery. Core countries show business cycles that are highly correlated with each other, while periphery countries have idiosyncratic business cycles, differing substantially from the core and among each other. Business cycle dissimilarities are a drawback within a monetary union with a single monetary policy regime (Mundell 1961; Bayoumi & Eichengreen 1992b).

Using this setup and cross-country data over the pre-crisis period, we test the hypothesis that the ECB's turn to conditional collateral policies gave rise to the shift in credit risk perception. To be precise, we answer the questions of (i) whether the change contributed to the emergence of sovereign spreads in the mid-2000s, (ii) if the effect was channeled through a disciplining of detrimental macroeconomic and fiscal conditions, and (iii) what factors determined the subsequent evolution of spreads until the financial crisis.

We find that making collateral eligibility conditional had a significant and substantial effect on spreads in the Euro Area periphery compared to the core. Our estimates suggest that the former experienced an increase of sovereign spreads of up to 20 basis points in response to the Single List, which, in total, is equivalent to a doubling of yield differences.

With respect to the channels by which the effect of conditional eligibility arose, we document that the fundamental channel is dominated by a periphery premium. Markets started demanding premia from countries whose business cycles are significantly off the average Eurozone cycle. In contrast, spreads did not emerge in countries that had exhibited adverse macroeconomic or fiscal positions, such as high debt positions, budget deficits or low economic growth, before the event.

However, in the subsequent pre-crisis period, fundamental variables prove to have influenced the evolution of sovereign spreads over time. We observe effects gaining significance after the event, which is in line with previous studies focusing on later periods. Hence, our results suggest that fundamental variables have turned into relevant determinants of sovereign spreads contingent on the adoption of conditional collateral standards.

This paper contributes to a deeper understanding of sovereign risk in Europe, and adds to the debate on how to develop the monetary union further. Our main finding is that sovereign spreads in the Eurozone owe their existence to an institutional change and business cycle dissimilarities among member states instead of differences in fundamental macroeconomic and fiscal information. This questions our conventional understanding of sovereign risk, being that it is necessarily and primarily reflective on fundamental data.

The remainder of the paper is structured as follows. Section 2 provides a review of the literature on sovereign risk in Europe, presenting empirical and theoretical evidence. Section 3 sketches the institutional background of the Single List reform and derives hypotheses. Section 4 introduces the empirical strategy and the data used for our analysis. We present our results in section 5, followed by final remarks in section 6.

2. Survey on sovereign spreads in the Euro Area

There is a rich literature addressing the determinants of sovereign risk. It has grown since the seminal paper by Eaton et al. (1986), who were the first to develop a theory of country risk in international sovereign debt markets.[1] As the literature on sovereign risk emerged in the wake of the Latin American debt crises of the 1970s and 1980s, it has been focused on global lending to emerging markets (Eaton et al. 1986, Hilscher & Nosbusch 2010). However, there has been a growing interest in the European case since the beginning of the European Economic and Monetary Union (EMU).

The Euro Area, in particular, is special by construction. Government bonds of countries in a monetary union may not be free from default risk, while those of monetarily sovereign countries, borrowing in their own currency, are indeed. They benefit from central banks intervening as a lender of last resort. In the case of the ECB, this function is called into question by the EU treaties and some recent court judgments,[2] raising the question of whether Eurozone government debt should actually be considered as safe or risky (Cœuré 2016). We summarize the state of research on Euro Area sovereign spreads as a measure of sovereign risk in the following section.

2.1 Empirical evidence

A first glance at the data. Figure 1 depicts the evolution of median sovereign spreads in the Euro Area from 2003 to late 2008, indicated by the pink line, as well as the range between the fifth and 95th percentile. During the first phase of the monetary union, government bond risks were priced equally for all member states. Spreads – calculated relative to German bond yields – varied only slightly around zero. Although the median spread remained close to zero until the crisis, spreads started diverging increasingly from 2005, the period marked by the grey-shaded area. Since the beginning of the crisis in 2007M8, yield differences widened explosively.

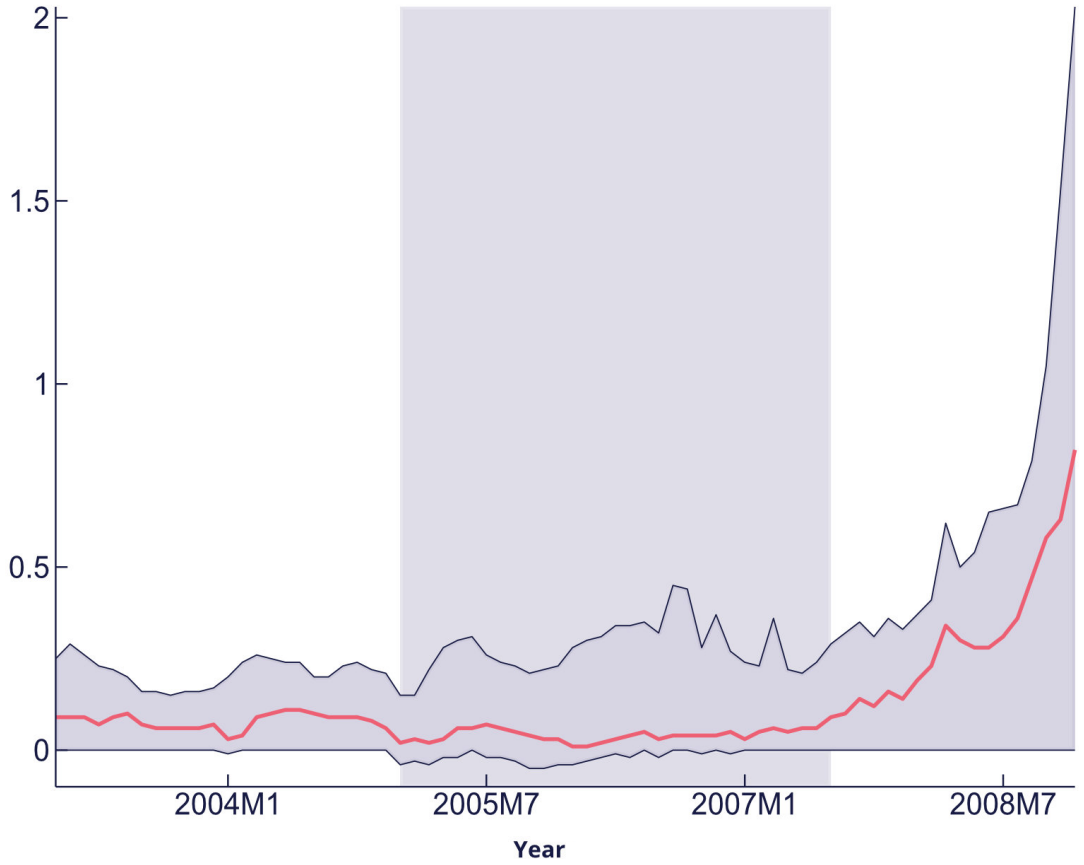
While the sharp increase of spreads during the financial crisis is attributable to the macroeconomic and financial turbulences of that time, as we will see below, two questions arise from figure 1 regarding the pre-crisis period: (i) What caused the sudden rise of sovereign spreads in some Euro Area countries in 2005 after several years of absence? And (ii), how can we explain the subsequent divergence of spreads among member states? Our analysis sheds light on the determinants of both the mere *existence* and the *extent* of spreads. In doing so, we go beyond the existing literature, which largely takes the existence of yield differentials as given.

Literature review. The empirical evidence on determinants of bond yield spreads as a measure of sovereign risk in the Eurozone is ambiguous. The literature classifies potential determinants into macroeconomic and fiscal fundamentals – henceforth referred to as *macro-fiscal fundamentals*, capturing default or redenomination risk –, liquidity-related variables, investors' risk appetite, as well as political and regulatory factors.

1 Following the literature, we employ sovereign bond spreads as an approximative measure of risk premia associated with a government bond. Risk premia encompass default risk, liquidity risk, as well as exchange rate risk in the case of governments that issue debt in foreign currencies, and redenomination risk in the case of countries in a monetary union (Alesina et al. 1992, Manganelli & Wolswijk 2009, Krishnamurthy et al. 2018, Kriwoluzky et al. 2019).

2 See the judgments of the German Federal Constitutional Court in "Gauweiler, 2016" and "Weiss, 2020", as well as of the European Court of Justice in "Gauweiler 2015".

Sovereign spreads in the Euro Area



Note: The pink line in this figure shows the evolution of median Euro Area sovereign spreads on ten-year maturity government bond yields over the period 2003M1–2008M12 in percentage points. The blue lines refer to the fifth and 95th percentile, and the blue area marks the corresponding interval. The shaded area indicates the period from 2005M1 to the beginning of the financial crisis in 2007M8. Luxembourg has been excluded for reasons of data availability.

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Figure 1

The role of macro-fiscal fundamentals is of particular interest because they establish a link between a government's financial and economic policy and the corresponding market responses. According to our conventional understanding, sound financial behavior translates into beneficial financing conditions, whereas the opposite motivates disciplining market signals in the form of high spreads (Kokott 2012). However, empirical studies of the disciplining channel show conflicting results.

Some panel studies confirm that macro-fiscal variables are major drivers of spread movements, as they represent an economy's basic economic strength and successfully discipline fiscal prudence. Particularly, they find that lower debt-to-GDP ratios, higher economic growth, budget surpluses, and beneficial trade positions diminish yield spreads (Alesina et al.1992, Baek et al. 2005, Attinasi et al. 2009, Haugh et al. 2009, Schuknecht et al. 2011, Maltritz 2012, Beirne & Fratzscher 2013, De Grauwe & Ji 2013, Constantini et al. 2014, De Grauwe et al. 2017).

Nonetheless, these results are not without restrictions. A range of studies shows that the effects of macro-fiscal fundamentals on Euro Area spreads are of minor quantitative importance (Beirne & Fratzscher 2013, De Grauwe & Ji 2013, De Grauwe et al. 2017), and have gained significance only since the financial crisis (Bernoth & Erdogan 2012, Afonso et al. 2015a, b). Correspondingly, Afonso & Strauch (2004) and Kalan et al. (2018) ascribe limited importance to policy events related to macroeconomic and fiscal surveillance in Europe. De Grauwe & Ji (2013) further highlight that, although – for example – debt levels in monetarily independent countries have varied at least as much as in the Euro Area, sovereign spreads have only widened in the latter. We add to this literature by examining how macro-fiscal fundamentals have contributed to the initial surge of Euro Area yield spreads, and how they influenced their evolution thereafter.

Ultimately, the literature has revealed that liquidity risk and international risk aversion are certainly non-negligible drivers of sovereign spreads. Several liquidity measures prove to be relevant, referring to trading intensity, bid-ask spreads, or market size (Codogno et al. 2003, Attinasi et al. 2009). Moreover, it has been found that high risk aversion explained a substantial fraction of the variation in yield spreads (Baek et al. 2005, Haugh et al. 2009, Attinasi et al. 2009, Manganelli & Wolswijk 2009, Schuknecht et al. 2011). We take account of these findings in our empirical model.

In conclusion, empirical results vary widely across studies. While they may well help to understand the unprecedented divergence of spreads across member states since the financial crisis, they are insufficient to explain why significant Euro Area sovereign spreads emerged in the first place. Our empirical analysis contributes to filling this gap. In this, it relates to the theoretical literature on multiple equilibria.

2.2 Multiple equilibria

Multiple equilibria in government debt markets arise from self-fulfilling expectations. Obstfeld (1986) was one of the first to model equilibria that are self-fulfilling in the sense of being raised by corresponding market expectations. In the context of sovereign borrowing, Calvo (1988) and Lorenzoni & Werning (2019) show that the feedback loop between interest rates and debt stocks gives rise to two distinct equilibria: one with high interest rates and high default risk, and one with low interest rates and low default risk. Which equilibrium arises depends on whether markets trust or distrust the respective government.

Distrust towards a government's debt obligations is more likely in a monetary union than in countries that control their own currency. The reason is that Euro Area countries, for instance, face a greater risk of liquidity crunches that turn into solvency crises (De Grauwe 2011).[3] Since investors can transfer euro liquidity freely across member states, and the ECB may not buy up government debt without limits as a crunch occurs, euro countries face a non-zero risk of default, similar to

3 For clarification, consider a country under monetary autonomy that borrows in its domestic currency. When investors are willing to sell sovereign bonds of this country, they will do so in exchange for other securities denominated in the same currency, or use their revenue to exchange it for another currency. In any case, the money stock of that specific country available for the government to issue debt remains constant. The price of bonds will fall until there is sufficient demand – even if it may be by the central bank working as the lender of last resort. Consequently, the default risk of that government is zero. If, in contrast, the same happens to a country within the Euro Area, investors might take the euro-denominated liquidity, formerly invested into this government's debt, and invest it into another euro country. Although the first is entirely indebted in euro, its debt carries liquidity risk that may convert into a solvency crisis under severe circumstances because the ECB is not allowed to step in.

emerging markets borrowing in foreign currencies (the so-called *original sin*; see Eichengreen et al. 2005). Given this immanent feature of monetary unions, the Eurozone may well experience equilibria associated with high spreads.

