Sovereign Risk Dynamics in the EU: The Time Varying Relevance of Fiscal and External (Im)balances

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Abstract

Acknowledging the potential detrimental impact that twin-deficits may have on sovereign risk, this study uses a two-step approach to assess the impact of fiscal and external sustainability on sovereign risk dynamics for a panel of 27 European Economies between 2001Q4 and 2022Q3. To do so, we first estimate a country-specific time-varying measure of fiscal sustainability, through the cointegration between government revenues and expenditures, and of external sustainability, derived from the exports-imports cointegration. We then resort to those time-varying coefficients to assess their impact on sovereign risk, proxied by 10-year CDS and CDS spreads (against the US) making use of Weighted Least Squares (WLS) analysis. Noticeably, we show that an improvement of both fiscal and external sustainability lead to a reduction in sovereign risk. This phenomenon becomes notably pronounced, particularly when examining countries experiencing an upward trajectory in their public debt levels.

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1. Introduction

The dynamics of sovereign risk have emerged as a critical factor, presenting notable challenges for European economies over time. The repercussions of the 2008 financial crisis manifested in difficulties for economies to finance their public sectors, subsequently resulting in significant implications for the private sector of the economy. As underlined by Agiakloglou et al. (2021), the drastic shifts in sovereign risk during turbulent times have led to significant variations in risk evaluations among European countries. This phenomenon persisted even among Eurozone countries operating under a uniform monetary policy, where, prior to the crisis, member states exhibited similarly low levels of risk. Over the past few decades, the noticeable increase in public debt levels in Europe has sparked concerns about the escalation of European's countries primary deficits. Therefore, budgetary sustainability has been of enormous importance in the fiscal domain to guarantee stability, investors' confidence levels, and overall financial health. Moreover, substantial, and enduring current account deficits give rise to apprehensions as they jeopardize a nation's economic prospects. The external sustainability of a government assumes paramount importance, signifying the resilience and adept management of a country's external financial position. A nation's ability to fulfil its international financial obligations without excessive reliance on borrowing serves as a pivotal factor in mitigating the overall risk of default.

The escalation of fiscal and current account deficits, often referred to as twin deficits, has been observed in European countries. Indeed, existing literature points out a positive causal relationship, known as the twin deficits hypothesis (Normandin, 1999). This phenomenon raises concerns about the potential risks associated with significant macroeconomic imbalances and sovereign default risk (Hurtgen and Ruhmkorf, 2014). It accentuates the intricacies linked to sovereign risk assessment, emphasizing the imperative to enhance macroeconomic surveillance.

Within the context of Optimum Currency Areas (OCAs), the presence of regional asymmetries among member countries, specifically the economic disparities between wealthier and less affluent nations, significantly complicates the examination of sovereign risk dynamics. The intricate web of economic interdependence between these nations accentuates the need to meticulously assess both internal (fiscal) and external risks. The asymmetrical degrees of fiscal and external resilience across member countries

introduce a layer of complexity that has the potential to disrupt the sustainable development of an OCA and may manifest as varying levels of sovereignty risk.

Against this contextual backdrop, our paper aims to offer a comprehensive understanding of sovereign risk dynamics by effectively bridging it with fiscal and external sustainability. Through an exploration of the connections between these domains, our objective is to unveil the impact that sustainable public accounts and external accounts exert on sovereign risk, proxied by two different risk measures, namely Credit Default Swaps (CDS) and CDS Spreads (against the United States), for 27 European Economies between 2001Q4 and 2022Q3. Moreover, our study intends to elucidate the policy implications arising from the identified relationship. Notably, this research represents a pioneering effort as it constitutes the first study to systematically analyze the interplay between sovereign risk and fiscal and external sustainability. To do so, we employed a two-step approach. First, we estimate a country-specific time-varying measure of both fiscal and external sustainability. Second, we employed Weighted Least Squares (WLS) Fixed Effect techniques within a panel framework. Additionally, we assess the dynamics of public debt across countries, by distinguishing between cases where sovereign debt is equal to or exceeds 90% of GDP and it is below 90% of GDP. We explore the consequences of both increasing or decreasing public debt. As a robustness test, we examine the impact of fiscal and external sustainability on sovereign risk, focusing on both high-performing and core European Union countries.

Our findings show that a nation's better sustainability in its public and external accounts contributes significantly to reducing sovereign risk. Fiscal sustainability signals prudent and responsible public finance management, instilling confidence in investors and stakeholders, thus mitigating concerns regarding government financial stability. Moreover, sustainable external current account balances are crucial for reducing government risk, particularly for European economies open to the exterior. The study also emphasizes the heightened importance of fiscal sustainability, especially in the context of increasing public debt levels. Countries facing rising indebtedness may need additional efforts to increase fiscal sustainability, thereby mitigating as far as possible overall government risk. Lastly, countries excelling in terms of external sustainability witness a more pronounced reduction in sovereign risk. The same phenomenon occurs in "older" European Union nations. From a policy perspective, imbalances in public and current

accounts pose risks to financial market stability, especially during crises. Policymakers are advised to monitor current account and budget imbalances carefully, implementing proactive structural reforms, fiscal consolidations, and measures to enhance external competitiveness to moderate potential unwanted repercussions.

This study is organised as follows. Section 2 presents the literature review. Section 3 provides the stylized facts on sovereign risks and fiscal and external sustainability. Section 4 details the data sources and methodology employed in our study. Section 5 discusses the baseline results, as well as other robustness exercises. Section 6 summarizes the main conclusions and provides some policy conclusions.

2. Literature Review

Throughout the years, several studies have analyzed the prevailing factors influencing the dynamics of sovereign risk. The literature has focused on macroeconomic, political, or institutional factors, such as fundamental variables (Dieckmann and Plank, 2012), liquidity and investor risk aversion (Heinz and Sun, 2014), parliamentary systems (Eichler, 2014) credit risk (Gibson et al. 2017), financial risk (Andersson et al, 2009; Silvapulle et al., 2016), equity prices and exchange rates (Agiakloglou et al., 2021), and geopolitical risk (Afonso et al., 2023). Moreover, research indicates that the government's financial management strategies, encompassing taxation and public spending, significantly contribute to enhancing fiscal sustainability, thereby playing a pivotal role in determining sovereign risk (Haugh et al., 2009; Maltritz, 2012).

Fiscal sustainability constitutes a crucial focus within the field of economics and public policy and has been the subject of extensive study over the years, due to its profound implications for economic growth (Golpe et al., 2023). For instance, as early as 1923, Keynes addressed the complexities arising from public debt in France. The author underscored the imperative for the French government to adopt sustainable fiscal policies to effectively meet its budgetary constraints. Keynes (1923) argued that sustainability becomes jeopardized when the "State's contractual liabilities (...) have reached an excessive proportion of the national income." Similarly, Hamilton (1986) presented a pioneer study on the analysis of postwar US deficits and the influence of balanced government budgets between 1962 and 1984. Additionally, Hakkio and Rush (1991) also showed the importance of government to meet current value budgetary constraints.

In recent years, there has been a heightened emphasis on examining the dynamics of budget balances, particularly in response to the escalation of public debt in developed countries. For instance, Getzner et al. (2001) reported that Austria's budgetary sustainability was guaranteed from 1960 to 1974, but not from 1975 to 1999. Hatemi (2002) observed cointegration relationships between the two sides of the budget balance in Sweden between 1945 to 2000. Afonso (2005) showed that with few exceptions, EU-15 governments, for the period of 1970-2003, had sustainability problems, although debt-to-GDP ratios showed signs of stabilizing at the end of the 1990s. Marinheiro (2006) showed that, between 1903 and 2003, Portugal had sustainability in their public finances, although it was not maintained after 1975. In the case of Spain, Bajo-Rubio et al. (2014) stated that the fiscal sustainability of Spanish budget deficits was guaranteed by a regime of fiscal dominance for the period of 1850-2000. Georgescu (2014) alerted to the high levels of indebtedness of Romania and its warning debt unsustainability after the 2008 crisis. Magazzino et al. (2019) concluded that there was a cointegration relation between public debt and primary budget balance in G7 countries between 1980 and 2015. For the same period, but for 28 European countries, Brady and Magazzino (2019) showed a positive long-run co-movement between government revenues and expenditures and an absence of any causal link between government revenues and expenditures. Further, they highlighted that Greece, Italy, Ireland, Portugal, and Spain did not show fiscal sustainability as government expenditures grew faster than revenues. Their findings showed the relevant differences between EU countries regarding public finances.

Typically, fiscal sustainability is identified by three empirical tests. The first two are the following: backward-looking, as outlined by Bohn (1998), and forward-looking, as expounded by Canzoneri et al. (2001). In the context of the former, fiscal policy is deemed sustainable, or even adhering to the Ricardian regime, under the condition that the primary surplus is adjusted to accommodate the rise in lagged debt (Afonso et al., 2023). In essence, this approach scrutinizes whether past policies regarding public debt and primary balance have been in line with the intertemporal government budget constraint (IBC). The forward-looking approach identifies a Ricardian/passive strategy if shocks in the primary surplus result in a reduction in debt. In this approach, forecasts are employed to assess whether prevailing and prospective fiscal policy positions align with the IBC.

Nonetheless, both methodologies have limitations. The backward-looking analysis fails to account for the possibility that future fiscal policy may deviate from past observed patterns. Conversely, the forward-looking analysis disregards historical context and presupposes that any future behaviour aligns with the IBC, contingent upon the perceived credibility of the public commitment to it (Afonso et al., 2023).

In response to the limitations inherent in existing methodologies, another testing approach has arisen. The third category of empirical tests is the cointegration analysis technique. Specifically, cointegration studies the relationship between the two sides of the government budget to measure the degree of fiscal sustainability (Afonso and Jalles, 2014).

In another strand of the literature, studies have examined how fiscal behaviour may affect governmental financing and risk. For instance, Laubach (2009) showed that the US public debt interest rate had a high degree of sensitivity to fiscal indiscipline between 1976 to 2006. Particularly, interest rates raised 25 basis points to an increase of one unit to the budgetary deficit and a 4 basis points raise to a one-point increase in the debt-to-GDP ratio. Borgy et al. (2011) observed that the deterioration of public finances within the European Monetary Union has been the primary factor of the widening yield spreads in the region since 2008. This phenomenon is attributed to both increased compensations for default risk and rising risk premia.

A compelling study conducted by Bi (2012) analysed the interactions among sovereign risk premia, fiscal limits, and fiscal policy. The author showed that due to the existence of fiscal limits, default risk premia start to appear when the debt level reaches a point where sovereign default becomes possible, and once it is initiated, the increase of risk premia is extremely fast. Moreover, Bi (2012) emphasized that increased government debt, coupled with lower distributions of fiscal limits, elevates sovereign borrowing costs, which further deteriorates the government budget. This self-fulfilling mechanism can instigate a surge in risk premiums during a recession. Lastly, the author states that fiscal consolidation programs with the objective of achieving balanced budgets do not have an impact in the short-run on default risk premia and, therefore, on sovereign yields. However, credible perceived fiscal programs in the long run have the effect of decreasing interest rates.

Furthermore, the literature has demonstrated the influence of financial integration among countries on the management of public finances. For instance, Ghosh et al. (2013) analysed how membership of a currency union affects public debt sustainability and market assessments of default risk in eurozone countries. They concluded that under tranquil periods both Credit Default Swaps (CDS) and government bond rates were low, while, under recession periods, both sovereign risk metrics were sharply higher than in other advanced countries. They justify this by the fact that currency union countries face policy constraints that make it more difficult to maintain their debt sustainability levels. Weichenrieder and Zimmer (2014) also reached the same conclusion for the countries that signed the Maastricht Treaty. Lee et al. (2018), Mackiewicz-Łyziak et al. (2019), and Afonso and Coelho (2022) also report similar results for a longer timespan analysis for the same countries. Golpe et al. (2023) also highlighted that countries belonging to the EMU have differences in terms of the design and application of fiscal policies.

Moreover, the default risk premium seems to depend on fluctuations caused by economic crises that affect governments at the fiscal level. In fact, Juessen et al. (2016) illustrated the dependence of default risk premiums on output fluctuations. Holding government spending and tax rates constant, the government has to issue more debt in response to an economic downturn, which diminishes tax revenue. In moments of higher debt levels, severe recessions could exacerbate government indebtedness, potentially leading to a partial government default. In line with this, Fournier and Fall (2017), and Aldama and Creel (2019) highlighted that fiscal authorities may face vulnerabilities in financial turmoil.

The 2008 economic and financial crisis (GFC) lifted the veil on some of the economic problems that can be found in the European Union. In particular, some researchers have noted that one of the causes of the sovereign debt crisis in Europe was the "excessive" external liabilities of some countries (Stein, 2012; Afonso et al., 2019). Since the formation of the EMU, some countries, particularly those on the periphery, faced large external deficits. The increasing dependence on external financing significantly increased the net external liabilities of debtor countries, reaching levels surpassing 100 percent of GDP at the beginning of the GFC, which raised concerns regarding the sustainability of their external liabilities positions (Shin, 2012; Semmler and Tahri, 2017). Furthermore, increasing instability may create difficulties for highly indebt countries as they face

higher interest rates and higher risk premiums, as was the case of Italy and Spain (Semmler and Tahri, 2017). Brissimis et al. (2010) highlighted that the presence of substantial and enduring current account deficits raises concerns, especially when considerations of sustainability come to the forefront, thereby jeopardizing the economic outlook of a nation. The authors emphasized that this concern is particularly relevant for small open economies heavily dependent on external financing, where an unfavourable shift in foreign investors' behaviour may instigate a process of abrupt and disorderly adjustment of external imbalances, leading to severe repercussions for the economy. This scenario gains significance in the context of the 2008 financial crisis, which appears to have heightened these risks. According to the authors, this escalation is partly attributed to the perception that the correction of current account imbalances after the crisis was predominantly cyclical and short-lived.

The literature typically measures the sustainability of external accounts based on trade balance, and current account balance, however, authors such as Gourinchas and Rey (2007) questioned their feasibility and accuracy, as they omit capital gains and losses on net foreign asset positions. Alternatively, Camarero et al. (2014) analysed the behaviour of EU net foreign assets based on the financial assets using structural breaks. Semmler and Tahri (2017) used an intertemporal model of finite time horizon solved through a Non-linear Model Predictive Control method. Afonso et al. (2019) employed both time-series and panel-data stationarity tests of current account balance-to-GDP ratios and cointegration tests of exports and imports of goods and services to assess the sustainability of the current account (CA) balance, net international investment position (NIIP) and net external debt (NED). These approaches have the advantage of being consistent and consider the existence of structural breaks and valuation effects. On the other hand, Navarro-Ortiz and Sapena (2020) used a probabilistic approach to measure external debt sustainability.

3. Stylized facts

The bursting of the US housing market crisis and the bankruptcy of the Lehman Brothers in 2008 triggered enormous consequences all around the globe and the ensuing GFC. Economies have entered a recession as a result of a sharp decline in both domestic and foreign aggregate demand, credit flows have begun to dry, lenders' confidence has

declined as investors repatriated funds to domestic markets. Europe was no exception. The risk of sovereign insolvency began to develop in peripheral countries such as Greece but quickly spread to other European economies, prompting more aggressive action from policymakers to stop a possible contagion. After 2009, several eurozone' members were unable to repay or refinance their government debt without the assistance of the International Monetary Fund (IMF) and the European Central Bank (ECB).

Figure 1 shows the evolution of the debt ratio for some European economies between 2001 and 2022. Clearly, the consequences of choosing different fiscal policies are reflected by looking at the different debt paths of these countries. Greece has the highest values of all the countries and is on an upward trajectory in the sample under analysis. This upward trend in Greece's debt started to take off at the beginning of the subprime crisis. In 2011, Greek debt was around 170% of GDP. Furthermore, there were some issues regarding the reporting of Greek public accounts to the European Commission that can be also a justification for its sharp increase of public debt.

In fact, during that time, countries such as Portugal, Ireland and Spain showed high increases in their debt ratio. Ireland, in particular, saw its debt rise from close to 40% of GDP, one of the lowest in Europe, to over 100% of GDP (due notably to the financial support to the banking sector). Portugal and Spain also exceeded the 100% threshold during the crisis. Ireland and Portugal received bailouts in 2010 and 2011, respectively. Greece received two bailouts in 2010 and 2012. Spain received rescue packages in 2012.

From 2014 onwards, these economies began to move away from their problematic situations. The improvement of structural deficits and the return to economic growth enable these economies to recover and regain access to the market. It should also be noted that in 2020, all countries presented a slight jump in their debt due to the Covid-19 pandemic. This does not come as a surprise since the pandemic worsened government deficits due to the extra measures made to mitigate the negative social and economic effects of Covid-19 (Figure 1).

For a deeper understanding of the financial crisis detrimental effects on sovereign debt dynamics, Figure 2 details the level of the debt ratio before (grey bar) and after (black bar) the subprime crisis, where number of countries holding sizeable amounts of debt after the subprime crisis can be observed. As previously mentioned, this share is more pronounced in Greece, Ireland, Spain, and Portugal which reported fiscal consolidation

programs after 2008 and the sovereign debt crisis. However, most of the countries increased their issuing of sovereign debt following this period.

Figure 1: Debt ratio by country
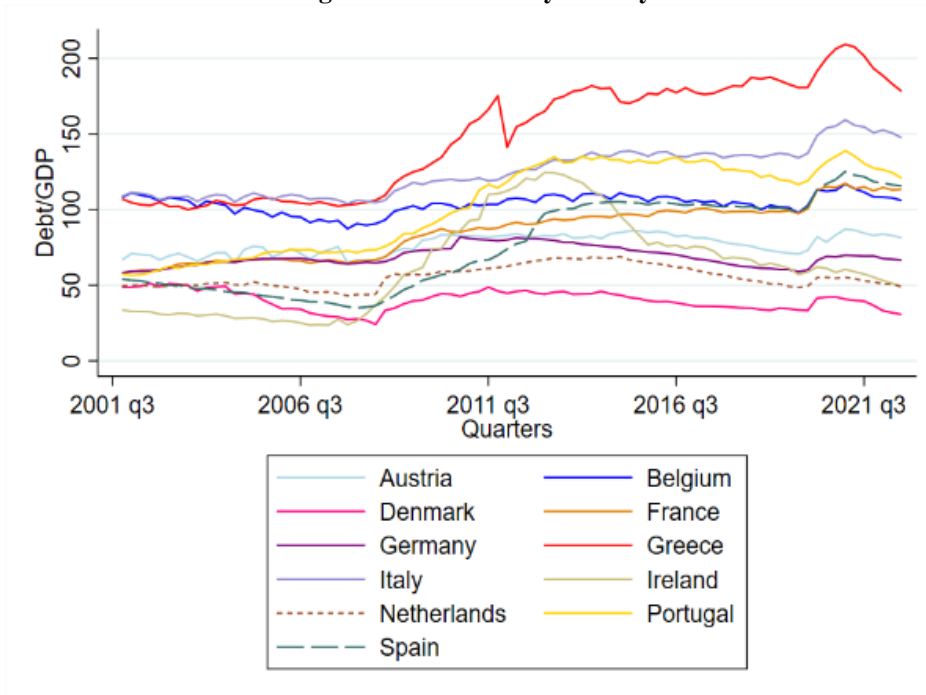
Notes: This figure display the debt ratio for 11 European countries, from 2001Q4 to 2022Q3. Source: Authors' own computations.

Figure 2: Debt ratio by country before and after the subprime crisis
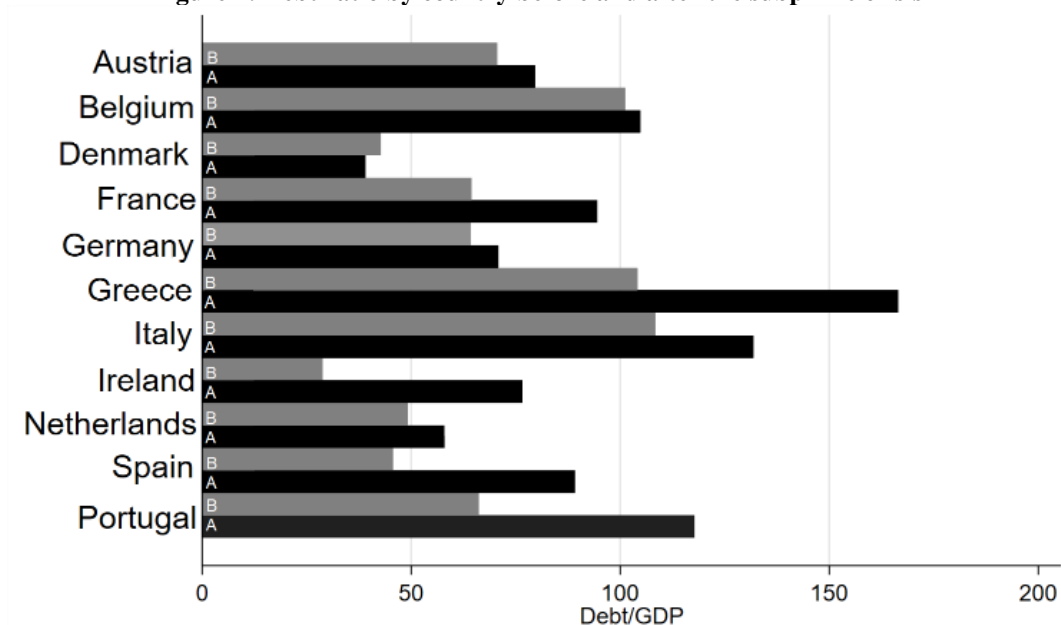
Notes: Gray bar is the country average Debt over GDP ratio Before the 2008 financial crisis (B) which includes quarters, and Black bar is the country average Debt over GDP ratio After and During the crisis (A), including quarters. Source: Authors' own computations.

Figure 3 presents the evolution of total general government Revenues and Expenditures over GDP in comparison with the debt ratio for a group of countries between 2001 and 2022. This plotting visualization may help us inspect some sustainability issues in individual cases.

Between 2001 and 2007, total general government expenditures were low and decreased for some countries as a ratio of GDP. According to the European Commission, this reflected the level of general public services and social protection in Europe. However, during the first years of the GFC, government expenditures increased in Europe as a percentage of GDP. This was a result of the lower levels of reported GDP. In countries such as Portugal, Ireland and Greece, total expenditure increased more than 20% between 2008 and 2013. Apart from this increase, in 2018-2019, it steadily decreased to around 45% of GDP. The fiscal consolidation policies, the economic recovery, and the countercyclical responses of government spending were some of the factors contributing to this slow decline. Still, the amount of one-off measures on the spending side made to support financial institutions has decreased recently (European Commission, 2024).

Due to the Covid-19 pandemic and the government's action to minimize its social and economic impact, total general government expenditure as a percentage of GDP rose sharply after 2020 in all European economies. This was, of course, a result of a decrease in GDP and an increase in government spending. The major areas of spending in the EU in 2021 were "social protection" (specifically, unemployment, with an increase of more than 40 billion), "economic affairs" (more than 90 billion Euros), and "health" (more than 100 billion Euros).

Regarding total general government revenues, we observe an increase as a percentage of GDP during the financial crisis for all economies analysed. We highlight that these values part from historically low tax revenues in Europe over the last 20 years. For example, in Greece, revenues increased during the crisis but decreased afterwards due to a decline in taxes on production and imports, and actual social contributions. The tax on real estate introduced during the crisis helped Greece's government contain this sharp decline.

Interestingly, before the subprime crisis, countries showed good budgetary positions, with a general approximation between revenue and expenditure, which contributed to

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low sovereign debt. This particular behaviour was observed for EMU countries that had the same monetary policy, as a result of a uniform monetary policy, although before the crisis all member states had similarly low levels of risk, since their yield spreads were very low and approximately the same.

Lastly, we can see that expenditures are practically always higher than expenses, especially in more indebted countries and during periods of crisis, such as the financial crisis and the Covid-19 pandemic in 2020. The gap between expenditure and revenues is very pronounced in Ireland, Greece, and Portugal during the financial crisis. In the other countries, expenditure has followed more or less the same trend over the years as revenues. We also conclude that government debt mimics the trajectory of expenditure in most countries.