Recapturing figure 1, it is evident that European sovereign debt markets have seen phases of both low and high yield differences. Relating the determination of sovereign spreads in the Euro Area to multiple equilibria has been ignored by the empirical literature thus far. Even though De Grauwe & Ji (2013) attribute some euro countries' drift towards bad equilibria in 2010 to negative market sentiments – a drift not observed in what they call *stand-alone countries* –, they do not make precisely estimate what drives these sentiments.

We pursue the goal to identify the causes of this shift empirically, explaining the sudden rise of spreads. Specifically, we hypothesize that the phenomenon can be explained by institutional changes during the first phase of the Eurozone; this will be the focus of the following section.

3. The ECB's Single List

The key hypothesis of this paper is that sovereign spreads in the Euro Area were brought about by the revision of the ECB's collateral framework in the 2000s. This section gives a brief sketch of the institutional shift. Subsequently, we derive the hypotheses to be tested in the empirical part.

3.1 Sketch of the reform

Institutional factors such as central bank collateral frameworks are found to impact security markets (Haque et al. 1998, Capelle-Blancard et al. 2019). In the case of debt securities, the way central banks treat them as collateral in monetary policy operations may have sizable implications for yields and market liquidity, as has recently been discussed in Nguyen (2020) and Pelizzon et al. (2020).

Notably, the Eurosystem's collateral framework experienced a major reform during the run-up to the financial crisis. In short, the ECB switched from a qualitative, discretionary to a quantitative, market-based system. Although using private credit ratings to assess eligibility and determine haircuts had always been an option, only then did it become the central strategy of risk management. A minimum rating requirement of A– and differential haircuts were henceforth effectively applied to sovereign debt.

The reform we allude to was the creation of the so-called *Single List*. Van 't Klooster (2021) analyzes the roots of the reform.[4] The Single List was meant to replace the former two-tier collateral framework that allowed the ECB and national central banks discretion in deciding what securities to accept as eligible. The adoption of quantitative models helped to overcome this issue. It was decided to effectively delegate the eligibility decision to the market, by specifying haircuts and valuation margins on the basis of private agencies' credit ratings.

The new policy came to be particularly relevant for government debt. While the ECB had considered Eurozone government debt as unconditionally eligible prior to the Single List, it then began to subject sovereign bonds to conditional eligibility. Specifically, eligibility was made conditional on compliance with minimum credit ratings.

The ECB's move towards handling sovereign bonds with conditionality has proved to be an exacerbating factor of the financial crisis (Orphanides 2017). Linking central bank eligibility to external risk assessment exerted sales pressure on low-rated sovereign bond holders because they could no longer be pledged as collateral. Governments thus had to pay an eligibility premium (Bindseil & Papadia 2006, Bank for International Settlements 2015, Corradin et al. 2017).

The shift attracted interest in the question of whether Euro Area debt does or does not bear default risk. The answer to that question potentially affects whether high or low spreads will arise in sovereign debt markets. Lengwiler & Orphanides (2023) adopt this stance and model multiple equilibria as a consequence of central banks' differential treatment of government debt securities based on external assessments. Their conclusion is that such collateral policies might result in sovereign debt crises and defaults that would have been absent if uniform haircuts had been applied.

4 A chronology of the process that led to the creation of the Single List is provided in the appendix.

Yet, an empirical analysis of the effects of this twist in collateral criteria on sovereign spreads is missing. Specifically, we investigate if establishing conditional eligibility as part of the Single List – referred to as the *SL event* in the following – originated the rise of sovereign bond yield spreads in the Eurozone.

3.2 Hypotheses

The 2005 revision of collateral criteria has sent two distinct signals to markets. First, sovereign bond eligibility has henceforth been *conditional*, implying that certain governments' debt would eventually bear default risk. Second, eligibility was made conditional on *private credit ratings*, the variation of which should therefore explain the evolution of sovereign spreads.

However, if one neglects the case of Greece, there was very little variation in credit ratings across the Eurozone before the financial crisis; this is beyond the interest of this paper. Euro countries all held high medium grades (AA) at least, while most of them maintained an AAA prime rating (see figures 5 and 6 in the appendix). Thus, the surge of sovereign spreads should not be explained by the mere fact that the new collateral system was rating-based.

Instead, we hypothesize that the henceforth conditional pledgeability of sovereign bonds triggered the divergence of spreads in the Euro Area as from the mid-2000s. Conditional eligibility signals that the central bank will eventually allow government defaults – whatever the underlying economic criterion may be. Sovereign spreads would then arise if governments were highly reliant on the eligibility of their debt securities as central bank collateral. The fact that governments face default risk premia in the presence of conditional eligibility – and that these premia are independent of changes in fundamental economic data – has been studied theoretically by Lengwiler & Orphanides (2023).

A government's reliance on having its bonds eligible as central bank collateral is closely linked to its liquidity needs. Satisfying large demands for financing on financial markets is facilitated if government bonds are traded in large and liquid markets. Market liquidity, in turn, tends to be higher provided that the bond in question is eligible as collateral at the central bank. That is because pledgeable bonds offer their holders a benefit beyond a pecuniary return, which is particularly important in periods of high demand for, or low supply of, collateral, such as during the financial crisis (Bindseil & Papadia 2006, Bank for International Settlements 2015, Corradin et al. 2017).

Hence, we derive the following hypotheses.

1. There is a causal link between the SL event and the emergence of sovereign spreads in the Euro Area.
2. The emergence of sovereign spreads in the Euro Area in response to the SL event is primarily reflective on unfavorable macro-fiscal fundamentals.
3. Since the SL event, macro-fiscal fundamentals have been relevant determinants of the evolution of sovereign spreads in the Euro Area.

These hypotheses will be tested in the following analysis and emphasize different aspects. Hypothesis (1) asks whether making collateral eligibility conditional explains the *existence* of significant sovereign spreads, corresponding to new government debt market equilibria.

Hypothesis (2) sheds light on the *channels* through which they arose. Following previous studies, which emphasize the role of fundamental economic data (see section 2), we conjecture that conditional eligibility should have incentivized investors to reassess macro-fiscal fundamentals. As governments facing detrimental economic conditions tend to require higher liquidity so as to refinance former debt or finance reform policies, they are more reliant on their bonds' pledgeability at the ECB and more exposed if the latter is no longer guaranteed. Hence, markets should be inclined to reprice government bonds based on economic fundamentals. Accordingly, we refer to this channel as *fundamental*.

Hypothesis (3) focuses on the question of what has determined the *extent* of sovereign spreads in the aftermath of the Single List reform. Testing this hypothesis provides a validation of previous empirical findings, summarized in section 2.

4. Empirical strategy and data

In this section, we present the strategy to explore the phenomenon of government bond spreads in the Euro Area empirically. We set out the method employed in the empirical part and introduce the data the analysis builds upon.

4.1 Method

To properly test the above hypotheses, we employ a difference-in-differences technique, comparing member states based on their exposure to the event.

As explained above, private credit ratings are not a suitable exposure measure because they barely varied prior to the financial crisis. Accordingly, when we perform the analysis with a rating-based measure, one does not find significant effects (see table 8 and figure 7 in the appendix). We use an indicator of credit ratings as a control variable in the main analysis instead.

In contrast, we want to estimate the impact of imposing conditions on the eligibility of government bonds as central bank collateral. A government's exposure to this decision depends on the extent to which it relies on issuing pledgeable bonds. This reliance is stronger, the more likely it is that the government faces high future financing needs. Conditional eligibility tends to tighten sovereign bond market liquidity, as it renders bonds in doubt of future pledgeability less attractive to hold. Governments with high demands for financing are thus exposed to potential liquidity and, ultimately, solvency problems. Against this background, we apply two distinct measures of exposure.

The fundamental channel. Referring to the *fundamental* channel outlined above, one exposure measure is based on macro-fiscal variables. Specifically, countries having higher debt levels, larger budget deficits, lower economic growth, or low competitiveness can be argued to face greater future needs for financing. Their exposure is higher because acquiring these funds would be facilitated by collateral eligibility, which is not unconditionally available in the revised framework.

The core-periphery channel. To disentangle different channels, we further measure a government's exposure to the event in a way unrelated to macro-fiscal fundamentals. We employ the core-periphery distinction of Euro Area members proposed by Bayoumi & Eichengreen (1992a, b). They distinguish European countries according to the synchronicity of their business cycles, building on the seminal contribution by Mundell (1961).

Synchronized cycles among members of a monetary union would imply that symmetric policy responses could effectively counteract economic shocks – the crucial premise if monetary policy applies a single instrument to multiple countries. If synchronicity is poor, in contrast, monetary policy responses would optimally be asymmetric, which is ruled out by construction.

In Bayoumi & Eichengreen (1992b) and the following literature, business cycle synchronicity is measured in terms of cross-country correlations of supply and demand shocks.[5] Coefficients are reported relative to Germany, which acts as the anchor country. Germany and its neighboring countries exhibit a high degree of symmetry, so they are grouped as the Euro Area *core*. Other countries' business cycles – the so-called *periphery* – show a weak correlation both with the core and among each other.

Exploiting this feature, the identifying assumption underlying this channel is the following: periphery countries face asymmetric business cycles in comparison with Germany and core countries, so monetary policy of the conventional "one-size-fits-all" style will be less effective and governments will require more borrowing in order to stabilize output fluctuations. Hence, periphery countries have a higher exposure to the SL event as conditional eligibility of sovereign bonds might well hamper them satisfying these liquidity needs on the market.

We include both a binary and a continuous core-periphery variable in the estimation. In the binary case, countries are grouped as core and periphery following Bayoumi & Eichengreen (1992b). We further use the coefficients they report for the correlation of economic disturbances between Germany and other member states as a continuous treatment measure. They capture a set of countries consisting of the Eurozone members Belgium, France, Greece, Ireland, Italy, the Netherlands, Spain, and Portugal. Moreover, Funke (1997) provides very similar estimates of correlation coefficients for some further European countries that we use to extend our sample. When employing these coefficients, we solely focus on supply shocks.[6]

Regression models. Formalizing the former, our baseline model to test the first hypothesis consists of the following two difference-in-differences regressions, where equation (1) corresponds to the binary periphery indicator and equation (2) to the continuous shock correlation measure:

$$Spread_{ct} = \alpha_c + \alpha_t + \beta \times Periphery_c \times SL_t^{2005M7} + \gamma^0 \times X_{ct} + \gamma^1 \times X_{ct} \times SL_t^{2005M7} + \varepsilon_{ct} \quad (1)$$

$$Spread_{ct} = \alpha_c + \alpha_t + \beta \times Correlation_c \times SL_t^{2005M7} + \gamma^0 \times X_{ct} + \gamma^1 \times X_{ct} \times SL_t^{2005M7} + \varepsilon_{ct}. \quad (2)$$

The outcome variable $Spread_{ct}$ is the sovereign spread of country c in month t vis-à-vis Germany. The variables α_c and α_t are country and time fixed effects. The treatment variable is the interaction of the exposure measure $Periphyery_c$ or $Correlation_c$, respectively, with the time dummy SL_t^{2005M7} equal to one as of the Single List announcement in July 2005. Macro-fiscal fundamentals are added through the matrix χ_{ct}, containing the debt-to-GDP ratio ($Debt_{ct}$), its square ($Debt_{ct}^2$), the budget balance ($Budget_{ct}$), the primary budget balance ($PBudget_{ct}$), the growth rate ($Growth_{ct}$), the current account balance (CA_{ct}), and the real effective exchange rate ($REER_{ct}$), which we further interact with the time indicator to take time-varying effects into account, as well as our liquidity measure ($Liquidity_{ct}$) and an indicator AAA_{ct}, which is equal to one if a country was rated AAA.

5 Bayoumi & Eichengreen (1992b) follow Blanchard & Quah (1989) in attributing output fluctuations to either demand or supply shocks, where the former are temporary and the latter are permanent in nature. In this literature, shocks are decomposed using Structural Vector Autoregressive Regressions (SVAR), and cross-country correlations are computed. This method is most prominent to approximate correlations of cyclical output movements across the monetary union, where risk sharing via exchange rate or interest rate adjustments is impeded (Bayoumi & Eichengreen 1992a, b, Frankel & Rose 1997, Fidrmuc & Korhonen 2003, 2004).

6 Supply shocks reveal more information about business cycle similarities than demand shocks because the latter are arguably endogenous to membership in the monetary union. Coordinated economic policies as well as common monetary policy are important drivers of demand, but meaningless regarding the underlying properties of the business cycle (Fidrmuc & Korhonen 2004).