Figure 3: Expenditures and Revenues vs Government debt

Panel A: France

Panel B: Germany

Panel C: Greece

Panel D: Ireland
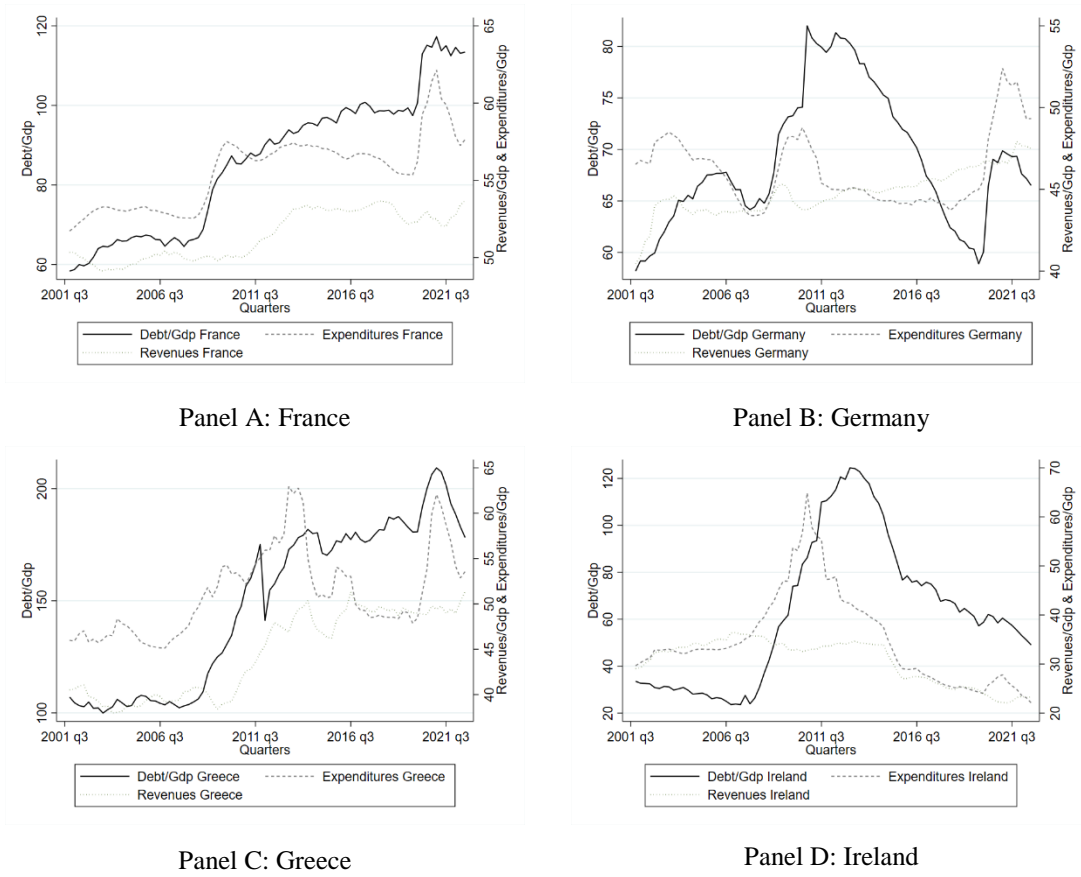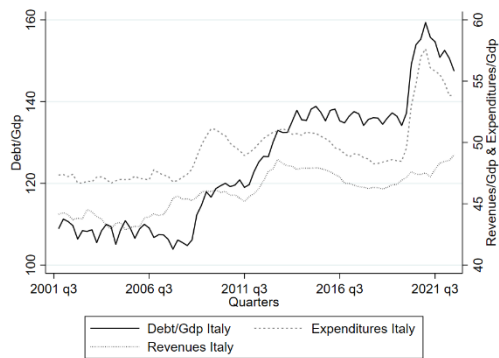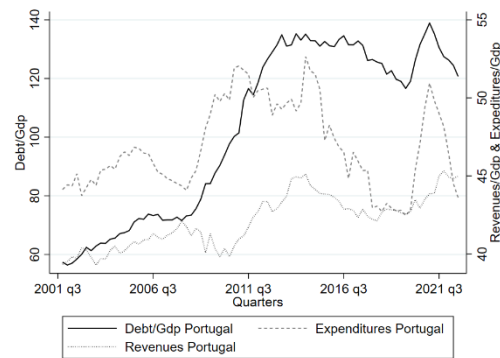
Panel E: Italy   Panel F: Portugal

Notes: This figure was developed by the authors.

In Figure A3, in the appendix, we exhibit six panels showing how Ratings evolve in relation to the share of Debt, Expenditure and Revenues as a percentage of GDP. It is clear that when the debt ratio increases, ratings fall substantially. In fact, in all countries, in mid-2011, when Europe's sovereign debt crisis hit, the ratings plummeted. The only exception to this trend was Germany, where the rating agencies have kept the rating at triple A. Furthermore, we observe that the ratings have not fully returned to their pre-subprime crisis levels. In the most recent period, they have been well below their former levels.

In Figure A4 of the Appendix, we show six panels with the relation of government Debt ratio in relation to Exports and Imports as a percentage of GDP for a selection of countries in our sample. The data depicted in the panels highlights a significant surge in both exports and imports during the periods marked by the sovereign debt crisis and the Covid-19 pandemic. Across all countries, except Ireland, a consistent correlation exists between the trends of exports and imports. Specifically, in France and Greece, imports consistently surpass exports, whereas in Germany and Ireland, exports tend to outpace imports during the analyzed period. This pattern underscores the more export-oriented nature of the latter two nations.

Turning our attention to debt dynamics, a noteworthy observation emerges. The fluctuations in debt levels closely mirror those in exports and imports in France, Greece, Italy, and Portugal. This alignment suggests a relationship between foreign trade activities and debt patterns in these countries.

During the financial crisis, sovereign insolvency and sovereign risk alarmed European economies. Typically, sovereign risk is primarily proxied by Credit Default

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Swaps (Ammer and Cai, 2007; Longstaff et al., 2011). This financial instrument offers an accurate measure of credit risk, for instance, compared to other measures, such as bond spreads. This is because bond spreads include various risk premiums beyond credit risk in their pricing (Ang and Longstaff, 2013).

According to Agiaklog (2021) during the turbulent period of the GFC, sovereign risk changed drastically, creating significant differences in risk evaluations for each country, which could be attributed to specific risk factors that became very important in pricing their risk levels. Figure 4 illustrates the evolution of sovereign risk proxied by ln CDS, and ln CDS Spread, throughout time. As expected, Greece presents the highest values in the overall sample for both proxies of government debt risk. This was even more pronounced during the financial crisis of 2008. Portugal and Italy also reported high values.

Figure 4: Sovereign Risks Evolution 2001Q4-2022Q3 (Panel A: CDS and Panel B: CDS Spreads)

Panel A: CDS   Panel B: CDS Spreads
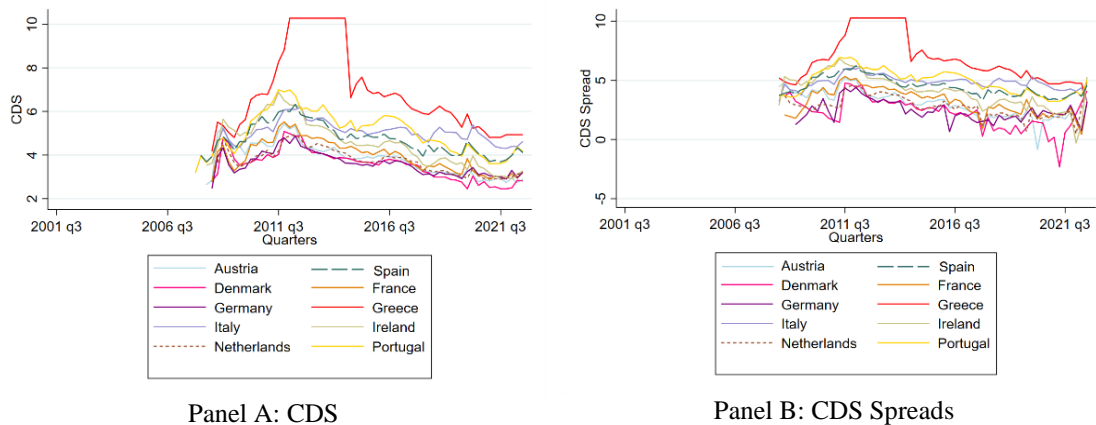
Notes: This figure reports the logarithm of CDS (Panel A) and CDS Spreads against the US, for 10 nations from our sample, between 2001Q4 and 2022Q3. Each line represents one Country. Source: Authors' own computations.

In Figure 5 we can observe the level of government risk proxied by CDS and the countries' credit rating average (from 2001Q4 to 2022Q3). From the graphical representation, it is clear that there are two large groups (one composed of Northern economies and the other of Mediteranean and Easthern economies) and one country that stands apart, which is Greece. Northern economies have high credit ratings and low levels of risk, placed in the upper left corner of the graph. While, Mediteranean and Easthern countries have moderate levels of risk and ratings. Greece is in the right and below part of the graphical representation with the highest sovereign risk and lower average rating value of the sample. This is, not surprising after all the difficulties Greece went through

during the 2008 GFC and more recently the Covid-19 crisis. However, the rating companies have been upgrading Greece's credit rating from junk status (see, for instance, Figure A3 in the appendix section). This is due to the expectation of general government debt/GDP to remain on a sharp downward trend, thanks to solid nominal growth, favourable debt-servicing structure, low policy risks, a stable political, backdrop and well-anchored fiscal prudence, according to Fitch (2024).

As a complementary analysis, we can see in Figure 5 that the higher the Debt ratio, the higher the sovereign risk proxied by the logarithm of CDS. While the graphical representation may not exhibit a distinct demarcation between country groups akin to Figure 5, it is evident that nations on the periphery, characterized by higher debt ratios, inherently depict greater governmental risk.

Figure 5: Countries' Risk against Ratings (Panel A) and Debt (Panel B) average from 2001Q4 to 2022Q3

Panel A: Countries' Ratings   *Panel B: Countries' Debts*
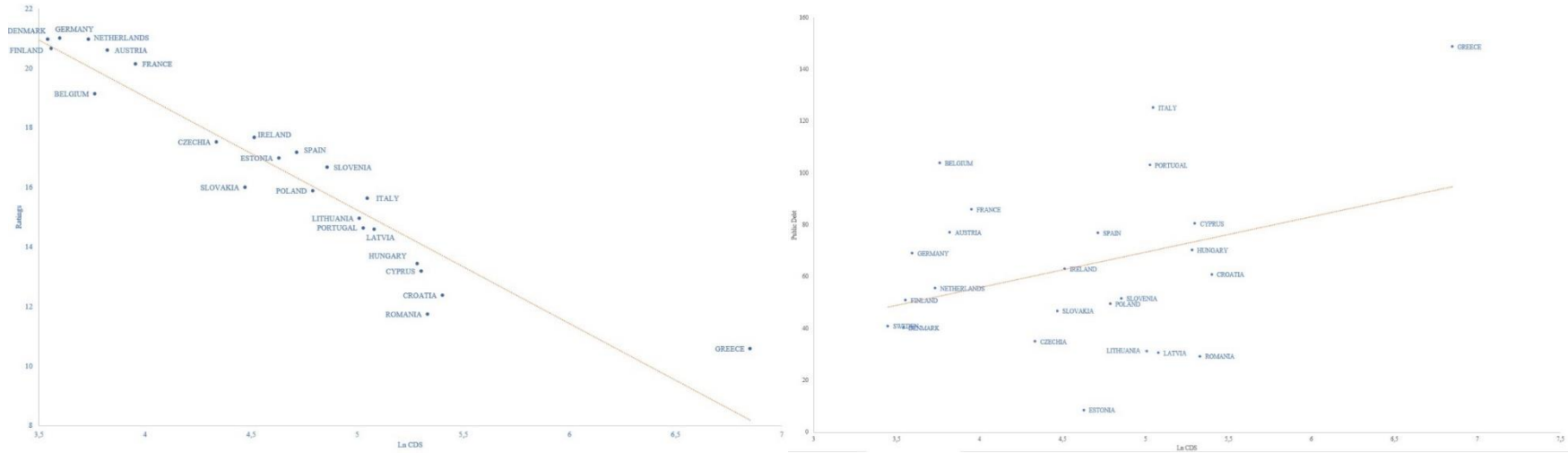
Notes: This figure presents the countries' risk proxied by the Ln CDS against Ratings (Panel A on the left) and against Public Debt (Panel B on the right). Each point represents the country's average for the full sample period of 2001Q4 to 2022Q3 and the yellow line is the trend line. Source: Authors' own computations.

4. Methodology and Data

4.1. Methodology

Regarding fiscal sustainability, we follow the approach of Afonso (2005) to evaluate whether a linear combination of government revenues and expenditures is stationary. In that scenario, government revenues and expenditures become cointegrated, indicating that the variables approach a stable long-run equilibrium relationship with only temporary short-run deviations from the equilibrium. In this way, we estimate the following regression for each country in the sample:

$$R_t = \alpha + \beta G_t + u_t \qquad (1),$$

where R_t represents the government revenues over GDP, G_t denotes the government expenditures over GDP and u_t denotes the standard i.i.d. disturbance term satisfying the usual assumptions. We are mostly interested in the behavior of the β coefficient estimate. Public finances will be more sustainable if the estimated β is closer to the unity; a unitary rise in government spending will be matched by a β units increase in government revenues.

Lastly, we assessed external sustainability following the same steps as before (Afonso et al, 2019). We evaluate whether a linear combination of exports and imports is stationary, estimating the following regression:

$$X_t = \theta + \gamma M_t + \epsilon_t \qquad (2)$$

where X_t represents the exports over GDP, M_t denotes the imports over GDP and ϵ_t denotes the standard i.i.d. disturbance term that satisfies the usual assumptions. When the estimated coefficient γ is closer to the unity, the more sustainable are the external accounts; a unitary rise in the country's imports will be matched by a γ increase in the country's exports.