To analyze the channels through which the SL event affected sovereign spreads (see hypothesis (2)), the model is slightly modified. The regression equations read:

$$Spread_{ct} = \alpha_c + \alpha_t + \beta^P \times Periphery_c \times SL_t^{2005M7} + \beta^F \times F_c \times SL_t^{2005M7} + \gamma^0 \times X_{ct}^{-F} + \gamma^1 \times X_{ct}^{-F} \times SL_t^{2005M7} + \varepsilon_{ct} \quad (3)$$

$$Spread_{ct} = \alpha_c + \alpha_t + \beta^P \times Correlation_c \times SL_t^{2005M7} + \beta^F \times F_c \times SL_t^{2005M7} + \gamma^0 \times X_{ct}^{-F} + \gamma^1 \times X_{ct}^{-F} \times SL_t^{2005M7} + \varepsilon_{ct}. \quad (4)$$

The basic structure of equations (3) and (4) is as before. We include country and time fixed effects, and the treatment variable is composed of an interaction of the (binary or continuous) periphery variable and the Single List time indicator. The only difference is the further interaction term we add, comprising the same time dummy and the pre-treatment value of one specific macro-fiscal fundamental, i.e. F_c, in each regression. In equations (1) and (2), we let macro-fiscal fundamentals be time-variant, allowing us to trace how they drove spreads after the event. Yet, to identify whether the SL event brought about spreads in the first place through a reassessment of these variables, we keep them fixed here at the time of the event. We perform a regression for each macro-fiscal fundamental separately. The remaining fundamental variables are collected in the matrix X_{ct}^{-F}, respectively.

Discussion. A potential threat to our identifying assumption is that countries in the sample might outgrow the periphery status over time and become part of the core. In particular, the synchronicity of business cycles could be endogenous to union membership, corresponding to the central promise of European integration: that the euro will bring countries closer together economically. The empirical evidence, however, suggests that business cycle dissimilarities have widened. While synchronization was observed in the 1990s, divergence remained substantial until and during the Great Recession (De Grauwe & Mongelli 2005, De Haan et al. 2008). Hence, we may plausibly assume that the countries that formed part of the core or the periphery, respectively, before the Eurozone was built, have persisted as such since then.

Another challenge is to ensure that our set of explanatory variables is indeed exogeneous to sovereign spreads. We argue that this is likely to be the case. First, as one can learn from section 3, the process that led to the conditional treatment of sovereign bonds as ECB collateral was neither foreseeable nor driven by sovereign spreads – as they were simply equal or close to zero. Second, there is not much concern with respect to macro-fiscal fundamentals or liquidity either. Albeit high spreads should exert influence on debt levels, growth, etc. in the future, this should not occur in the same period.

4.2 Data and variables[7]

As mentioned above, the data needed to construct the treatment variable, composed of the *core-periphery exposure measure* as well as a *time dummy* for the SL event, is taken from Bayoumi & Eichengreen (1992b) and Funke (1997). Moreover, as the outcome variable, we use *sovereign spreads*, computed as the difference between the yields of government bonds with a ten-year maturity of the sample countries and Germany. Our approach is common in the literature presented in section 2. Monthly yield data is provided by Eurostat.

Aside from that, we include a variety of controls. Information on *sovereign credit ratings* is available from S&P Global Ratings, Moody's, and Fitch. Controls further encompass macro-fiscal fundamentals, which we choose in line with the literature.

Three fiscal variables are covered by the estimation. First, the *debt-to-GDP ratio*, extracted from Eurostat, acts as a measure of a country's debt level. The relationship is supposably non-linear, so we add the squared debt-to-GDP ratio to the regression, reflecting the fact that investors' sensitivity to potential default should increase when a government starts to accumulate more debt. Second, the relative stock of debt is accompanied by the *budget balance* (as a percentage of GDP), which is in turn a flow variable. Both budget balances and GDP data are retrieved from the International Monetary Fund's (IMF) International Financial Statistics (IFS). Third, we add the less frequently used *primary budget balance*, calculated as the budget balance bar interest payments relative to GDP and taken from the IMF's Government Finance Statistics (GFS). The measure is directly controlled by governments and not affected by changing interest rates, so it conveys more profound information on actual fiscal policy than the budget balance itself.

Three further fundamental variables capture the broader macroeconomic environment. First, we include *economic growth* as an indicator of how well the government is able to raise tax revenue. Data comes from the Organization of Economic Cooperation and Development's (OECD) Quarterly National Accounts (QNA). Second, we take a country's position in the global economy into account, approximated by the *current account balance* relative to GDP. Data stems from the OECD's Main Economic Indicators (MEI). Current account surpluses and deficits affect sovereign default risk because they represent an economy's net foreign wealth or indebtedness, respectively. Third, international trade considerations are measured by the real *effective exchange rate*. We use the index of real effective exchange rates provided by the IFS. It is informative on a country's competitiveness in the sense that an appreciation (depreciation) could induce future current account deficits (surpluses) and consequent debt problems.

Apart from macro-fiscal fundamentals, we further control for *liquidity* in our model, since higher liquidity should correlate with lower spreads. As elaborated in section 2, there is a wide range of potential variables, reaching from turnover volumes and bid-ask spreads to market size. Bearing in mind what the literature has revealed about significance and endogeneity of these measures, we follow Attinasi et al. (2009) in approximating liquidity risk by market size. Specifically, we use gross government debt issuance as a share of total Euro Area issuances. Information on debt issuances is offered by the ECB's Statistical Data Warehouse (SDW).

Lastly, international risk aversion proves to be a determinant of sovereign spreads. A natural figure for risk aversion would be the spread between top-rated US corporate bond yields and US treasury yields. However, since the measure varies only over time, it is implicitly integrated through time fixed effects.

7 A detailed overview of all variables and their sources is provided in the appendix.

Summary statistics by group

	Periphery		Core		
	Mean	SD	Mean	SD	t-stat
Spread	0.057	0.026	0.043	0.027	−0.943
Debt	62.392	0.431	72.663	1.155	20.409
Budget	−2.834	0.810	−4.009	3.456	−0.811
PBudget	2.114	0.064	1.003	0.029	−38.648
Growth	2.782	0.155	2.103	0.246	−5.725
CA	−4.755	0.204	3.145	0.086	87.437
REER	102.233	0.860	103.987	0.954	3.344
$\Delta\ Spread_{t,t+1}^{2005M1-2005M6}$	0.000	0.031	0.001	0.029	0.048
$\Delta\ Debt_{t,t+1}^{2005M1-2005M6}$	0.246	0.078	0.688	0.443	2.407
$\Delta\ Budget_{t,t+1}^{2005M1-2005M6}$	−0.114	1.165	−0.021	4.029	0.055
$\Delta\ PBudget_{t,t+1}^{2005M1-2005M6}$	0.047	0.178	0.046	0.141	−0.003
$\Delta\ Growth_{t,t+1}^{2005M1-2005M6}$	0.093	0.078	−0.148	0.149	−3.507
$\Delta\ CA_{t,t+1}^{2005M1-2005M6}$	−0.101	0.211	−0.049	0.075	0.573
$\Delta\ REER_{t,t+1}^{2005M1-2005M6}$	−0.529	0.542	−0.517	0.586	0.038

Note: This table compares periphery and core countries with regard to spreads and a range of macro-fiscal fundamentals over the period 2005M1–2005M6, when the Single List was announced. The lower part reports the month-on-month changes of spreads and some macro-fiscal fundamentals.

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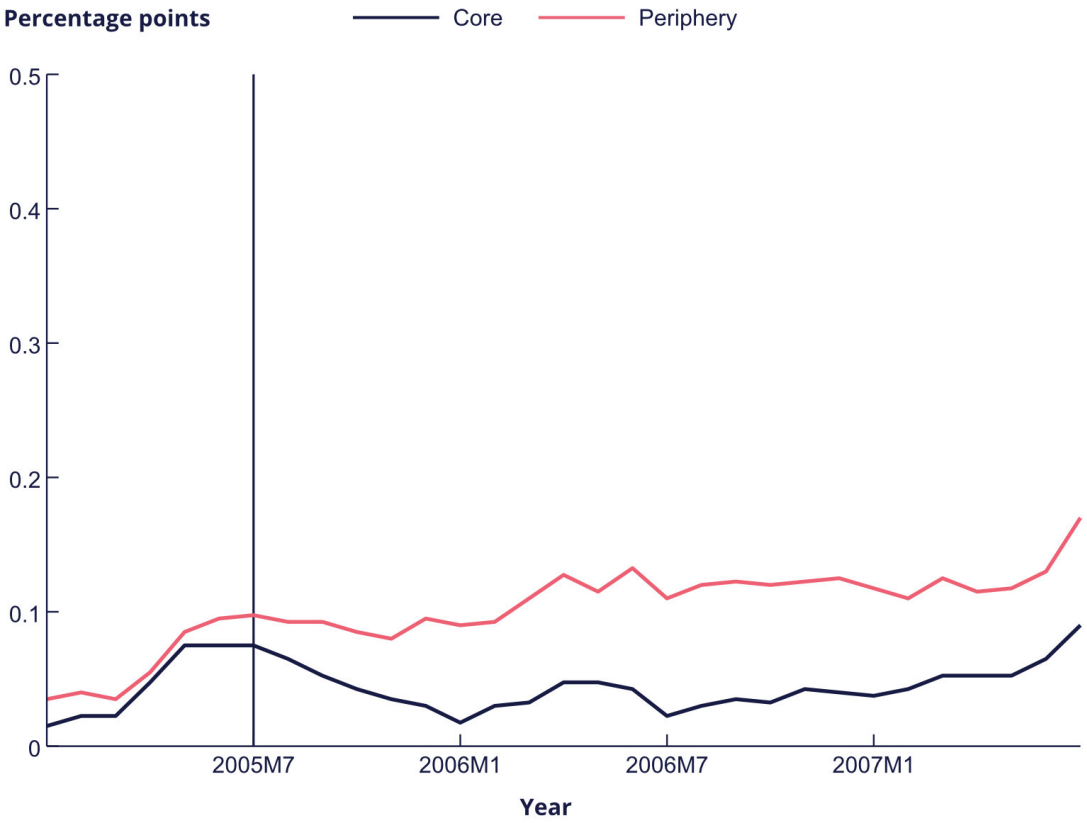
Table 1

We use data at the monthly level. Since macro-fiscal fundamentals are mostly published once in a quarter, linear interpolation is required. Admittedly, this comes at the cost of reducing standard errors, but it allows for more variation in the dependent variable. Moreover, the interpolation is applied to highly persistent stock variables only, keeping the threat to valid statistical inference moderate (Dell'Ariccia et al. 2006, Hauner et al. 2010, Beirne & Fratzscher 2013). In addition, we assume flow variables that are only available quarterly, such as the budget balance, to be constant for the three months of a quarter.

The final sample consists of all Euro Area countries that were founding members and for which shock correlation coefficients are reported in Bayoumi & Eichengreen (1992b) or Funke (1997). To be precise, we include as core countries Austria, Belgium, France, and the Netherlands, while Ireland, Italy, Portugal, and Spain serve as periphery countries. Germany is excluded to act as reference country, and Greece faces endogeneity issues in our robustness checks, as we will see in the next section. We further omit the two smallest core Eurozone countries, Finland and Luxembourg, so as to keep the two groups of equal size.

5. Results

Sovereign spreads in the core and periphery Euro Area



Note: This figure shows the evolution of average sovereign spreads on ten-year maturity government bond yields in core and periphery Euro Area countries, respectively, relative to Germany over the period 2005M1–2007M7 in percentage points. The vertical line at 2005M7 indicates the announcement of the SL event.

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Figure 2

The empirical analysis is conducted in three steps, following the hypotheses outlined above. First, we document that the SL event contributed significantly to the rise of sovereign spreads in the Eurozone. Second, we gauge the channels through which the SL event induced the surge of spreads, concluding that it worked primarily through a periphery premium instead of fundamental differences in macro-fiscal information. Third, we validate previous studies' findings regarding the role of macro-fiscal fundamentals. Finally, we provide a series of robustness checks.

Before the results are presented, we show evidence that core and periphery Euro Area countries are suitable comparison groups. Table 1 reports summary statistics of the key variables in our model before the Single List was created for periphery and core countries separately.

The figures in the upper part of table 1 reveal that the two groups both experienced spreads close to zero, but clearly differed in terms of macro-fiscal fundamentals. Notably, fundamentals tended to be more beneficial in peripheral Eurozone member countries. They had, on average, lower debt levels, smaller budget deficits, larger primary surpluses, higher growth rates, and better terms of trade given a lower real effective exchange rate.

The fact that the periphery exhibits more favorable average macro-fiscal fundamentals reassures our approach of distinguishing countries by business cycle synchronicity. It would be cast into doubt if the periphery status, in contrast, correlated with worse fundamental data. Since this is not the case, we may plausibly argue that, if the SL event raised sovereign spreads in the periphery, the effect should not be driven by fundamental data.

Moreover, key variables in the periphery and the core, albeit differing in absolute terms, evolved similarly *prior* to the event. In the lower panel of table 1, we report trends in spreads and economic fundamentals until June 2005.[8] The co-movement of these variables is evident, most importantly in the case of sovereign spreads. Figure 2, depicting average spreads in the two groups before the financial crisis, supports this pattern. All in all, these findings assure the appropriateness of our approach.

5.1 The effect of conditional eligibility

First, we establish that the Eurosystem's decision to make collateral eligibility conditional as part of the Single List contributed to the emergence of sovereign bond yield spreads. The main coefficient of interest is β in equations (1) and (2).

Table 2 shows the results of estimating equations (1) and (2), where columns (1) and (2) refer to the binary treatment variable, and columns (3) and (4) refer to the continuous treatment variable. In each specification, periphery countries experience higher spreads in response to the Single List. The effect is statistically significant, irrespective of whether the binary or the continuous treatment variable is used.

It is furthermore economically important. Keeping all else fixed, spreads in the periphery increased by up to 20 basis points relative to the core after the event.[9] The coefficients of the control variables furthermore indicate that, in the aftermath, countries with favorable economic fundamentals benefited from lower spreads.

The latter may dampen the widening of yield differences in the periphery, but it does not offset their sizable response. Given that they amounted to five basis points on average prior to the event, our estimates in their entirety imply a doubling of sovereign spreads in periphery countries as a consequence of conditional eligibility.

Notably, yield spreads are unresponsive to whether governments do or do not have a prime rating (AAA). We will be more precise on control variables in general – and macro-fiscal fundamentals in particular – below.

The coefficients presented thus far are average estimates over the entire sample period. In addition, we study the effect of conditional eligibility in more detail by allowing for time-variant

8 *t*-statistics below two in absolute terms indicate that different trends can be ruled out with a probability of at least 95%.

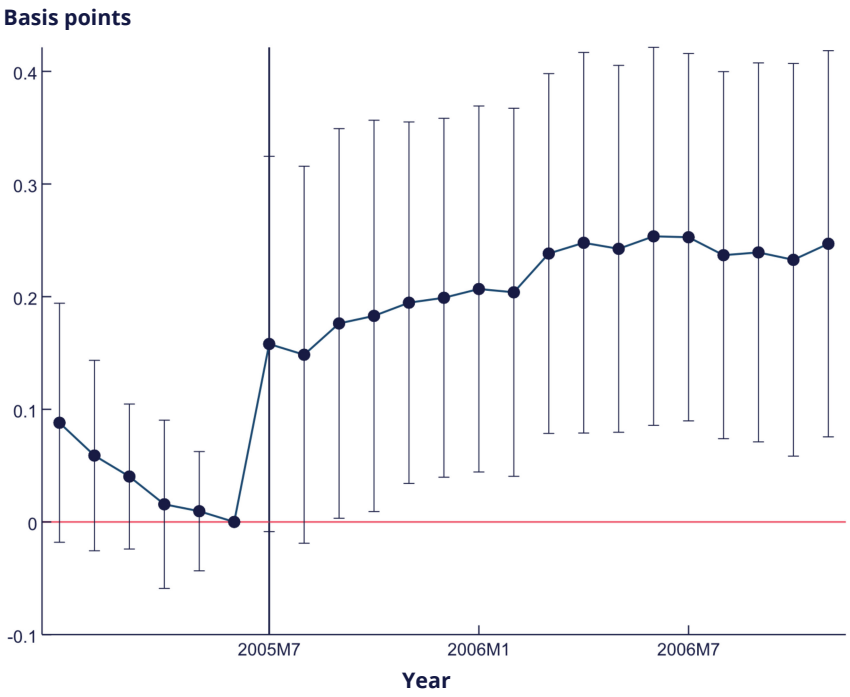
9 The coefficients turn out to be larger if controls are interacted with the time dummy. This is because, after the event, the total estimated effect of our set of controls has a decreasing effect on spreads, which in columns (1) and (3) is all captured by the first coefficient. However, in columns (2) and (4), the latter isolates the treatment effect on periphery relative to core countries. Since the Single List indicator is further correlated with the interacted controls, its standard errors increase as well if the latter are added to the model.

Sovereign spreads and the Single List

	Spread			
	(1)	(2)	(3)	(4)
SL^{2005M7} × *Periphery*	0.0304*	0.1994***		
	(0.0157)	(0.0489)		
SL^{2005M7} × *Correlation*			−0.0913**	−0.5388***
			(0.0435)	(0.1518)
Debt	0.0042	−0.0080	0.0038	−0.0097
	(0.0049)	(0.0084)	(0.0049)	(0.0089)
$Debt^2$	0.0000	0.0001**	0.0000	0.0001**
	(0.0000)	(0.0001)	(0.0000)	(0.0001)
Budget	0.0019***	0.0033***	0.0019***	0.0032***
	(0.0007)	(0.0005)	(0.0006)	(0.0005)
PBudget	−0.0056	−0.0158	−0.0058	−0.0444**
	(0.0047)	(0.0189)	(0.0047)	(0.0203)
Growth	0.0061	0.0099	0.0057	0.0089
	(0.0089)	(0.0135)	(0.0089)	(0.0140)
CA	−0.0058*	−0.0125***	−0.0055*	−0.0103**
	(0.0034)	(0.0044)	(0.0033)	(0.0046)
REER	−0.0110	0.0303**	−0.0097	0.0269**
	(0.0067)	(0.0120)	(0.0062)	(0.0125)
Liquidity	0.0007	0.0007	0.0007	0.0007
	(0.0008)	(0.0006)	(0.0008)	(0.0006)
SL^{2005M7} × *AAA*		−0.0955		−0.0328
		(0.0742)		(0.0672)
SL^{2005M7} × *Debt*		0.0192**		0.0209**
		(0.0083)		(0.0091)
SL^{2005M7} × $Debt^2$		−0.0001**		−0.0001**
		(0.0001)		(0.0001)
SL^{2005M7} × *Budget*		−0.0042***		−0.0040***
		(0.0009)		(0.0009)
SL^{2005M7} × *PBudget*		0.0017		0.0305
		(0.0178)		(0.0187)
SL^{2005M7} × *Growth*		−0.0520***		−0.0498***
		(0.0151)		(0.0153)
SL^{2005M7} × *CA*		0.0188***		0.0161***
		(0.0048)		(0.0050)
SL^{2005M7} × *REER*		−0.0169		−0.0142
		(0.0118)		(0.0124)
Time FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Adj. R^2	0.915	0.953	0.915	0.953
Observations	144	144	144	144

Note: This table reports estimates of the effect of the SL event on sovereign spreads in periphery countries relative to core countries over the period 2005M1–2006M12. The corresponding regression equations are (1) and (2). The outcome variable is the country-level sovereign spread of a ten-year maturity government bond relative to Germany. The treatment variable is the interaction of a time dummy, that equals one as of the announcement of the Single List in 2005M7, and either a binary periphery dummy or a continuous shock correlation variable. Further controls are added, independently in columns (1) and (3), and interacted with the time dummy in columns (2) and (4). Columns (1) and (2) report coefficients for the binary treatment variable, while columns (3) and (4) report coefficients for the continuous treatment variable. All regressions include time and country fixed effects. Standard errors in parentheses are robust to heteroscedasticity and autocorrelation. Stars indicate the 10%, 5%, and 1% significance level, respectively.

Coefficient estimates around the SL event



Note: This figure shows regression coefficients and confidence intervals for the difference in sovereign spreads between periphery and core Euro Area countries in each month. The coefficient is normalized to zero in 2005M6, i.e. the month before the SL event. Vertical lines indicate 99% confidence intervals based on standard errors robust to heteroscedasticity and autocorrelation. The vertical line at 2005M7 indicates the announcement time of the SL event.

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Figure 3

coefficients for each month separately. This is helpful to understand the dynamics of the effect, and to test the assumption of common trends prior to the event. To that end, we estimate the following two modifications of our baseline model:

$$Spread_{ct} = \alpha_c + \alpha_t + \sum_{j=-J}^{J} \beta_j \times Periphery_c \times SL_{t+j}^{2005M7} + \gamma^0 \times X_{ct} \; \gamma^1 \times X_{ct} \times SL_t^{2005M7} + \varepsilon_{ct} \quad (5)$$

$$Spread_{ct} = \alpha_c + \alpha_t + \sum_{j=-J}^{J} \beta_j \times Correlation_c \times SL_{t+j}^{2005M7} + \gamma^0 \times X_{ct} \; \gamma^1 \times X_{ct} \times SL_t^{2005M7} + \varepsilon_{ct}. \quad (6)$$

Figure 3 shows the regression results for equation (5). Since the estimates for months before the SL event are all small and insignificant, we find support for the assumption that pre-treatment spreads of core and periphery countries evolved homogeneously. Moreover, after the event, there is a sharp upward trend of spreads in the peripheral Euro Area compared to the core. Coefficients become significant and keep rising until 2006M4, remaining at this level afterwards. They are sizeable, amounting to roughly 20 basis points, in line with the average effect.

In summary, our evidence suggests that the adoption of conditional collateral eligibility standards in the Single List explains a substantial fraction of the subsequent rise in sovereign bond yield spreads in the Eurozone, confirming our first hypothesis. We now turn to the channels through which the shift in collateral policies took effect.

5.2 The periphery premium

We proceed by estimating equations (3) and (4). This specification distinguishes the fundamental channel from the periphery channel, allowing us to directly identify which channel dominates in the transmission of the SL event on sovereign spreads.

β^P yields an estimate of an effect that we refer to as the *periphery premium*. It captures the variation in spreads in response to the event that can be explained by differences in the business cycles of a country and the remaining Eurozone. It reflects the fact that being different from the core is economically disadvantageous under a common monetary policy. However, β^P has no reference to the underlying economic differences which we control for explicitly through macro-fiscal controls.

In contrast, β^F may be interpreted as the fundamental channel. If it is significant, the estimate tells us that spreads emerged because investors responded to the SL event by demanding higher yields from countries with an unfavorable position in fundamental F_c at the time of treatment. We perform several estimations with F_c being either the credit rating indicator *AAA* or one of the macro-fiscal fundamental variables. Our results are compiled in table 3 and table 4 for both the binary and the continuous exposure measure, respectively.

Both tables present the same result. The periphery premium is highly significant under most specifications while fundamental channels and credit ratings are, if at all, of minor importance.

If we use the binary exposure variable (see table 3), the periphery premium is significant compared to all fundamental channels but for debt and the budget balance, which are, in turn, insignificant as well. The premium amounts to approximately 17 to 20 basis points, resembling the estimates of the effect of conditional eligibility reported in the previous section. These numbers imply a doubling of sovereign spreads for periphery countries in response to the SL event.

Employing the continuous exposure measure, the results are similar. Periphery member states experienced significantly increasing yield spreads, while most of macro-fiscal fundamental data did not contribute to this increase. The periphery premium is insignificant only if combined with the fundamental channels through debt and the current account balance, both being insignificant themselves.

Among fundamental channels, it turns out that only higher primary budget surpluses and lower real effective exchange rates led to increases of sovereign spreads in response to the Single List. In quantitative terms, if we increase the primary budget balance by one standard deviation, this results in an increase of spreads by eight basis points. An equal variation of the real effective exchange rate yields a decrease of spreads by 24 basis points. These effects are, thus, lower than or of a similar magnitude to the periphery premium. However, they are not robust to the choice of exposure variables, given their insignificance if the binary measure is used.

Overall, the empirical evidence rejects our second hypothesis that the SL event affected sovereign spreads through macro-fiscal fundamentals. Conditional collateral eligibility did not induce bond yield spreads to emerge in countries with less beneficial economic conditions, but in those whose business cycles are less aligned with the Eurozone. We conclude that the periphery premium clearly dominates fundamental channels.