We highlight that the stationarity of these variables has been assessed, as one can see in tables A2 and A3 in the appendix. We examined the stationarity characteristics of government revenues and expenditures country by country, both in levels and first differences. Most countries reported non-stationarity variables. We implement three

different types of panel unit root tests: (i) first-generation tests, namely the Im-Pesaran-Shin unit-root test, Im et al. (2003); the Fisher-type unit-root test based on augmented Dickey-Fuller and based on Phillips-Perron; and (ii) the so-called second-generation tests, such as Pesaran (2007) panel unit root test[4]. From these tests, we conclude that the use of the first differences of the respective variables, to compute both fiscal and external sustainability coefficients, is the most appropriated approach.

4.2. Data

This study employs quarterly data from 27 European economies, spanning the period from 2001Q4 to 2022Q3. The countries included in the analysis are Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, and Sweden. The selection of these countries is dictated by the data availability[5].

The primary focus of our study is the sovereign risk, which is proxied by the logarithm of the sovereign credit default swaps (*CDS*) with 10 years of maturity and CDS spreads against the United States (*CDS Spread*). We retrieved the CDS data from Thomson Reuters Datastream.[6]

We also resort to general government total revenues GDP (*Revenues)*, general government total expenditures (*Expenditures*), imports (*Imports*), and exports (*Exports*) collected from the EUROSTAT Database, all of them as a percentage of GDP.

Regarding the control variables we include government debt as percentage of GDP (Debt), the logarithm of the real effective exchange rate *(REER),* also from the EUROSTAT Database. The REER variable generally captures credit risk arising from general macroeconomic disequilibrium. A rise (decrease) in the REER indicates real exchange rate appreciation (depreciation), which is projected to increase (decrease) sovereign risk, as theoretically supported by Arghyrou and Tsoukalas (2011) and Afonso et al. (2015). Next, we include the logarithm of the harmonized index of consumer prices (*Inflation*), the short-run 3-month interest rate, (*Short rate*), the trade openness degree,

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[4] For reasons of parsimony, we do not provide such results here. However they are are available upon request.
[5] We exclude the United Kingdom due to unavailablity of the data.
[6] We choose the United States instead of Germany, whose economy is also considered as a robust economy and it is usually served as a financial stable benchmark, because in this way it allows us to incorporate Germany in our analysis.

measured by the quotient between the sum of exports and imports over GDP (*Openness*), the output gap, meaning the difference between the actual level of GDP against the full employment level GDP (*Output Gap*), the logarithm of the sovereign credit Ratings (*Ratings*) following the approach of Afonso et al. (2014). This approach categorizes qualitative ratings from Moody's, Standard & Poor's, and Fitch credit agencies on a quantitative scale from 1 (low quality, <=B-) to 17 (high quality, AAA). The overall measure is the simple average of the sovereign credit ratings of these three main credit agencies for each country.

Table 1 summarizes the relevant features of the data used in this study. The dataset comprises quarterly observations spanning the period from 2001Q4 to 2022Q3. It encompasses approximately 2250 observations for each variable, thoroughly documented for all 27 European countries incorporated in the study. The logarithm of CDS and CDS Spread exhibits an average value in proximity to its median counterpart, indicating a symmetrical distribution. The standard deviation is relatively low as well. The fiscal and external sustainability proxied by the beta and gamma coefficients have an average value of 0.160 and 0.688, respectively and relatively low standard deviations. This indicates that a unitary rise in the country's expenditures (imports) will be matched by a 0.160 (0.688) increase in the country's revenues (exports), on average. These coefficients attain their maximum values at 1.243 for fiscal sustainability and 2.104 for external sustainability.

Table 1: Summary Statistics

	Mean	Median	Std. Dev.	Min	Max
CDS	4.619	4.584	1.075	1.902	10.278
CDS Spread	4.193	4.348	1.477	-2.303	10.277
Revenues	42.447	42.114	6.368	22.091	56.362
Expenditures	45.078	45.172	6.706	22.087	64.895
Imports	59.708	52.484	29.261	22.588	174.09
Exports	61.847	53.582	34.793	18.555	208.38
Debt	60.57	53.797	36.124	3.436	209.27
REER	4.624	4.629	0.071	4.096	4.846
Inflation	4.535	4.585	0.144	3.719	4.970
Short Rate	1.921	1.096	2.875	-0.600	34.20
Openness	123.169	108.497	64.347	45.376	382.47
Output Gap	-0.025	-0.159	2.212	-9.959	11.312
Ratings	2.791	2.833	0.272	1.204	3.045
Fiscal (beta)	0.160	0.124	0.211	-0.533	1.243
External (gamma)	0.688	0.759	0.287	-0.512	2.104

Notes: This table presents the summary statistics of the variables under study for the period of 2001-2022. Specifically, we report the mean, median, Standard deviation (Std. Dev.), the maximum, and the minimum of the series.

Figure 6 presents the map of correlations between the variables under study. We can see that a warmer colour (red) means a greater positive correlation, while a lighter one means a more negative correlation (yellow). As expected, CDS and CDS Spreads are highly and negatively correlated with Ratings, indicating that when the credit rating increases, the sovereign risk decreases. Sovereign debt is positively correlated with the CDS, therefore, when the debt ratio increases the risk of the government also increases. The measures of sovereign risk are low and negatively correlated with fiscal and external coefficients. This indicates that other variables may also influence at the same time the relationship between them.

Figure 6: Heatmap of Correlations (all sample)
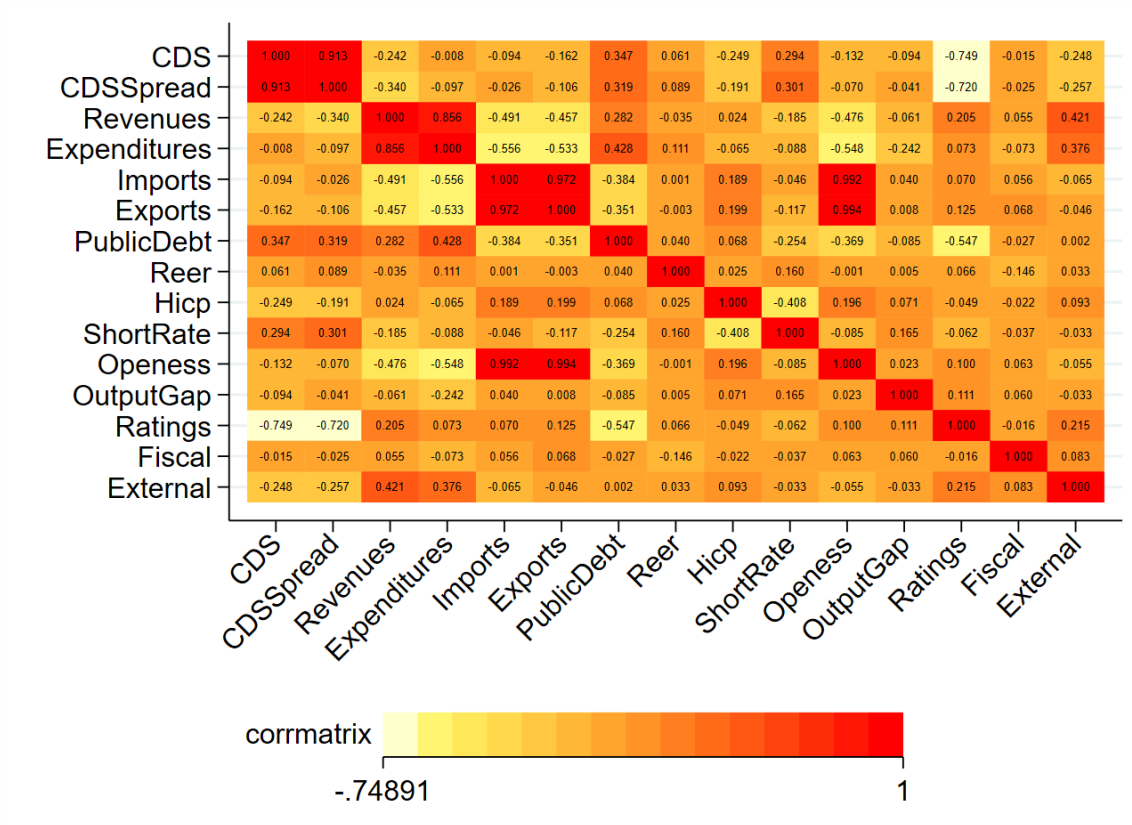
Notes: This figure reports the correlation coefficients between the variables used in this study. Since economies are susceptible to external shocks, this has an impact on countries' sovereign debt risk. A warmer colour means a correlation closer to 1 (red) and a lighter one closer to -1 (light yellow). Source: Authors' own computations.

4.3. Description of fiscal and external sustainability and sovereign risks

In this section, we undertake an analysis of the intricate interplay between sovereign risk, and fiscal and external sustainability. Figure 7 presents three-dimensional graphical

depictions of these relationships. It is discernible that elevated levels of fiscal and external sustainability correspond to diminished sovereign debt risk, as gauged by the logarithm of CDS and CDS spreads. This observation is substantiated by the positioning of the surface below the mean sovereign risk, as indicated on the vertical axis to the left, and within the bottom corner of the graph. This particular location is aligned with the highest values of both external and fiscal sustainability. Both graphs motivate the idea that there is some relation between high level of fiscal and external sustainability and lower levels of governmental risk.

In Figure A1 in the Appendix we concentrate our analysis on the relation between fiscal and external sustainability for the overall sample period. Countries in the first quadrant report above-average fiscal and external sustainability levels. We highlight the case of Denmark and Germany. On the second quadrant, countries report above-average fiscal sustainability but below-average external sustainability, for example, Estonia and Ireland. The countries that are on the third quadrant have the worst performance in terms of fiscal and external sustainability, for instance, Cyprus, Italy, and Lithuania. Lastly, nations that perform worst in terms of fiscal sustainability but good in terms of external sustainability include countries such as France, Austria, and Finland, but also Portugal and Croatia. We observe that there is an upward tendency between fiscal and external levels of sustainability.

Figure 7: CDS Spreads vs Fiscal and External Sustainability
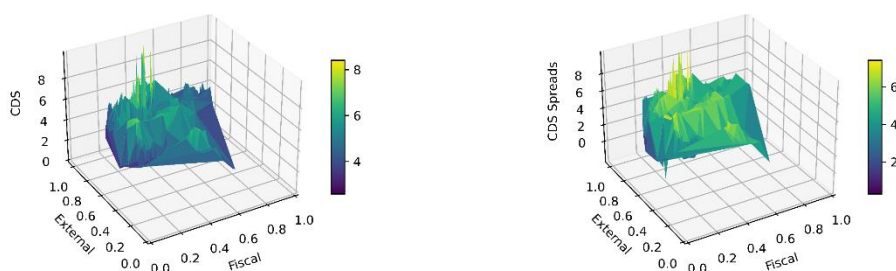
Notes: This graph present the beta fiscal and External between 0 and 1 by country. Where the axis are the means of both variables. Source: Authors' own computations.

For testing the quarterly relationship between sovereign risk and fiscal and external sustainability, we estimate the following baseline equation (3):

$$SovereignRisk_{i,t,k} = \alpha_0 + \beta_1.Sustainability_{i,t,n} + \beta_2.X_{i,t} + \psi_i + \eta_t + \varepsilon_{i,t} \qquad (3)$$

where $SovereignRisk_k$ represents the sovereign risk faced by each country, where k is, alternatively, 10-year logarithm CDS and CDS Spreads, $Sustainability_{i,t,n}$ is each type of sustainability n, where n is the fiscal or external sustainability coefficient, for country i in quarter t, X is the set of the abovementioned control variables, ψ and η are the country i and time t specific effects, and ε is the error term. Equation (2) is estimated by employing a Panel Data Weighted Least Squares WLS-FE approach with country and time-fixed effects since the dependent variables are based on estimates. In particular, the estimates of the marginal responses are weighted by the respective standard deviations. Moreover, standard errors are corrected for heteroskedasticity and serial correlation.

5. Empirical Analysis

Regarding our results, we start by outlining the WLS-FE benchmark model for sovereign risks and fiscal and external sustainability. Further, in section 5.2. we report an analysis of the empirical results for different debt dynamics. Lastly, in section 5.3 we present a robustness analysis for country specific regions.

5.1. The Benchmark Model Results

Tables 2 and 3 provide the estimated results of equation (3), for CDS and CDS spreads, respectively. Specifically, we first highlight the results with the sustainability coefficients with one control variable at a time, until column (16) and all the control variables included in columns (17) and (18).