Channels of the effect of conditional eligibility (binary)

	Spread						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
SL^{2005M7} × *Periphery*	0.1994***	0.0341	0.2255	0.1745***	0.1825***	0.1703**	0.1759***
	(0.0489)	(0.0660)	(0.1512)	(0.0464)	(0.0507)	(0.0855)	(0.0560)
SL^{2005M7} × AAA^{2005M6}	−0.0955						
	(0.0742)						
SL^{2005M7} × $Debt^{2005M6}$		0.0008					
		(0.0009)					
SL^{2005M7} × $Budget^{2005M6}$			−0.0037				
			(0.0175)				
SL^{2005M7} × $PBudget^{2005M6}$				0.0024			
				(0.0170)			
SL^{2005M7} × $Growth^{2005M6}$					−0.0145		
					(0.0335)		
SL^{2005M7} × CA^{2005M6}						0.0157	
						(0.0100)	
SL^{2005M7} × $REER^{2005M6}$							−0.0377
							(0.0246)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Interacted Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.953	0.936	0.944	0.950	0.944	0.951	0.951
Observations	144	144	144	144	144	144	144

Note: This table reports estimates of the effects of the SL event on sovereign spreads in periphery countries relative to core countries and in comparison to countries with different levels of macro-fiscal fundamentals, respectively, over the period 2005M1–2006M12. The corresponding regression equation is (3). The outcome variable is the country-level sovereign spread of a ten-year maturity government bond relative to Germany. Treatment variables are interactions of a time dummy, that equals 1 as of the announcement of the Single List in 2005M7, and the binary periphery dummy as well as, by column, the level of one macro-fiscal fundamental in the month prior to the SL event. Further controls are added, both independently and interacted with the time dummy. All regressions include time and country fixed effects. Standard errors in parentheses are robust to heteroscedasticity and autocorrelation. Stars indicate the 10%, 5%, and 1% significance level, respectively.

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Table 3

5.3 The conditional effect of macro-fiscal fundamentals

In our analysis, macro-fiscal fundamentals are added as controls or to distinguish fundamental channels from the periphery premium. Now, we briefly describe our estimates of their effects, validating the results from previous studies and shedding light on the question of what explains the extent and the evolution of sovereign spreads in the aftermath of the event, as stated in hypothesis (3). Coefficients are reported in table 2.

While the coefficients in columns (1) and (3) ascribe limited importance to these variables, those in columns (2) and (4) provide evidence for a *conditional* effect of macro-fiscal fundamentals – in the sense that they gained relevance only through the event – or their impact changed.

This pattern is particularly pronounced in the case of debt and economic growth. Whereas spreads were unresponsive to these fundamental variables prior to the SL event, they have been responsive indeed afterwards. Our estimates imply that a one standard deviation increase in the debt-to-GDP ratio results in 50 basis points increase in spreads. Correspondingly, an increase of the growth rate by one standard deviation reduces spreads by eight basis points. These figures are sizable, reflecting that markets started to punish excessive debt positions and low economic growth since the Single List.

Channels of the effect of conditional eligibility (continuous)

	Spread						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
SL^{2005M7} × *Correlation*	−0.5388***	0.0719	−0.8340***	−0.5381***	−0.5083***	−0.3825	−0.5426***
	(0.1518)	(0.1656)	(0.2940)	(0.1358)	(0.1100)	(0.2621)	(0.1386)
SL^{2005M7} × AAA^{2005M6}	−0.0328						
	(0.0672)						
SL^{2005M7} × $Debt^{2005M6}$		−0.0004					
		(0.0005)					
SL^{2005M7} × $Budget^{2005M6}$			0.0042				
			(0.0043)				
SL^{2005M7} × $PBudget^{2005M6}$				0.0307**			
				(0.0148)			
SL^{2005M7} × $Growth^{2005M6}$					−0.0069		
					(0.0338)		
SL^{2005M7} × CA^{2005M6}						0.0097	
						(0.0082)	
SL^{2005M7} × $REER^{2005M6}$							−0.0335*
							(0.0178)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Interacted Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.953	0.933	0.944	0.950	0.945	0.951	0.951
Observations	144	144	144	144	144	144	144

Note: This table reports estimates of the effects of the SL event on sovereign spreads in periphery countries relative to core countries and in comparison to countries with different levels of macro-fiscal fundamentals, respectively, over the period 2005M1–2006M12. The corresponding regression equation is (4). The outcome variable is the country-level sovereign spread of a ten-year maturity government bond relative to Germany. Treatment variables are interactions of a time dummy that equals 1 as of the announcement of the Single List in 2005M7, and the continuous shock correlation variable as well as, by column, the level of one macro-fiscal fundamental in the month prior to the SL event. Further controls are added, both independently and interacted with the time dummy. All regressions include time and country fixed effects. Standard errors in parentheses are robust to heteroscedasticity and autocorrelation. Stars indicate the 10%, 5%, and 1% significance level, respectively.

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Table 4

Moreover, a country's position in international trade proves to influence sovereign yield differences. Specifically, the current account balance has a significant effect, albeit its direction changed in response to the event. Increasing the current account balance by one standard deviation reduced spreads by eight basis points before the event, but raised them by four basis points in the aftermath. While the former replicates previous findings from the literature, the latter suggests that markets reassessed governments' integration in global markets and potential dependencies from a strong reliance on external demand.

In contrast to the former, the real effective exchange rate turns out to have a steady effect on sovereign spreads that has not changed through the SL event. The effect is economically significant, amounting to an increase of spreads by approximately 21 basis points in response to a one standard deviation increase of the exchange rate. Arguably, the estimate mirrors the special role of competitiveness in a monetary union. When giving up control over its currency, a country waives the capacity to devaluate or revaluate as stabilizing measures to maintain competitiveness. It is hence plausible that markets generally perceive the lack of currency control as an important factor of sovereign risk. This aspect has already been stressed in Maltritz (2012).

With regard to the fiscal stance, we find that the primary budget balance is largely uninformative for explaining spread movements. Moreover, the budget balance has quantitatively negligible explanatory power, given that its effect is limited to one basis point for a one standard deviation increase of the budget balance.

In conclusion, our results provide supportive evidence for the findings in earlier studies. Macro-fiscal fundamentals, even if not in their entirety, prove to explain substantial fractions of spread movements in the aftermath of the SL event. Since the literature has produced similar results for subsequent crisis and post-crisis periods (Bernoth & Erdogan 2012, Afonso et al. 2015a, b), our findings suggest that the adoption of conditional eligibility in 2005 constituted a permanent and significant link between sovereign bond spreads and macro-fiscal fundamentals, which is why we dub their effect *conditional*.

5.4 Robustness

To complete our analysis, we conduct several robustness tests, showing that our results do not change if we modify the empirical setup.

First, we check how sensitively our estimates respond to a variation of credit ratings. In the previous analysis, the binary indicator *AAA* was included as a control variable, equal to one if a government held a prime rating, and to zero otherwise. In table 9, we repeat the regressions based on the equations (1) and (2), replacing the prime rating indicator by the continuous variable *Rating*. The latter exhibits slightly more variation than its binary counterpart, however, given no sample country was given a rating lower than the high medium grade (AA), this is only true to a limited extent. Accordingly, we find no major changes of the coefficients from table 2, neither with respect to statistical nor economic significance. Importantly, the rating variable remains insignificant, reassuring the robustness of the effect of conditional eligibility on periphery countries' sovereign spreads.

Second, we test to what extent our estimates depend on the choice of the sample period, which has thus far been set to 2005M1–2006M12. To this end, we perform the regressions based on equations (1) to (4) for two longer time horizons, starting in 2004M7 and extending the period to 2007M7 and 2008M8, respectively. These dates correspond to the months before the first signs of financial crisis appeared (which was in August 2007, as commonly agreed), and before the crisis reached its peak with the failure of Lehman Brothers in September 2008. The results are reported in tables 10 to 15 in the appendix. Apart from some differences in the coefficients of control variables, the estimates of the effect of conditional eligibility and its channels are similar to those reported in the main text.

Third, we validate the effect of conditional eligibility through a placebo test. We test whether the effect is truly a result of the decision to make collateral eligibility conditional. The effect we measure could alternatively emanate from previous changes in actual credit ratings, thus reflecting usual market responses to rating publications rather than an institutional change questioning the unconditional eligibility of sovereign bonds as central bank collateral.

Specifically, we modify the estimation of equations (1) and (2) by adding a placebo treatment indicator for November 2004. This was when Greek government bonds were set from A+ to A by S&P Global Ratings, approaching the later minimum requirement of A–.[10] Including the placebo indicator further requires an earlier regression period (2004M1–2005M12).

10 To circumvent endogeneity issues, Greece is excluded from the sample. Assuming that downgrades have a signaling effect conveying information on the Eurozone as a whole, which has been argued to be plausible during the financial crisis, the Greek downgrade near the later threshold of A– might have induced investors to demand differentiated premia from other countries as well.

The results are compiled in columns (1) and (2) of table 5. They suggest that the effect of conditional eligibility is barely affected, shrinking slightly to 14 basis points but remaining significant, while sovereign spreads did not respond to the downgrade in November 2004. We may conclude that our estimates truly capture the effect of conditional eligibility, not the effect of actual rating downgrades before.

Fourth, we evaluate our results by testing immediate responses of spreads around the SL event. We estimate the following two equations using daily data:

$$Spread_{ct} = \alpha_t + \beta \times Periphery_c \times SL_t^{22jul2005} + \gamma \times X_{ct} + \varepsilon_{ct} \quad (7)$$

$$Spread_{ct} = \alpha_t + \beta \times Correlation_c \times SL_t^{22jul2005} + \gamma \times X_{ct} + \varepsilon_{ct}. \quad (8)$$

There are two major differences to the previous models. Since variation of macro-fiscal fundamentals is limited at the daily level within a narrow time frame around the event, we first drop interacted controls. Second, we omit country fixed effects, given that our control variables account for country specifics quite well. The estimation is performed for both a window of 14 days and a window of four months. Results are reported in columns (3) to (6) of table 5.

We do not find a significant response of sovereign spreads for periphery countries relative to core countries within seven days before and after the SL event. Hence, it appears there was no immediate market reaction to the new collateral rules. Yet, the earliest effect we document is after two months. Although being significant only if the binary exposure measure is employed, the estimate suggests that periphery countries experienced a relative increase of spreads of about one and a half basis points within two months after the event.

Placebo and robustness tests

	Spread					
	2004M1–2005M12		+/– 7 days		+/– 2 months	
	(1)	(2)	(3)	(4)	(5)	(6)
$SL^{22jul2005}$ × *Periphery*	0.1366**		0.0117		0.0135**	
	(0.0571)		(0.0132)		(0.0058)	
$SL^{22jul2005}$ × *Correlation*		–0.4311**		–0.0016		0.0114
		(0.1663)		(0.0237)		(0.0116)
$SL^{2004M11}$ × *Periphery*	0.0126					
	(0.0106)					
$SL^{2004M11}$ × *Correlation*		–0.0478				
		(0.0329)				
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	No	No	No	No
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Interacted Controls	Yes	Yes	No	No	No	No
Adj. R^2	0.883	0.884	0.805	0.803	0.767	0.765
Observations	144	144	88	88	712	712

Note: Columns (1) and (2) of this table report estimates of the effect of the SL event on sovereign spreads in periphery countries relative to core countries in two months over the period 2004M1–2005M12. The outcome variable is the country-level sovereign spread of a ten-year maturity government bond relative to Germany. Treatment variables are interactions of either of two time dummies, that equal one as of the announcement of the Single List in 2005M7, and the last time a euro country experienced a rating downgrade before the SL event in 2004M11, respectively, and either a binary periphery dummy or a continuous shock correlation variable. Further controls are added, both independently and interacted with the time dummies. Column (1) reports coefficients for the binary treatment variable, while column (2) reports coefficients for the continuous treatment variable. The regressions in columns (1) and (2) include time and country fixed effects. Columns (3) to (6) of this table report estimates of the effect of the SL event on sovereign spreads in periphery countries relative to core countries within 14 days and 4 months around the announcement date on 22 July 2005, respectively. The corresponding regression equations are (7) and (8). The outcome variable is the country-level sovereign spread of a ten-year maturity government bond relative to Germany. The treatment variable is the interaction of a time dummy, that equals one as of 22 July 2005, and either a binary periphery dummy or a continuous shock correlation variable. Further controls are added. Columns (3) and (5) report coefficients for the binary treatment variable, while columns (4) and (6) report coefficients for the continuous treatment variable. The regressions in columns (3) to (6) include time fixed effects. Standard errors in parentheses are robust to heteroskedasticity and autocorrelation. Stars indicate the 10%, 5%, and 1% significance level, respectively.

6. Final remarks

Since the euro was introduced, sovereign debt markets in the Euro Area have seen different phases of credit risk perception. While sovereign debt was first considered to be risk-free, spreads have arisen since the second half of the 2000s and persisted ever after. Albeit the literature has produced a rich set of results on the determinants of sovereign spreads during and after the financial crisis, a complete understanding of why they emerged in the first place is still missing.

In this paper, we provide evidence that sovereign spreads in the Eurozone emerged in the mid-2000s as a consequence of conditional collateral eligibility, which is a core component of the 2005 revision of the ECB's collateral framework, referred to as the Single List. The twist in collateral policies gave rise to yield differences in the form of periphery premia. Specifically, countries having business cycles significantly off the Euro Area average, the so-called periphery, saw higher spreads in response to the event compared to core countries. This channel dominates the fundamental channel, linking higher spreads to unfavorable macroeconomic and fiscal fundamental data.