Regarding these results, we find the a priori expected results, i.e., a negative link between sovereign risks proxied by CDS and CDS Spreads and Fiscal and External Sustainability. Therefore, our findings underscore that fiscal sustainability within a country is inversely related to government risk. This suggests that effective public financial management by governments plays a pivotal role in diminishing its overall risk. When a country is more fiscally sustainable, it may signify prudent and responsible management of public finances, which, in turn, instils confidence in investors and stakeholders, mitigating concerns relative to the government's financial stability.

Effective public financial supervision and administration may reduce the general risk associated with government operations.

Our results also report a negative and statistically significant coefficient for external sustainability. This indicates that when a nation has more sustainable external current account balances this reduces the risk of the government, for the CDS, by 0.205 percentage points and for the CDS Spread by 0.265 percentage points. This is particularly pertinent for European economies with an outward orientation. The process of monetary integration, culminating in the adoption of the euro in 2001, has witnessed an expansion of credit and a decline in the private savings ratio, resulting in elevated current account deficits (Brissimis et al., 2010). Consequently, European economies, particularly those within the Eurozone, have become more susceptible to global external shocks. The maintenance of stable current account balances has, therefore, become pivotal in ensuring external financing stability.

In addition, our analysis indicates a positive and statistically significant relationship between the real effective exchange rate and risk. Hence, an appreciation of the REER is found to be leading to an increase in sovereign risk. The short-term rate is also positive and significantly related to risk, indicating that states find it more difficult to finance themselves.

Interestingly, inflation reported a positive and highly significant coefficient for the full regression of the CDS. Hence, a rise in inflation lead to an increase in sovereign risk. When inflation rises, central banks may respond by increasing interest rates to control it. Higher interest rates can significantly increase the cost of borrowing for the government. Moreover, inflation is often associated with economic uncertainty. A sudden increase in inflation can create uncertainty about future economic conditions, making it more challenging for governments to formulate effective fiscal policies. Investors may become wary of the economic outlook, leading to increased sovereign risk.

The coefficient for economic openness is negative and highly statistically significant. Thereby, greater openness, characterized by increased international trade and investment, can enhance a country's economic resilience. Diversification of economic activities and exposure to global markets can reduce reliance on a specific sector or domestic demand, making the economy more resilient to shocks. Moreover, open economies often have better access to external financing. A country engaged in

international trade and investment may find it easier to attract foreign capital. This can provide a buffer against fiscal pressures and reduce the risk of a country.

Not surprisingly, an increase in the output gap originates lower sovereign risk in the stand-alone estimates. However, when all variables are included, the relation is the opposite. We justify this by the interaction present in the full model between all variables and we confirm that there is no multicollinearity in the regression in accordance to the usual tests. During periods of positive output gap, government revenues typically rise, and government expenditures decline, largely influenced by the operation of automatic stabilizers. Generally, in such periods, there is a reduced reliance on discretionary fiscal policies, leading to an increase in public savings. Conversely, in periods characterized by a negative output gap, government revenues decrease, government expenditures increase, and there is a heightened reliance on discretionary fiscal policies to stabilize economic activity, thereby diminishing public savings.

Ultimately, we highlight that credit ratings exert an inverse influence on sovereign risk. Specifically, an increase in the rating level, as projected by credit rating agencies, serves to diminish the perceived market risk associated with the country's debt. When there is an improvement in the credit rating assigned by credit rating agencies, it signals a higher level of confidence in the country's ability to meet its financial obligations. Conversely, a reduction in a country's credit rating by credit agencies signifies diminished creditworthiness and a higher level of risk associated with that country.

Table 2: Results on CDS for an WLS-FE estimation, 2001Q4-2022Q3

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
β	-0.333***		-0.317***		-0.287**		-0.391***		-0.292**		-0.293**		-0.370***		-0.379***		-0.353***	
	(0.119)		(0.122)		(0.121)		(0.124)		(0.121)		(0.118)		(0.116)		(0.102)		(0.101)	
γ		-0.093		-0.083		-0.077		-0.055		-0.112*		-0.101		-0.260***		-0.205***		-0.205***
		(0.061)		(0.061)		(0.061)		(0.064)		(0.059)		(0.064)		(0.057)		(0.059)		(0.053)
REER			1.086***	0.667**													0.660*	0.689**
			(0.372)	(0.318)													(0.367)	(0.325)
Inflation					1.405**	0.877*											2.023***	1.929***
					(0.620)	(0.484)											(0.588)	(0.493)
Short Rate							0.086***	0.082***									0.053***	0.049***
							(0.011)	(0.010)									(0.009)	(0.008)
Openness									-0.013***	-0.012***							-0.006***	-0.007***
									(0.002)	(0.002)							(0.002)	(0.001)
Output Gap											-0.027**	-0.018*					0.025***	0.019**
											(0.011)	(0.011)					(0.008)	(0.008)
Debt													0.012***	0.014***			0.003*	0.003**
													(0.002)	(0.001)			(0.002)	(0.002)
Ratings															-1.783***	-1.941***	-1.719***	-1.862***
															(0.146)	(0.127)	(0.185)	(0.162)
Constant	1.841***	2.183***	-3.212*	-0.913	-4.466	-1.758	1.417***	1.768***	3.058***	3.371***	1.912***	2.244***	1.268***	1.521***	7.662***	8.379***	-4.643*	-3.524
	(0.119)	(0.171)	(1.741)	(1.483)	(2.792)	(2.180)	(0.138)	(0.192)	(0.216)	(0.254)	(0.128)	(0.177)	(0.130)	(0.139)	(0.497)	(0.430)	(2.486)	(2.186)
Obs.	1,354	1,354	1,297	1,297	1,297	1,297	1,297	1,297	1,297	1,297	1,297	1,297	1,354	1,354	1,33	1,33	1,273	1,273
R^2	0.835	0.830	0.832	0.825	0.832	0.825	0.840	0.836	0.839	0.834	0.832	0.825	0.846	0.846	0.883	0.878	0.891	0.891

Notes: * indicates the level of significance of 10%, ** a level of 5% and *** a level of 1%. In brackets we report the robust standard errors. Obs. are the observations for each regression.

Table 3: Results on CDS Spreads for an WLS-FE estimation, 2001Q4-2022Q3

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
β	-0.364*		-0.344*		-0.289		-0.411**		-0.305		-0.345*		-0.412**		-0.411**		-0.410**	
	(0.187)		(0.188)		(0.186)		(0.192)		(0.186)		(0.187)		(0.182)		(0.172)		(0.172)	
γ		-0.104		-0.088		-0.062		-0.080		-0.136		-0.108		-0.340***		-0.221**		-0.265***
		(0.106)		(0.106)		(0.104)		(0.108)		(0.102)		(0.109)		(0.105)		(0.106)		(0.101)
REER			1.500**	1.176**													0.396	0.334
			(0.655)	(0.598)													(0.687)	(0.668)
Inflation					2.400**	2.731***											3.607***	4.949***
					(0.966)	(0.955)											(1.198)	(1.245)
Short Rate							0.068***	0.076***									0.032*	0.045**
							(0.018)	(0.016)									(0.019)	(0.019)
Openness									-0.016***	-0.013***							-0.007*	-0.005
									(0.003)	(0.003)							(0.004)	(0.003)
Output Gap											-0.011	-0.007					0.060***	0.051***
											(0.014)	(0.015)					(0.013)	(0.013)
Debt													0.016***	0.019***			0.012***	0.013***
													(0.002)	(0.002)			(0.003)	(0.003)
Ratings															-1.740***	-2.072***	-1.586***	-1.884***
															(0.179)	(0.170)	(0.225)	(0.222)
Constant	3.142***	3.345***	-3.878	-2.156	-7.624*	-8.932**	2.797***	2.945***	4.671***	4.635***	3.196***	3.383***	2.289***	2.459***	8.665***	9.974***	-10.282*	-15.108***
	(0.337)	(0.345)	(3.128)	(2.835)	(4.335)	(4.277)	(0.348)	(0.356)	(0.437)	(0.416)	(0.347)	(0.365)	(0.334)	(0.343)	(0.676)	(0.631)	(5.352)	(5.714)
Obs.	1,285	1,285	1,234	1,234	1,234	1,234	1,234	1,234	1,234	1,234	1,234	1,234	1,285	1,285	1,262	1,262	1,211	1,211
R^2	0.813	0.794	0.811	0.789	0.811	0.792	0.812	0.793	0.816	0.794	0.810	0.788	0.823	0.808	0.839	0.822	0.848	0.835

Notes: * indicates the level of significance of 10%, ** a level of 5% and *** a level of 1%. In brackets we report the robust standard errors. Obs. are the observations for each regression.

5.2. Empirical results for different Debt Dynamics

In this subsection, we report our estimates of the dynamics of debt across countries. We begin by estimating four regressions for each sovereign risk proxy, for the case where sovereign debt is higher or equal to 90% of GDP, and lower than 90% of GDP[7]. This analysis is based on Reinhart and Rogoff (2010) who grouped observations according to the debt-to-GDP ratio. These results are presented in Table 4. We can see clearly that only in the case where debt is higher than 90% of the GDP, the sustainability of public finances is relevant since coefficients are negative and statistically significant. This demonstrates that fiscal sustainability does matter more for highly indebted countries, notably due to several interconnected factors that impact their stability, creditworthiness, and overall financial health.

Table 4: Results for different indebted levels – WLS-FE, from 2001Q4-2022Q3

Variable	Debt higher than 90% of GDP				Debt lower than 90% of GDP			
	CDS	CDS spread	CDS	CDS spread	CDS	CDS spread	CDS	CDS spread
β	-1.665***	-1.749***			0.046	-0.075		
	(0.313)	(0.379)			(0.065)	(0.175)		
γ			-0.192	-0.233			0.038	0.012
			(0.131)	(0.191)			(0.065)	(0.133)
REER	-21.450***	-15.500**	-21.472**	-16.384*	-0.286	-0.962	-0.169	-0.777
	(6.548)	(6.141)	(8.602)	(9.530)	(0.336)	(0.780)	(0.292)	(0.766)
Inflation	24.381***	18.695***	29.393***	24.433***	0.904	1.372	0.795	2.786*
	(6.111)	(6.721)	(7.775)	(9.331)	(0.591)	(1.409)	(0.542)	(1.478)
Short Rate	2.125***	1.275**	2.442***	1.600**	0.059***	0.037*	0.058***	0.044**
	(0.558)	(0.542)	(0.775)	(0.750)	(0.008)	(0.021)	(0.007)	(0.021)
Openness	0.034***	0.026**	0.022***	0.006	-0.005***	-0.009**	-0.007***	-0.006**
	(0.009)	(0.012)	(0.008)	(0.016)	(0.002)	(0.004)	(0.002)	(0.003)
Output Gap	-0.043	-0.061**	-0.034	-0.036	0.016**	0.043***	0.016*	0.039***
	(0.029)	(0.030)	(0.033)	(0.040)	(0.008)	(0.014)	(0.008)	(0.013)
Debt	-0.001	-0.008	0.009	0.006	0.014***	0.033***	0.016***	0.033***
	(0.007)	(0.008)	(0.007)	(0.008)	(0.002)	(0.005)	(0.002)	(0.004)
Ratings	-1.948***	-1.652***	-2.000***	-1.711***	-1.057***	-0.593**	-1.244***	-1.137***
	(0.230)	(0.277)	(0.259)	(0.367)	(0.178)	(0.292)	(0.176)	(0.290)
Constant	-15.216	-14.268	-37.927***	-35.569**	2.039	2.067	2.607	-3.677
	(16.118)	(17.191)	(12.987)	(17.321)	(2.534)	(6.470)	(2.470)	(6.816)
Obs.	305	302	305	302	968	909	968	909
R^2	0.915	0.905	0.910	0.883	0.921	0.859	0.913	0.852

Notes: * indicates the level of significance of 10%, ** a level of 5% and *** a level of 1%. In brackets we report the robust standard errors. Obs. are the number of Observations included.

Typically, heavily indebted nations face higher debt servicing obligations, including interest payments and principal repayments. Hence, fiscal sustainability is essential for

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[7] In the Appendix, we report the results for above average debt over GDP.

ensuring that governments can meet these financial obligations without resorting to unsustainable levels of borrowing. A failure to service debt can lead to defaults, damaging the country's creditworthiness and its access to financial markets.

Tables 5 and 6 provide a comprehensive analysis of the public debt dynamics. In Table 5, we present distinct analyses delineating the repercussions of rising public and external debt, as well as the consequences associated with diminishing debt levels. Our estimates indicate that during periods of rising debt, a greater emphasis on sustainable public accounts correlates with a reduction in the sovereign risk faced by nations. Conversely, when public debt is on the decline, no significant impact is discerned for fiscal sustainability. This observation implies that nations grappling with elevated levels of indebtedness may need to exert additional efforts to enhance the sustainability of their public finances. Such endeavours, in turn, are anticipated to yield positive repercussions in terms of mitigating the overall government risk.