Our results add to the debate on how to develop the monetary union further. They challenge previous findings claiming that sovereign spreads are primarily reflective of fundamental macroeconomic and fiscal information. This notion underlies two constitutive EU legal principles: the no-bailout norm (art. 125 TFEU) and the no-monetary-state-financing norm (art. 123 TFEU). If unconditional financial support was allowed, this would disturb market signals emanating from sovereign spreads, which are supposed to incentivize prudent policies for an improvement of economic and fiscal fundamentals.

However, if sovereign spreads in the Eurozone owe their existence to an institutional change and business cycle dissimilarities among member states instead of macro-fiscal fundamentals, it may be questioned whether the former are suited to incentivize optimal economic policies. A clear proof of their effectiveness as constructive incentives would yet be necessary, taking into account that spreads come at substantial macroeconomic costs (Bahaj 2020).

Consequently, this paper stresses the importance of the Eurozone's institutional setup, motivating a political discussion of the future fiscal and monetary framework. Does one prefer fiscal disciplining through market pressure even if less costly low-spread equilibria could be sustained by institutional design? Or has fiscal surveillance through the SGP proven to be insufficient, which makes market-based disciplining indispensable? These questions are subject to ongoing discussions. This paper can thus add to the debate and fill the gap in understanding sovereign risk in the Euro Area.

Appendix

A Chronology of the creation of the Single List

Building on the chronology provided by van 't Klooster (2021), we briefly recall how fiscal considerations contributed to the creation of the Single List. It started with the 1988 Delors Committee report on the need for fiscal constraints in the evolving European monetary system. The report argued that, given high price volatility and their exposure to abrupt shocks to market expectations (Minsky 1986, Aliber & Kindleberger 2015), bond markets were not suitable as a disciplining instrument for national fiscal policies. Instead, constraints were to be implemented by means of fiscal rules, helping to attain the coordination required in a monetary union. These rules were first formulated in 1992 in the Maastricht Treaty and further developed in the 1997 SGP. Since then, member states are bound by quantitative criteria for debt and annual deficits as well as bans on monetary financing through the ECB or inter-state bailouts.

Nonetheless, sovereign debt continued as an important financial instrument for monetary policy. Given its crucial role for the functioning of financial markets, it was used as collateral that private institutions pledged in exchange for central bank money. How it should be treated in this context was subject to a debate within the Eurosystem in the late 1990s. On one side, proponents advocated the adoption of private credit ratings, while, on the other side, a group of national central banks led by the German Bundesbank were skeptical about giving power to private institutions. They suggested using the SGP and its strict enforcement to ensure that sovereign borrowers were suffciently creditworthy. In April 1997, the two sides agreed upon a compromise: there should be a minimum rating requirement for government bonds, but it remained effectively unused as it was kept secret.

The agreement was called into question after the SGP was blurred by Germany and France in the early 2000s. The call for tighter fiscal constraints, including a greater role for disciplining through the market, was considerable (Buiter & Sibert 2005, Fells 2005). In July 2005, the ECB finally abandoned the position proposed by the Delors report and published the decision to make sovereign bond haircuts conditional on credit agency ratings. The minimum rating requirement, set at a level of A– on a conventional scale, was specified in November that year.

B Additional figures and tables

B.1 Data and variables

Variables

Variable name	Description	Frequency	Source
Spread	Spread between yields on government bonds with a ten-year maturity of euro area countries and Germany	Monthly	Eurostat
Periphery	Binary periphery indicator equal to 0 if a country forms part of the core euro area and to 1 if a country forms part of the periphery euro area		Assignment to core and periphery following Bayoumi & Eichengreen (1992a, b)
Correlation	Correlation of supply shocks between euro area countries and Germany		(Bayoumi & Eichengreen, 1992b), Funke (1997) (only Austria)
SL^{YYYYMM}	Binary Single List time dummy equal to 0 for periods prior to YYYYMM and to 1 for periods thereafter		
AAA	Binary sovereign credit rating indicator equal to 0 if a country is rated below AAA and to 1 if a country is rated AAA		S&P Global Ratings, Moody's, Fitch
Rating	Numerical variable of sovereign credit ratings in the interval from 0 to 23 where each number corresponds to a rating on the S&P Global Ratings scale or Moody's and Fitch equivalents with 0 corresponding to default and 23 corresponding to an AAA rating		S&P Global Ratings, Moody's, Fitch
Debt	Stock of outstanding government debt divided by GDP	Quarterly	Eurostat
Budget	Budget balance divided by GDP	Quarterly	IMF International Financial Statistics
PBudget	Primary budget balance divided by GDP	Annual	IMF Government Finance Statistics
Growth	Annual growth rate of GDP	Quarterly	OECD Quarterly National Accounts
CA	Current account balance divided by GDP	Quarterly	OECD Main Economic Indicators
REER	Real effective exchange rate index based on consumer price index	Monthly	IMF International Financial Statistics
Liquidity	Gross government debt issuance divided by total euro area gross government debt issuance	Monthly	ECB Statistical Data Warehouse

Note: This table provides an overview of the variables included in the regressions.

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Table 6

Summary statistics

	Mean	SD	Min	Max	*N*
Spread	0.066	0.086	–0.250	0.340	192
Debt	66.737	25.716	23.600	110.900	192
Budget	–1.570	4.497	–17.978	8.804	192
PBudget	1.872	1.455	–0.567	4.710	168
Growth	2.800	1.476	0.365	6.806	192
CA	–1.312	5.603	–11.709	9.635	192
REER	102.214	1.682	98.467	106.575	192
Liquidity	10.958	10.536	0.000	35.517	168

Note: This table provides summary statistics of spreads, a range of macro-fiscal fundamentals, and liquidity over the sample period 2005M1–2006M12 used for the analysis in the main text.

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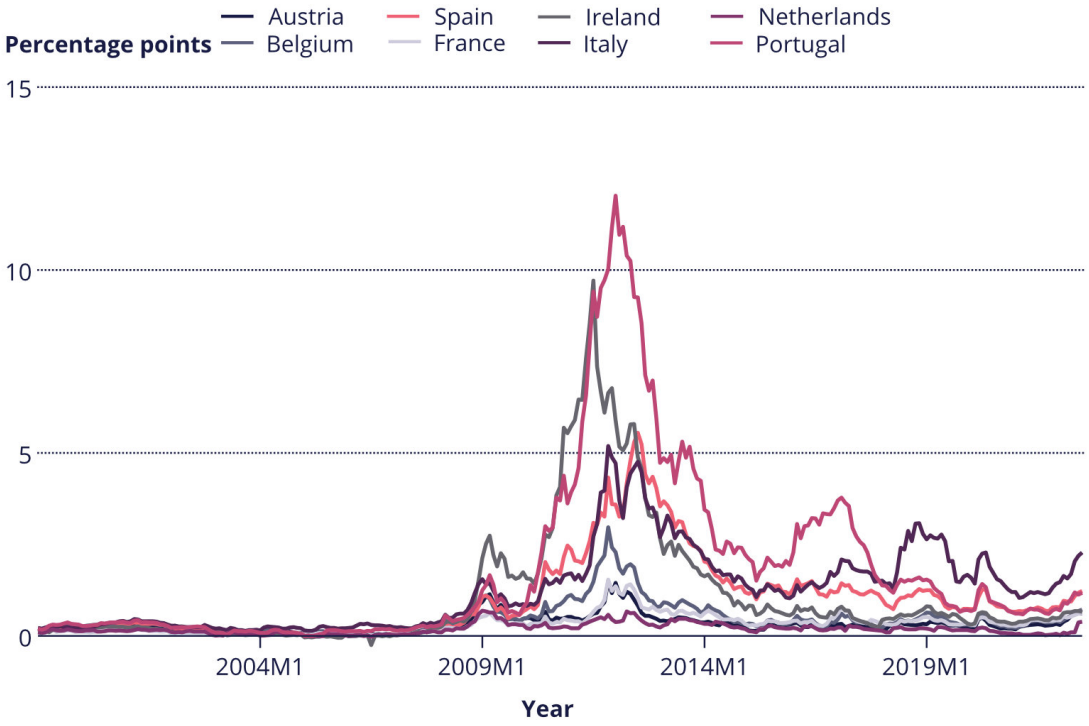
Table 7

Sovereign spreads in the Euro Area



Note: This figure shows the evolution of sovereign spreads on ten-year maturity government bond yields for eight Euro Area countries relative to Germany over the period 1999M1–2019M12 in percentage points.

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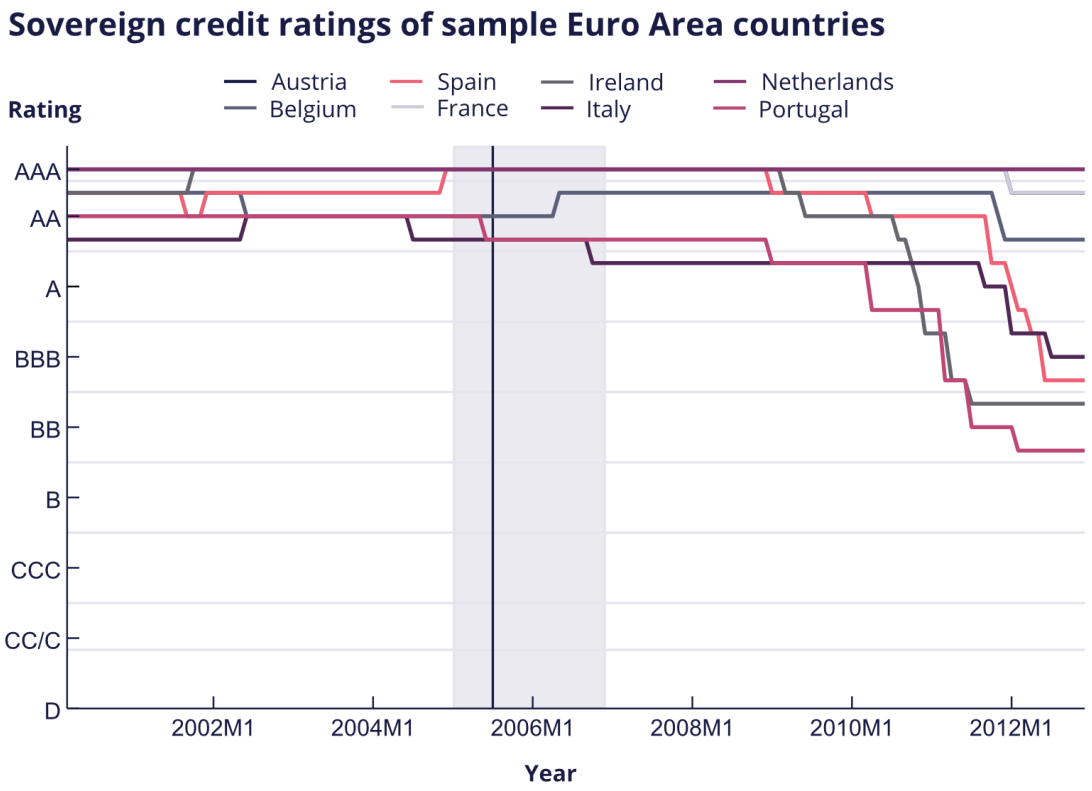
Figure 4

B.2 Sovereign credit ratings



Note: This figure shows the evolution of sovereign credit ratings of the Euro Area countries included in the sample used for the analysis in the main text over the period 2003M1–2012M12. The figure includes ratings assigned by S&P Global Ratings, Moody's or Fitch only, depicting the lowest rating assigned by one of these institutions at any point in time. The vertical line at 2005M7 indicates the announcement of the SL event. The shaded area indicates the sample period 2005M1–2006M12 used for the analysis in the main text. The horizontal lines demarcate grade ranges.