Table 5: Analysis of Distinct Dynamics in Debt Trends – WLS-FE, from 2001Q4-2022Q3

	Debt Rising				Debt Falling			
Variable	CDS		CDS Spread		CDS		CDS Spread	
β	-0.599***		-0.756***		-0.052		0.198	
	(0.193)		(0.240)		(0.077)		(0.246)	
γ		-0.046		-0.051		-0.452***		-0.594***
		(0.076)		(0.119)		(0.074)		(0.171)
REER	0.042	-0.064	-0.766	-0.911	0.517	0.428	0.622	0.587
	(0.495)	(0.496)	(0.862)	(0.870)	(0.521)	(0.488)	(1.141)	(1.115)
Inflation	0.430	0.875	3.274***	3.814***	2.046***	1.695**	2.654	2.055
	(0.859)	(0.860)	(1.188)	(1.200)	(0.781)	(0.701)	(1.919)	(1.893)
Short Rate	0.037***	0.036***	0.044**	0.041**	0.078***	0.070***	-0.013	-0.017
	(0.013)	(0.012)	(0.018)	(0.017)	(0.020)	(0.017)	(0.052)	(0.051)
Openness	-0.009***	-0.009***	-0.007	-0.008*	-0.003	-0.003	-0.005	-0.007
	(0.002)	(0.002)	(0.004)	(0.004)	(0.002)	(0.002)	(0.006)	(0.005)
Output Gap	0.032***	0.027**	0.066***	0.059***	0.017	0.012	0.063***	0.058***
	(0.012)	(0.012)	(0.018)	(0.018)	(0.011)	(0.010)	(0.020)	(0.020)
Debt	0.001	0.002	0.009**	0.010**	0.006***	0.006***	0.016***	0.016***
	(0.003)	(0.003)	(0.004)	(0.004)	(0.002)	(0.002)	(0.005)	(0.005)
Ratings	-1.957***	-1.940***	-1.795***	-1.775***	-1.226***	-1.273***	-1.071***	-1.152***
	(0.259)	(0.271)	(0.295)	(0.311)	(0.203)	(0.176)	(0.283)	(0.260)
Constant	7.077*	5.591	-2.539	-4.249	-6.523**	-3.970	-9.102	-5.406
	(3.933)	(3.895)	(6.393)	(6.444)	(3.231)	(2.933)	(8.877)	(9.142)
Obs.	664	664	632	632	609	609	579	579
R^2	0.893	0.890	0.852	0.849	0.919	0.925	0.874	0.878

Notes: * indicates the level of significance of 10%, ** a level of 5% and *** a level of 1%. In brackets we report the robust standard errors. Obs. are the number of Observations included.

Notably, a distinctive pattern emerges when examining the dynamics associated with descent of public debt for the external sustainability. Our findings reveal that when there is declining public debt, an increased emphasis on the sustainability of external accounts corresponds to a reduction in sovereign risk. We argue that during phases of decreasing public debt, the primary drivers of sovereign risk may extend beyond the management of external accounts and may potentially encompass broader economic factors or global market conditions.

Table 6: Results for interaction - WLS-FE, from 2001Q4-2022Q3

Variable	CDS		CDS Spread	
β	-0.204		0.334	
	(0.252)		(0.397)	
$\beta *D$ ($\beta >avg$ β)	-0.161		-0.809**	
	(0.209)		(0.347)	
γ		-0.085		0.019
		(0.078)		(0.176)
$\gamma *D$ ($\gamma >avg$ γ)		-0.088*		-0.212*
		(0.045)		(0.116)
REER	0.654*	0.639*	0.321	0.188
	(0.366)	(0.326)	(0.688)	(0.670)
Inflation	2.036***	1.981***	3.718***	5.104***
	(0.587)	(0.494)	(1.203)	(1.213)
Short Rate	0.054***	0.050***	0.038*	0.048**
	(0.010)	(0.008)	(0.019)	(0.019)
Openness	-0.006***	-0.007***	-0.006*	-0.004
	(0.002)	(0.001)	(0.004)	(0.003)
Output Gap	0.025***	0.019**	0.061***	0.052***
	(0.008)	(0.008)	(0.013)	(0.013)
Debt	0.003*	0.003**	0.011***	0.013***
	(0.002)	(0.002)	(0.003)	(0.003)
Ratings	-1.716***	-1.861***	-1.572***	-1.872***
	(0.187)	(0.163)	(0.231)	(0.222)
Constant	-4.688*	-3.629*	-10.540**	-15.352***
	(2.476)	(2.170)	(5.330)	(5.643)
Obs.	1,273	1,273	1,211	1,211
R^2	0.891	0.891	0.849	0.836

Notes: * indicates the level of significance of 10%, ** a level of 5% and *** a level of 1%. In brackets we report the robust standard errors. Obs. are the number of Observations included. $\beta *D$ ($\beta >avg$ β) represents the interaction between the fiscal sustainability coefficients with a Dummy variable that takes the value 1 if the Country under study is above its average fiscal sustainability for a Quarter. $\gamma *D$ ($\gamma >avg$ γ) represents the interaction between the external sustainability coefficients with a Dummy variable that takes the value 1 if the Country under study is above its average external sustainability for a Quarter.

Furthermore, Table 6 displays the estimated results for the WLS-FE model which includes a dummy that takes the value 1 if, for each country if their fiscal (external) sustainability coefficient is higher than its average. We concluded that when countries

have an above average performance in terms of external sustainability coefficient it leads to a decrease in sovereign risk of 0.088 percentage points (for CDS), and 0.212 percentage points (for CDS Spreads) in comparison to countries that underperform.

Concerning the control variables, they provided the anticipated signs for the coefficients.

5.3. Results for country groups

In this section, we present a robustness analysis of countries' characteristics. Specifically, we investigate the impact of fiscal and external sustainability on sovereign risk for the first countries integrating the European Union[8] (Table 7).

Table 7: Results for interaction old vs new - WLS-FE, from 2001Q4-2022Q3

Variable	CDS		CDS Spread	
β	0.073		0.075	
	(0.097)		(0.145)	
$\beta *D (OLD)$	-0.649***		-0.766***	
	(0.163)		(0.276)	
γ		0.187*		0.440**
		(0.104)		(0.173)
$\gamma *D (OLD)$		-0.497***		-0.897***
		(0.123)		(0.212)
REER	0.734**	0.738**	0.472	0.437
	(0.368)	(0.321)	(0.685)	(0.658)
Inflation	1.928***	1.813***	3.522***	4.709***
	(0.592)	(0.497)	(1.203)	(1.247)
Short Rate	0.052***	0.048***	0.031	0.043**
	(0.009)	(0.008)	(0.019)	(0.019)
Openness	-0.006***	-0.007***	-0.007**	-0.005*
	(0.002)	(0.002)	(0.004)	(0.003)
Output Gap	0.027***	0.020***	0.064***	0.054***
	(0.008)	(0.008)	(0.013)	(0.013)
Debt	0.004*	0.004**	0.012***	0.014***
	(0.002)	(0.002)	(0.003)	(0.003)
Ratings	-1.715***	-1.813***	-1.585***	-1.788***
	(0.186)	(0.166)	(0.226)	(0.228)
Constant	-4.581*	-3.271	-10.260*	-14.613**
	(2.494)	(2.194)	(5.358)	(5.679)
Obs.	1,273	1,273	1,211	1,211
R^2	0.893	0.892	0.849	0.837

Notes: * indicates the level of significance of 10%, ** a level of 5% and *** a level of 1%. In brackets we report the robust standard errors. Obs. are the number of Observations included. *β *D (OLD)* represents the interaction term between the fiscal sustainability coefficients and a Dummy variable that takes the value 1 if the Country under study belongs to the first countries integrating the European Union. *γ *D (OLD)* represents the interaction term between the external sustainability coefficients and a Dummy variable that takes the value 1 if the Country under study belongs to the first countries integrating the European Union.

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[8] The countries are: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Italy, Ireland, Luxembourg, Netherlands, Portugal, Spain, and Sweden.

Our key observation is that for countries belonging to this group, a one-unit variation in the external sustainability coefficient corresponds to a noteworthy 3.1% reduction in sovereign risk, as measured by the CDS (0.187-0.497=-0.31). Additionally, in the case of the CDS Spreads, we note that an increase in the External Sustainability coefficient results in a consequential reduction of 4.57% (0.44-0.897) of the government's risk. Older countries within the European Union have a history of economic and political stability and include many core European economies. Thus, what happens within these countries naturally impacts others.

6. Conclusions

In this study, we have assessed the impact of fiscal and external sustainability on sovereign risk dynamics, spanning from 2001Q4 to 2022Q3, across a panel of 27 European Economies. To do so, we employed a two-step approach. Firstly, we have computed a country-specific, time-varying measure for both fiscal and external sustainability. Secondly, we employ Weighted Least Squares (WLS) Fixed Effect techniques within a panel data framework.

Additionally, we assess the dynamics of public debt across countries. Our approach starts by estimating four regressions for each sovereign risk proxy, distinguishing between cases where sovereign debt is equal to or exceeds 90% of GDP and it is below 90% of GDP. Subsequently, we delineate the ramifications of increasing public debt, as well as the consequences associated with decreasing debt levels. Finally, in a robustness analysis, we explore the impact of fiscal and external sustainability on sovereign risk, focusing on the initial countries integrating into the European Union.

The empirical findings highlight that a nation's fiscal sustainability contributes to a discernible reduction in its sovereign risk. When a country is fiscally more sustainable, it may signify prudent and responsible management of public finances, which, in turn, instils confidence in investors and stakeholders, mitigating concerns relative to the government's financial stability. We also concluded that when a country has more sustainable external current account balances this contributes to reduce the risk of the government. This is particularly pertinent for European economies open to the exterior. Furthermore, we find that fiscal sustainability matters more for more indebted countries, which may be due to several interconnected factors that impact their stability, creditworthiness, and overall financial health.

However, there is an amplification of these effects when countries have an upward trajectory in their government debt levels. This conclusion implies that nations grappling with increasing levels of indebtedness may need to exert additional efforts to enhance the sustainability of their public finances. Such endeavours, in turn, are anticipated to yield positive repercussions in terms of mitigating the overall government risk.

Lastly, our findings indicate that countries that overperform in terms of external sustainability experience a more pronounced reduction in sovereign risk, particularly evident in "older" European Union nations.

From a policy standpoint, it is imperative to underscore that imbalances in both public and current accounts hold the potential to instigate disruptive adjustments, thereby posing significant implications for financial market stability and overall economic activity. The confluence of a stressful scenario, such as a financial or pandemic crisis, coupled with external lack of sustainability, has the capacity to jeopardize a countrie's creditworthiness, leading to heightened risk premia and an ensuing disruption in financial flows. We highlight that in the context of Optimum Currency Areas (OCAs), economic disparities among member countries complicate sovereign risk analysis. The intricate economic interdependence emphasizes the need to assess internal and external risks. Asymmetrical fiscal and external resilience may disrupt OCA development, leading to varying levels of sovereign risk.

Finally, we stress that the less fiscal sustainable accounts could further precipitate uncontrolled deficits, necessitating external assistance and giving rise to substantial social and economic repercussions. Policymakers are advised to meticulously monitor their public and current account deficits, eventually necessitating proactive and gradual policy interventions. This may encompass robust structural policy reforms, stringent fiscal consolidations, and assertive measures to enhance external competitiveness.