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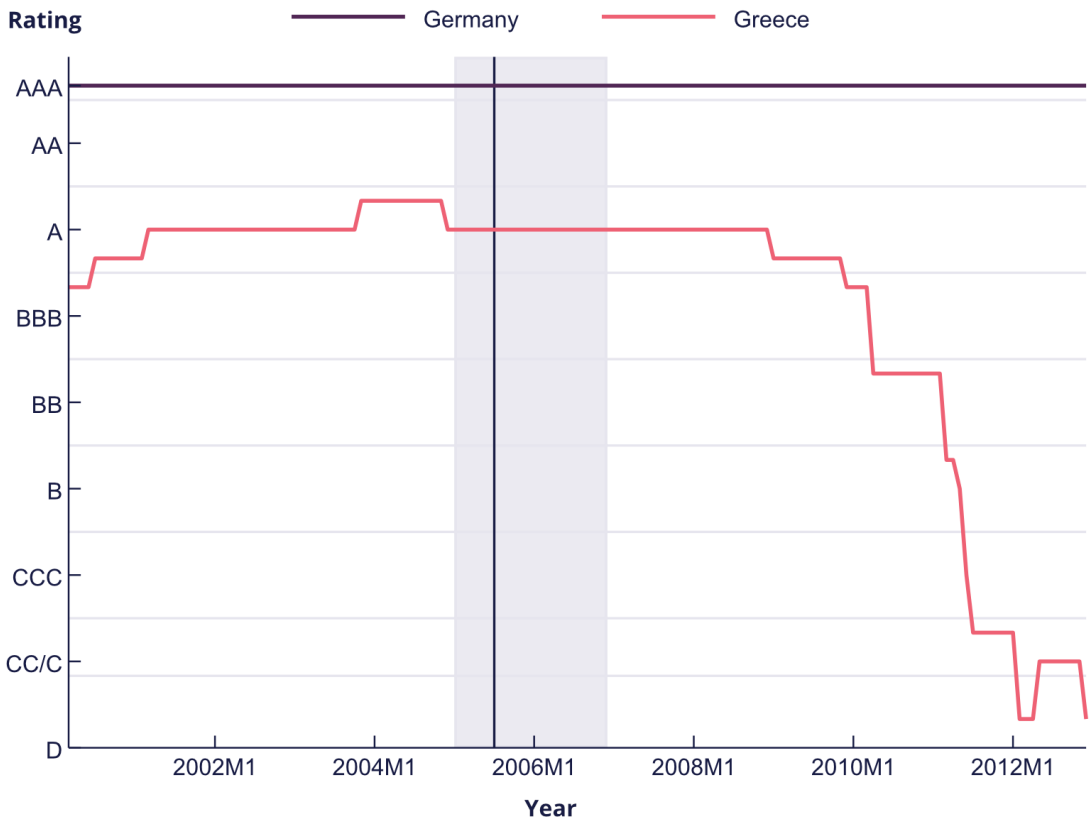
Figure 5

Sovereign credit ratings of Germany and Greece



Note: This figure shows the evolution of sovereign credit ratings of Germany and Greece over the period 2003M1–2012M12. The figure includes ratings assigned by S&P Global Ratings, Moody's or Fitch only, depicting the lowest rating assigned by one of these institutions at any point in time. The vertical line at 2005M7 indicates the announcement of the SL event. The shaded area indicates the sample period 2005M1–2006M12 used for the analysis in the main text. The horizontal lines demarcate grade ranges.

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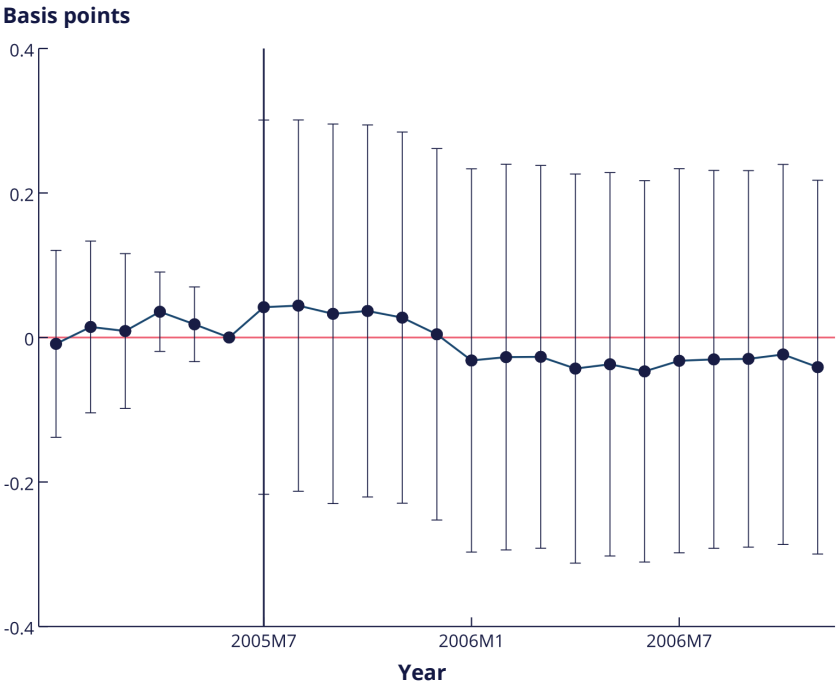
Figure 6

Sovereign spreads and the Single List (rating-based distinction)

	Spread			
	(1)	(2)	(3)	(4)
SL^{2005M7} × *AAA*	−0.0528***	0.0593		
	(0.0125)	(0.0652)		
SL^{2005M7} × *Rating*			−0.0179***	−0.0063
			(0.0041)	(0.0092)
Debt	−0.0012	0.0064	−0.0012	0.0009
	(0.0053)	(0.0078)	(0.0053)	(0.0065)
$Debt^2$	0.0001***	0.0000	0.0001**	0.0001
	(0.0000)	(0.0001)	(0.0000)	(0.0000)
Budget	0.0017***	0.0037***	0.0017***	0.0035***
	(0.0006)	(0.0005)	(0.0006)	(0.0005)
PBudget	−0.0071	−0.0350*	−0.0028	−0.0463***
	(0.0050)	(0.0209)	(0.0050)	(0.0166)
Growth	0.0105	0.0458***	0.0053	0.0495***
	(0.0081)	(0.0134)	(0.0082)	(0.0133)
CA	−0.0003	−0.0006	0.0005	0.0030
	(0.0038)	(0.0047)	(0.0037)	(0.0042)
REER	0.0014	0.0330**	−0.0003	0.0269**
	(0.0048)	(0.0143)	(0.0047)	(0.0123)
Liquidity	0.0005	0.0006	0.0009	0.0007
	(0.0007)	(0.0006)	(0.0007)	(0.0006)
SL^{2005M7} × *Debt*		0.0021		0.0082*
		(0.0069)		(0.0048)
SL^{2005M7} × $Debt^2$		−0.0000		−0.0001*
		(0.0001)		(0.0000)
SL^{2005M7} × *Budget*		−0.0043***		−0.0042***
		(0.0009)		(0.0009)
SL^{2005M7} × *PBudget*		0.0218		0.0326**
		(0.0196)		(0.0163)
SL^{2005M7} × *Growth*		−0.0833***		−0.0891***
		(0.0162)		(0.0154)
SL^{2005M7} × *CA*		0.0046		0.0015
		(0.0044)		(0.0031)
SL^{2005M7} × *REER*		−0.0223		−0.0155
		(0.0144)		(0.0123)
Time FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Adj. R^2	0.925	0.951	0.925	0.950
Observations	144	144	144	144

Note: This table reports estimates of the effect of the SL event on sovereignspreads in AAA-rated countries relative to below-AAA-rated countries over the period 2005M1–2006M12. The outcome variable is the country-level sovereign spread of a ten-year maturity government bond relative to Germany. The treatment variable is the interaction of a time dummy, that equals one as of the announcement of the Single List in 2005M7, and either a binary prime rating dummy or a continuous rating variable. Further controls are added, independently in columns (1) and (3), and interacted with the time dummy in columns (2) and (4). Columns (1) and (2) report coefficients for the binary treatment variable, while columns (3) and (4) report coefficients for the continuous treatment variable. All regressions include time and country fixed effects. Standard errors in parentheses are robust to heteroscedasticity and autocorrelation. Stars indicate the 10%, 5%, and 1% significance level, respectively.

Coefficient estimates around the SL event (rating-based distinction)



Note: This figure shows regression coefficients and confidence intervals for the difference in sovereign spreads between below-AAA-rated countries and AAA-rated countries in each month. The coefficient is normalized to zero in 2005M6, i.e. the month before the SL event. Vertical lines indicate 99% confidence intervals based on standard errors robust to heteroskedasticity and autocorrelation. The vertical line at 2005M7 indicates the announcement time of the SL event.

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Figure 7

B.3 Robustness

Sovereign spreads and the Single List (incl. continuous rating variable)

	Spread			
	(1)	(2)	(3)	(4)
SL^{2005M7} × *Periphery*	0.0304*	0.1671***		
	(0.0158)	(0.0400)		
SL^{2005M7} × *Correlation*			−0.0915**	−0.5183***
			(0.0438)	(0.1401)
Rating	−0.0018	0.0391	−0.0017	0.0143
	(0.0103)	(0.0387)	(0.0103)	(0.0391)
Debt	0.0042	−0.0089	0.0037	−0.0113
	(0.0050)	(0.0084)	(0.0049)	(0.0086)
$Debt^2$	0.0000	0.0001**	0.0000	0.0001**
	(0.0000)	(0.0001)	(0.0000)	(0.0001)
Budget	0.0019***	0.0032***	0.0019***	0.0031***
	(0.0007)	(0.0005)	(0.0007)	(0.0005)
PBudget	−0.0053	−0.0158	−0.0055	−0.0437**
	(0.0056)	(0.0193)	(0.0056)	(0.0177)
Growth	0.0059	0.0067	0.0055	0.0064
	(0.0090)	(0.0141)	(0.0090)	(0.0146)
CA	−0.0056	−0.0110**	−0.0053	−0.0093*
	(0.0035)	(0.0047)	(0.0034)	(0.0049)
REER	−0.0111	0.0322***	−0.0098	0.0272**
	(0.0068)	(0.0117)	(0.0062)	(0.0117)
Liquidity	0.0007	0.0009	0.0007	0.0009
	(0.0008)	(0.0006)	(0.0008)	(0.0006)
SL^{2005M7} × *Rating*		−0.0503		−0.0242
		(0.0384)		(0.0385)
SL^{2005M7} × *Debt*		0.0199**		0.0226***
		(0.0079)		(0.0083)
SL^{2005M7} × $Debt^2$		−0.0002**		−0.0002**
		(0.0001)		(0.0001)
SL^{2005M7} × *Budget*		−0.0039***		−0.0038***
		(0.0009)		(0.0009)
SL^{2005M7} × *PBudget*		0.0037		0.0315*
		(0.0183)		(0.0167)
SL^{2005M7} × *Growth*		−0.0522***		−0.0507***
		(0.0155)		(0.0157)
SL^{2005M7} × *CA*		0.0179***		0.0159***
		(0.0053)		(0.0054)
SL^{2005M7} × *REER*		−0.0195*		−0.0146
		(0.0112)		(0.0113)
Time FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Adj. R^2	0.914	0.953	0.914	0.953
Observations	144	144	144	144

Note: This table reports estimates of the effect of the SL event on sovereign spreads in AAA-rated countries relative to below-AAA-rated countries over the period 2005M1–2006M12. The outcome variable is the country-level sovereign spread of a ten-year maturity government bond relative to Germany. The treatment variable is the interaction of a time dummy, that equals one as of the announcement of the Single List in 2005M7, and either a binary prime rating dummy or a continuous rating variable. Further controls are added, independently in columns (1) and (3), and interacted with the time dummy in columns (2) and (4). Columns (1) and (2) report coefficients for the binary treatment variable, while columns (3) and (4) report coefficients for the continuous treatment variable. All regressions include time and country fixed effects. Standard errors in parentheses are robust to heteroskedasticity and autocorrelation. Stars indicate the 10%, 5%, and 1% significance level, respectively.