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Appendix

Table A1: Matrix of Correlations

| Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
(1) cds	1.000														
(2) cdsspread	0.913	1.000													
(3) revenues	-0.242	-0.340	1.000												
(4) expenditures	-0.008	-0.097	0.856	1.000											
(5) imports	-0.094	-0.026	-0.491	-0.556	1.000										
(6) exports	-0.162	-0.106	-0.457	-0.533	0.972	1.000									
(7) Public debt	0.347	0.319	0.282	0.428	-0.384	-0.351	1.000								
(9) leer	0.061	0.089	-0.035	0.111	0.001	-0.003	0.040	1.000							
(10) Inflation	-0.249	-0.191	0.024	-0.065	0.189	0.199	0.068	0.025	1.000						
(11) Short rate	0.294	0.301	-0.185	-0.088	-0.046	-0.117	-0.254	0.160	-0.408	1.000					
(12) Openess	-0.132	-0.070	-0.476	-0.548	0.992	0.994	-0.369	-0.001	0.196	-0.085	1.000				
(13) Output gap	-0.094	-0.041	-0.061	-0.242	0.040	0.008	-0.085	0.005	0.071	0.165	0.023	1.000			
(14) Ratings	-0.749	-0.720	0.205	0.073	0.070	0.125	-0.547	0.066	-0.049	-0.062	0.100	0.111	1.000		
(15) fiscal	-0.015	-0.025	0.055	-0.073	0.056	0.068	-0.027	-0.146	-0.022	-0.037	0.063	0.060	-0.016	1.000	
(16) external	-0.248	-0.257	0.421	0.376	-0.065	-0.046	0.002	0.033	0.093	-0.033	-0.055	-0.033	0.215	0.083	1.000

Table A2: Tests of unit Root

	Im-Pesaran-Shin unit-root test		Fisher-type unit-root test Based on augmented Dickey-Fuller		Fisher-type unit-root test Based on Phillips-Perron	
Variables	Statistic	p-value	Statistic	p-value	Statistic	p-value
CDS	-2.7197	0.0033	72.6126	0.0124	101.7715	0.0000
CDS spread	-2.9245	0.0017	81.3636	0.0019	115.2910	0.0000
Revenues	-20.7037	0.0000	585.9750	0.0000	1161.202	0.0000
Expenditures	-17.1387	0.0000	447.2013	0.0000	836.0411	0.0000
Exports	-10.4836	0.0000	232.6919	0.0000	251.4217	0.0000
Imports	-11.3447	0.0000	266.4225	0.0000	271.4558	0.0000

**Table A3: Fisher-type unit-root test Based on augmented Dickey-Fuller**

Variables	Revenues		Expenditures		Exports		Imports	
Countries	Stat.	p-value	Stat.	p-value	Stat.	p-value	Stat.	p-value
Austria	26.8512	0.0000	13.2871	0.0013	13.7920	0.0010	15.8856	0.0004
Belgium	19.7189	0.0001	16.9176	0.0002	18.5891	0.0001	22.0219	0.0000
Bulgaria	24.0589	0.0000	22.5475	0.0000	9.8237	0.0074	8.3108	0.0157
Croatia	22.8637	0.0000	15.2554	0.0005	5.9895	0.0500	0.4285	**0.8072**
Cyprus	24.5926	0.0000	25.6021	0.0000	9.1263	0.0104	13.7490	0.0010
Czechia	36.5691	0.0000	19.7610	0.0001	11.2957	0.0035	11.3307	0.0035
Denmark	7.0389	0.0000	6.1666	0.0458	5.3178	0.0700	9.7891	0.0075
Estonia	20.0191	0.0000	8.9640	0.0113	7.7985	0.0203	12.6537	0.0018
Finland	27.4423	0.0000	8.9523	0.0114	11.0789	0.0039	8.3476	0.0154
France	11.0222	0.0040	13.6133	0.0011	7.1872	0.0275	3.8243	**0.1478**
Germany	19.4075	0.0001	11.4666	0.0032	10.9935	0.0041	6.2971	0.0429
Greece	19.6803	0.0001	21.3724	0.0000	3.9410	**0.1394**	3.7170	**0.1559**
Hungary	19.0327	0.0001	25.6866	0.0000	7.6976	0.0213	7.0559	0.0294
Ireland	17.9592	0.0001	23.7509	0.0000	6.9637	0.0308	19.2662	0.0001
Italy	20.9497	0.0000	14.8016	0.0006	7.5075	0.0234	5.1558	0.0759
Latvia	33.9564	0.0000	12.5568	0.0019	2.5236	**0.2831**	3.0777	**0.2146**
Lithuania	12.4903	0.0019	14.1150	0.0009	12.3798	0.0021	10.0845	0.0065
Luxembourg	21.0818	0.0000	13.0760	0.0014	9.5387	0.0085	14.7949	0.0006
Malta	26.1685	0.0000	19.1881	0.0001	5.4934	0.0641	10.1944	0.0061
Netherlands	30.9484	0.0000	10.2106	0.0061	9.4112	0.0090	10.7485	0.0046
Poland	15.9330	0.0003	23.7351	0.0000	11.9544	0.0025	9.8262	0.0073
Portugal	38.5978	0.0000	16.9774	0.0002	3.4370	**0.1793**	6.4241	0.0403
Romania	16.4438	0.0003	29.4520	0.0000	10.3525	0.0056	11.2339	0.0036
Slovakia	20.5374	0.0000	9.9653	0.0069	8.2394	0.0162	9.9499	0.0069
Slovenia	22.1115	0.0000	23.4943	0.0000	6.5707	0.0374	10.9450	0.0042
Spain	11.7357	0.0028	14.6341	0.0007	4.3715	**0.1124**	9.1588	0.0103
Sweden	18.7641	0.0001	11.6517	0.0030	11.3177	0.0035	12.1515	0.0023

Figure A1: Fiscal and External Sustainability by country (not normalized)
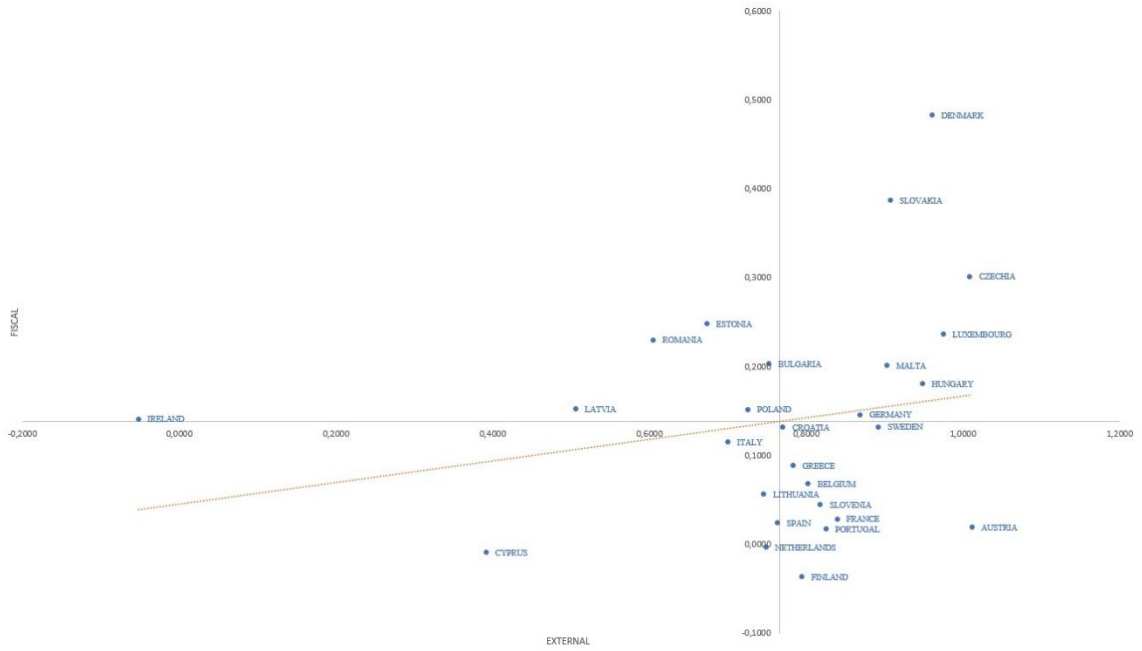
Notes: These graphs present the beta fiscal and External by country. Where the axis are the means of both variables.

Figure A2: Overall Fiscal and External Sustainability
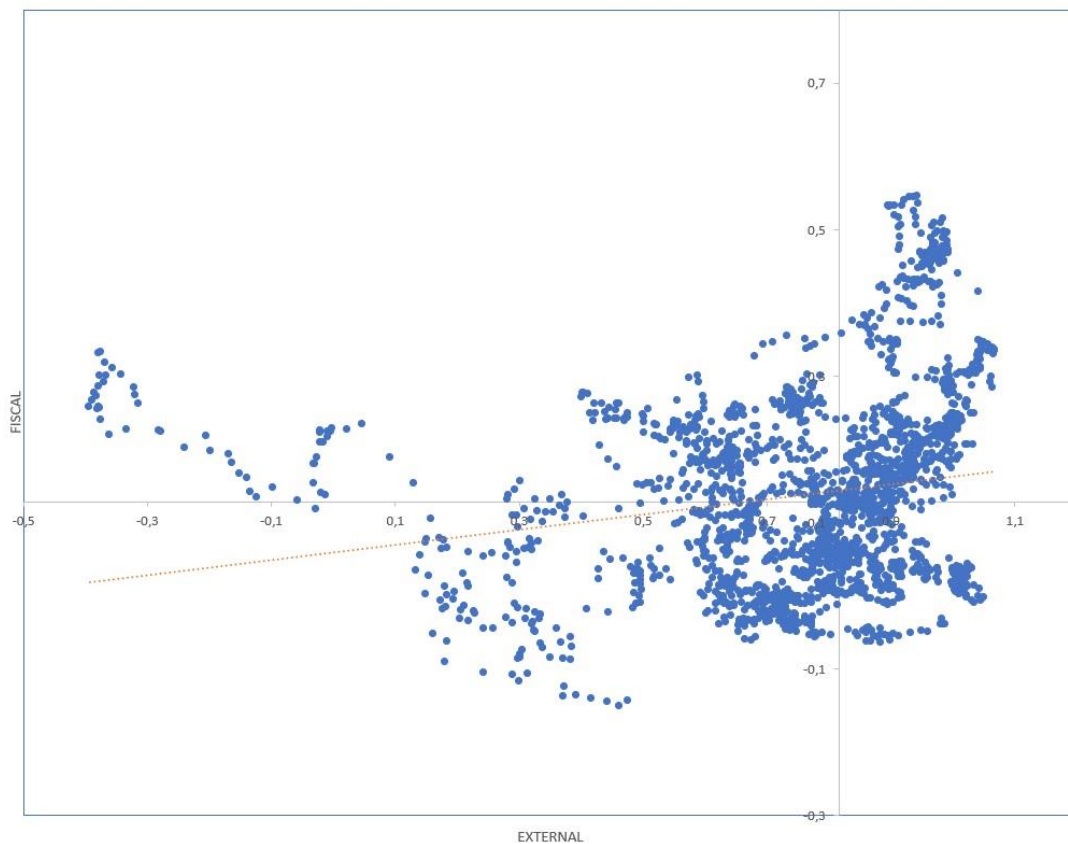
Notes: These graphs present the beta fiscal and External scatter plot. Where the axis are the means of both variables.

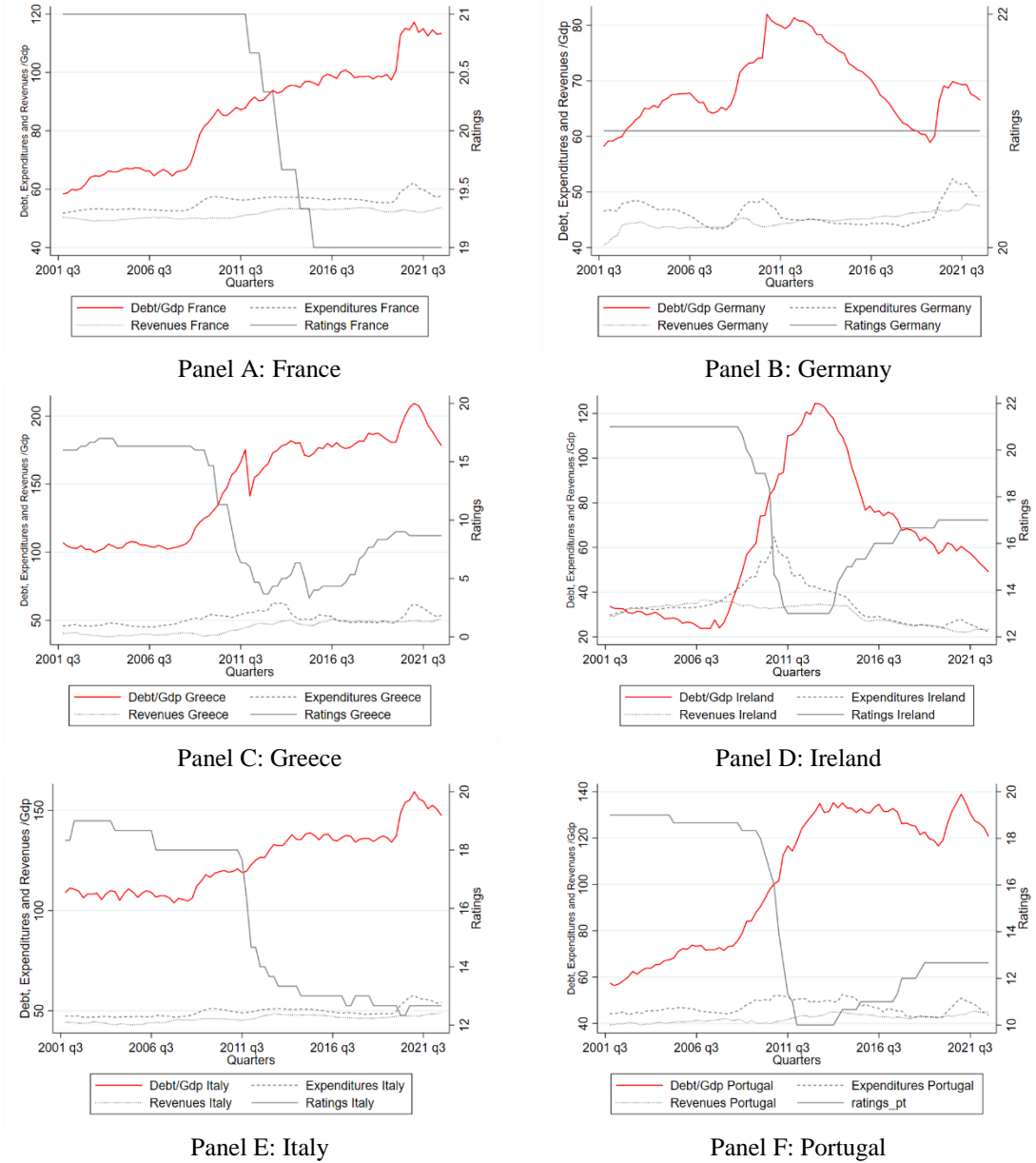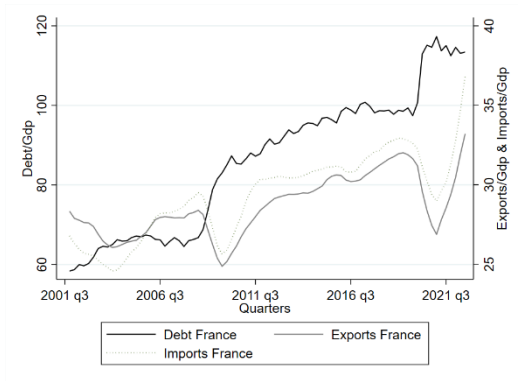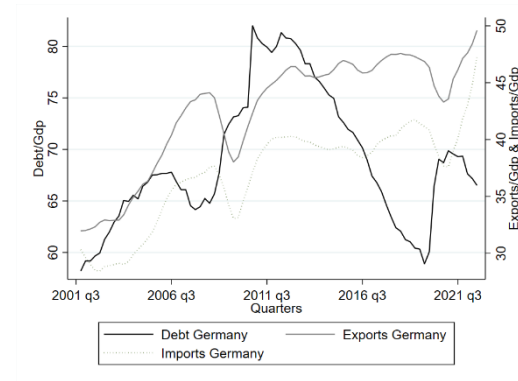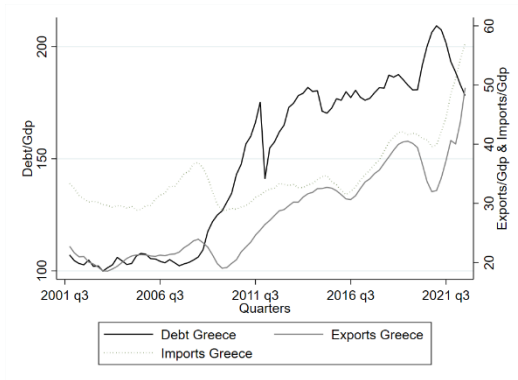**Figure A3**: Debt, Expenditures, Revenues over GDP and Ratings

Panel A: France

Panel B: Germany

Panel C: Greece

Panel D: Ireland

Panel E: Italy

Panel F: Portugal

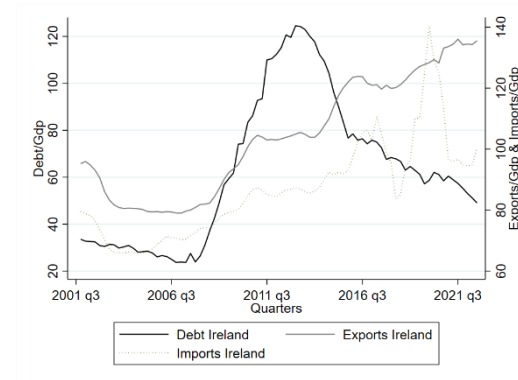**Figure A4:** Exports and Imports vs Debt
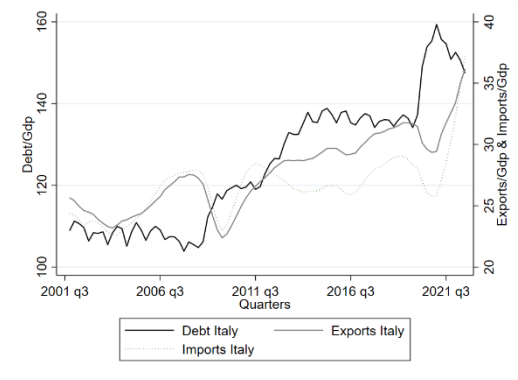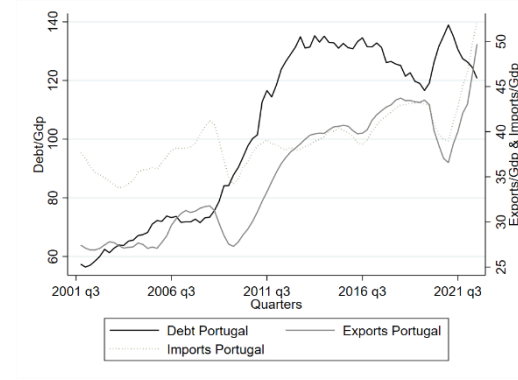

Panel A: France

Panel B: Germany

Panel C: Greece

Panel D: Ireland

Panel E: Italy

Panel F: Portugal

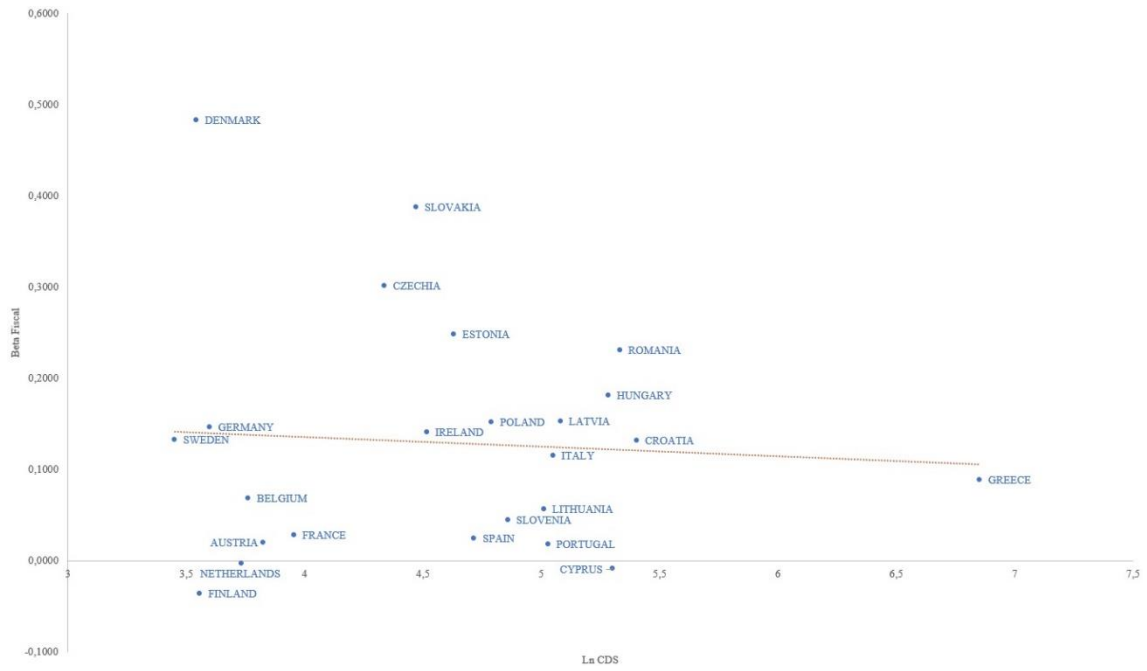**Figure A5:** LnCDS vs Fiscal Sustainability by Country
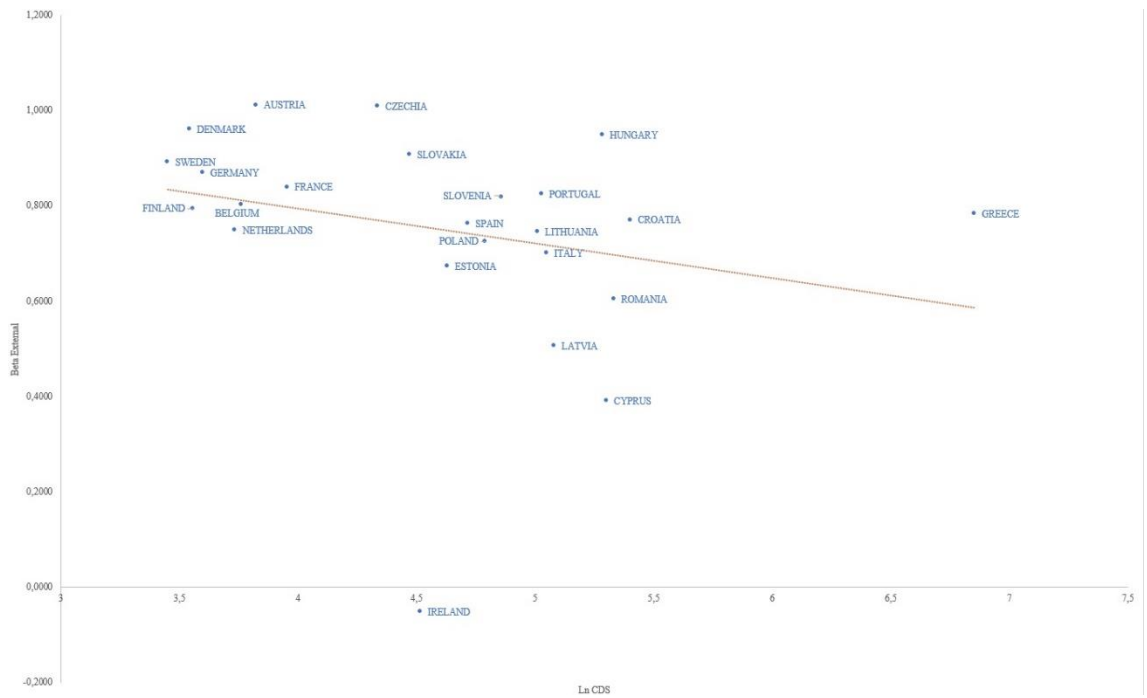

Figure A6: LnCDS vs External Sustainability by Country

Table 4.2: Results for different indebted levels – WLS-FE, from 2001Q4-2022Q3

Variable	Debt higher than Average				Debt lower than Average			
	CDS	CDS spread	CDS	CDS spread	CDS	CDS spread	CDS	CDS spread
β	-0.761***	-0.861***			0.072	-0.167		
	(0.153)	(0.185)			(0.152)	(0.477)		
γ			-0.274***	-0.236**			0.372**	0.169
			(0.056)	(0.106)			(0.156)	(0.308)
REER	1.076***	0.691	1.402***	1.037	0.435	0.914	-0.032	1.425
	(0.394)	(0.750)	(0.314)	(0.691)	(0.900)	(1.525)	(0.644)	(1.348)
Inflation	4.935***	6.297***	3.793***	6.237***	-0.286	-2.666	-0.118	-0.044
	(0.622)	(1.276)	(0.481)	(1.351)	(1.197)	(2.465)	(1.115)	(2.077)
Short Rate	0.030**	0.007	0.016	0.019	-0.003	-0.101***	0.010	-0.095***
	(0.015)	(0.024)	(0.011)	(0.018)	(0.016)	(0.036)	(0.016)	(0.035)
Openness	0.006**	0.006	-0.001	-0.004	-0.010***	-0.012*	-0.009***	-0.005
	(0.002)	(0.004)	(0.002)	(0.003)	(0.003)	(0.007)	(0.003)	(0.006)
Output Gap	-0.013	-0.001	-0.012	-0.002	0.035**	0.107***	0.024*	0.095***
	(0.011)	(0.015)	(0.009)	(0.013)	(0.014)	(0.025)	(0.014)	(0.027)
Public Debt	-0.003	-0.002	-0.000	0.002	0.019**	0.039**	0.032***	0.065***
	(0.003)	(0.004)	(0.002)	(0.004)	(0.010)	(0.016)	(0.007)	(0.013)
Ratings	-1.370***	-1.154***	-1.505***	-1.215***	-2.700***	-2.826***	-2.265***	-3.041***
	(0.185)	(0.214)	(0.178)	(0.230)	(0.654)	(0.778)	(0.628)	(0.775)
Constant	-18.609***	-25.348***	-13.788***	-25.655***	9.318	18.615	8.259	2.497
	(2.996)	(7.178)	(2.257)	(6.877)	(5.693)	(11.839)	(5.078)	(9.752)
Obs.	891	884	891	884	382	327	382	327
R^2	0.905	0.875	0.907	0.865	0.931	0.893	0.927	0.893