Sovereign spreads and the Single List (2004M7–2007M7)

	Spread			
	(1)	(2)	(3)	(4)
SL^{2005M7} × *Periphery*	0.0352***	0.1039**		
	(0.0104)	(0.0405)		
SL^{2005M7} × *Correlation*			−0.1094***	−0.3217**
			(0.0289)	(0.1303)
Debt	0.0057*	−0.0023	0.0052*	−0.0021
	(0.0030)	(0.0055)	(0.0030)	(0.0055)
$Debt^2$	0.0000	0.0001*	0.0000	0.0001*
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Budget	0.0010**	0.0033***	0.0010**	0.0033***
	(0.0005)	(0.0005)	(0.0005)	(0.0005)
PBudget	−0.0174***	−0.0244***	−0.0170***	−0.0235***
	(0.0025)	(0.0035)	(0.0024)	(0.0036)
Growth	0.0020	0.0162*	0.0021	0.0117
	(0.0046)	(0.0096)	(0.0045)	(0.0113)
CA	−0.0045**	−0.0078**	−0.0040*	−0.0097**
	(0.0021)	(0.0033)	(0.0021)	(0.0038)
REER	−0.0045	0.0125**	−0.0030	0.0180***
	(0.0035)	(0.0058)	(0.0032)	(0.0060)
Liquidity	0.0003	0.0001	0.0003	0.0002
	(0.0005)	(0.0005)	(0.0005)	(0.0005)
SL^{2005M7} × *AAA*		−0.1050**		−0.0614
		(0.0525)		(0.0464)
SL^{2005M7} × *Debt*		0.0115**		0.0101*
		(0.0057)		(0.0053)
SL^{2005M7} × $Debt^2$		−0.0001**		−0.0001*
		(0.0000)		(0.0000)
SL^{2005M7} × *Budget*		−0.0037***		−0.0036***
		(0.0008)		(0.0008)
SL^{2005M7} × *PBudget*		0.0073		0.0074
		(0.0047)		(0.0047)
SL^{2005M7} × *Growth*		−0.0274**		−0.0207*
		(0.0109)		(0.0123)
SL^{2005M7} × *CA*		0.0071**		0.0093**
		(0.0029)		(0.0037)
SL^{2005M7} × *REER*		0.0018		−0.0046
		(0.0063)		(0.0062)
TimeFE	Yes	Yes	Yes	Yes
CountryFE	Yes	Yes	Yes	Yes
Adj. R^2	0.912	0.935	0.914	0.935
Observations	144	144	144	144

Note: This table reports estimates of the effect of the SL event on sovereign spreads in periphery countries relative to core countries over the period 2004M7–2007M7. The corresponding regression equations are (1) and (2). The outcome variable is the country-level sovereign spread of a ten-year maturity government bond relative to Germany. The treatment variable is the interaction of a time dummy that equals 1 as of the announcement of the Single List in 2005M7, and either a binary periphery dummy or a continuous shock correlation variable. Further controls are added, independently in columns (1) and (3), and interacted with the time dummy in columns (2) and (4). Columns (1) and (2) report coefficients for the binary treatment variable, while columns (3) and (4) report coefficients for the continuous treatment variable. All regressions include time and country fixed effects. Standard errors in parentheses are robust to heteroscedasticity and autocorrelation. Stars indicate the 10%, 5%, and 1% significance level, respectively.

Channels of the effect of conditional eligibility (binary, 2004M7–2007M7)

	Spread						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
SL^{2005M7} × *Periphery*	0.1039**	0.0511**	0.1083*	0.1116*	0.1099***	0.0729	0.0768*
	(0.0405)	(0.0245)	(0.0608)	(0.0612)	(0.0377)	(0.0503)	(0.0424)
SL^{2005M7} × AAA^{2005M6}	−0.1050**						
	(0.0525)						
SL^{2005M7} × $Debt^{2005M6}$		0.0001					
		(0.0006)					
SL^{2005M7} × $Budget^{2005M6}$			0.0031				
			(0.0066)				
SL^{2005M7} × $PBudget^{2005M6}$				−0.0344*			
				(0.0204)			
SL^{2005M7} × $Growth^{2005M6}$					−0.0242		
					(0.0189)		
SL^{2005M7} × CA^{2005M6}						0.0045	
						(0.0035)	
SL^{2005M7} × $REER^{2005M6}$							−0.0100
							(0.0108)
TimeFE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CountryFE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
InteractedControls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.935	0.922	0.925	0.909	0.933	0.933	0.932
Observations	144	144	144	144	144	144	144

Note: This table reports estimates of the effects of the SL event on sovereign spreads in periphery countries relative to core countries and in comparison to countries with different levels of macro-fiscal fundamentals, respectively, over the period 2004M7–2007M7. The corresponding regression equation is (3). The outcome variable is the country-level sovereign spread of a ten-year maturity government bond relative to Germany. Treatment variables are interactions of a time dummy that equals 1 as of the announcement of the Single List in 2005M7, and the binary periphery dummy as well as, by column, the level of one macro-fiscal fundamental in the month prior to the SL event. Further controls are added, both independently and interacted with the time dummy. All regressions include time and country fixed effects. Standard errors in parentheses are robust to heteroscedasticity and autocorrelation. Stars indicate the 10%, 5%, and 1% significance level, respectively.

Channels of the effect of conditional eligibility (continuous, 2004M7–2007M7)

	Spread						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
SL^{2005M7} × *Correlation*	−0.3217**	−0.1294	−0.2883*	−0.3673**	−0.2969***	−0.2211	−0.2230**
	(0.1303)	(0.0910)	(0.1692)	(0.1779)	(0.0997)	(0.2106)	(0.1092)
SL^{2005M7} × AAA^{2005M6}	−0.0614						
	(0.0464)						
SL^{2005M7} × $Debt^{2005M6}$		−0.0002					
		(0.0002)					
SL^{2005M7} × $Budget^{2005M6}$			0.0014				
			(0.0024)				
SL^{2005M7} × $PBudget^{2005M6}$				−0.0185			
				(0.0158)			
SL^{2005M7} × $Growth^{2005M6}$					−0.0154		
					(0.0196)		
SL^{2005M7} × CA^{2005M6}						0.0068	
						(0.0058)	
SL^{2005M7} × $REER^{2005M6}$							−0.0205**
							(0.0087)
TimeFE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CountryFE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
InteractedControls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.935	0.922	0.926	0.911	0.933	0.933	0.932
Observations	144	144	144	144	144	144	144

Note: This table reports estimates of the effects of the SL event on sovereign spreads in periphery countries relative to core countries, and in comparison of countries with different levels of macro-fiscal fundamentals, respectively, over the period 2004M7–2007M7. The corresponding regression equation is (4). The outcome variable is the country-level sovereign spread of a ten-year maturity government bond relative to Germany. Treatment variables are interactions of a time dummy that equals 1 as of the announcement of the Single List in 2005M7, and the continuous shock correlation variable as well as, by column, the level of one macro-fiscal fundamental in the month prior to the SL event. Further controls are added, both independently and interacted with the time dummy. All regressions include time and country fixed effects. Standard errors in parentheses are robust to heteroscedasticity and autocorrelation. Stars indicate the 10%, 5%, and 1% significance level, respectively.

Sovereign spreads and the Single List (2004M7–2008M8)

	Spread			
	(1)	(2)	(3)	(4)
SL^{2005M7} × *Periphery*	0.0563***	0.2206***		
	(0.0123)	(0.0412)		
SL^{2005M7} × *Correlation*			−0.1764***	−0.6225***
			(0.0342)	(0.1479)
Debt	0.0099***	−0.0199***	0.0090***	−0.0158**
	(0.0026)	(0.0059)	(0.0026)	(0.0064)
$Debt^2$	−0.0001***	0.0001***	−0.0001***	0.0001**
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Budget	0.0001	0.0028***	0.0001	0.0027***
	(0.0005)	(0.0006)	(0.0005)	(0.0006)
PBudget	−0.0081***	−0.0184***	−0.0075***	−0.0167***
	(0.0019)	(0.0037)	(0.0019)	(0.0040)
Growth	−0.0031	0.0044	−0.0028	0.0004
	(0.0047)	(0.0097)	(0.0046)	(0.0121)
CA	0.0056**	−0.0023	0.0061***	−0.0049
	(0.0024)	(0.0035)	(0.0023)	(0.0042)
REER	0.0017	0.0026	0.0033	0.0173 ***
	(0.0035)	(0.0051)	(0.0032)	(0.0053)
Liquidity	−0.0009	−0.0008	−0.0008	−0.0008
	(0.0008)	(0.0008)	(0.0008)	(0.0007)
SL^{2005M7} × *AAA*		−0.1616***		−0.0653
		(0.0517)		(0.0525)
SL^{2005M7} × *Debt*		0.0267***		0.0216***
		(0.0057)		(0.0060)
SL^{2005M7} × $Debt^2$		−0.0002***		−0.0002***
		(0.0000)		(0.0000)
SL^{2005M7} × *Budget*		−0.0031***		−0.0029***
		(0.0009)		(0.0009)
SL^{2005M7} × *PBudget*		0.0157***		0.0146***
		(0.0041)		(0.0044)
SL^{2005M7} × *Growth*		−0.0151		−0.0094
		(0.0114)		(0.0135)
SL^{2005M7} × *CA*		0.0102***		0.0136***
		(0.0029)		(0.0040)
SL^{2005M7} × *REER*		0.0158**		0.0018
		(0.0061)		(0.0063)
TimeFE	Yes	Yes	Yes	Yes
CountryFE	Yes	Yes	Yes	Yes
Adj. R^2	0.926	0.940	0.927	0.939
Observations	144	144	144	144

Note: This table reports estimates of the effect of the SL event on sovereign spreads in periphery countries relative to core countries over the period 2004M7–2008M8. The corresponding regression equations are (1) and (2). The outcome variable is the country-level sovereign spread of a ten-year maturity government bond relative to Germany. The treatment variable is the interaction of a time dummy that equals 1 as of the announcement of the Single List in 2005M7, and either a binary periphery dummy or a continuous shock correlation variable. Further controls are added, independently in columns (1) and (3), and interacted with the time dummy in columns (2) and (4). Columns (1) and (2) report coefficients for the binary treatment variable, while columns (3) and (4) report coefficients for the continuous treatment variable. All regressions include time and country fixed effects. Standard errors in parentheses are robust to heteroscedasticity and autocorrelation. Stars indicate the 10%, 5%, and 1% significance level, respectively.

Channels of the effect of conditional eligibility (binary, 2004M7–2008M8)

	Spread						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
SL^{2005M7} × *Periphery*	0.2206***	0.0490**	0.0988	0.2423***	0.2265***	0.2738***	0.2417***
	(0.0412)	(0.0246)	(0.0668)	(0.0580)	(0.0363)	(0.0537)	(0.0454)
SL^{2005M7} × AAA^{2005M6}	−0.1616***						
	(0.0517)						
SL^{2005M7} × $Debt^{2005M6}$		0.0011					
		(0.0007)					
SL^{2005M7} × $Budget^{2005M6}$			−0.0128*				
			(0.0075)				
SL^{2005M7} × $PBudget^{2005M6}$				−0.0083			
				(0.0202)			
SL^{2005M7} × $Growth^{2005M6}$					−0.0027		
					(0.0193)		
SL^{2005M7} × CA^{2005M6}						0.0140***	
						(0.0038)	
SL^{2005M7} × $REER^{2005M6}$							0.0069
							(0.0097)
TimeFE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CountryFE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
InteractedControls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.940	0.938	0.939	0.937	0.940	0.936	0.937
Observations	144	144	144	144	144	144	144

Note: This table reports estimates of the effects of the SL event on sovereign spreads in periphery countries relative to core countries and in comparison to countries with different levels of macro-fiscal fundamentals, respectively, over the period 2004M7–2008M8. The corresponding regression equation is (3). The outcome variable is the country-level sovereign spread of a ten-year maturity government bond relative to Germany. Treatment variables are interactions of a time dummy that equals 1 as of the announcement of the Single List in 2005M7, and the binary periphery dummy as well as, by column, the level of one macro-fiscal fundamental in the month prior to the SL event. Further controls are added, both independently and interacted with the time dummy. All regressions include time and country fixed effects. Standard errors in parentheses are robust to heteroscedasticity and autocorrelation. Stars indicate the 10%, 5%, and 1% significance level, respectively.

Channels of the effect of conditional eligibility (continuous, 2004M7–2008M8)

	Spread						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
SL^{2005M7} × *Correlation*	−0.6225***	−0.1032	−0.4918***	−0.6343***	−0.6068***	−0.9169***	−0.5431***
	(0.1479)	(0.0910)	(0.1701)	(0.1580)	(0.1127)	(0.2196)	(0.1385)
SL^{2005M7} × AAA^{2005M6}	−0.0653						
	(0.0525)						
SL^{2005M7} × $Debt^{2005M6}$		0.0004*					
		(0.0002)					
SL^{2005M7} × $Budget^{2005M6}$			−0.0014				
			(0.0027)				
SL^{2005M7} × $PBudget^{2005M6}$				0.0236			
				(0.0178)			
SL^{2005M7} × $Growth^{2005M6}$					0.0183		
					(0.0230)		
SL^{2005M7} × CA^{2005M6}						0.0219***	
						(0.0061)	
SL^{2005M7} × $REER^{2005M6}$							−0.0241***
							(0.0081)
TimeFE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CountryFE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
InteractedControls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.939	0.937	0.937	0.937	0.938	0.934	0.935
Observations	144	144	144	144	144	144	144

Note: This table reports estimates of the effects of the SL event on sovereign spreads in periphery countries relative to core countries and in comparison to countries with different levels of macro-fiscal fundamentals, respectively, over the period 2004M7–2008M8. The corresponding regression equation is (4). The outcome variable is the country-level sovereign spread of a ten-year maturity government bond relative to Germany. Treatment variables are interactions of a time dummy that equals 1 as of the announcement of the Single List in 2005M7, and the continuous shock correlation variable as well as, by column, the level of one macro-fiscal fundamental in the month prior to the SL event. Further controls are added, both independently and interacted with the time dummy. All regressions include time and country fixed effects. Standard errors in parentheses are robust to heteroscedasticity and autocorrelation. Stars indicate the 10%, 5%, and 1% significance level, respectively.

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