Fiscal Discipline meets Macroeconomic Stability: When the Eurobonds are a Good Idea

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Abstract

We describe a new Euro-insurance bond that implies sovereign debt mutualization in the Eurozone without any significant short-term redistribution across countries or perverse incentives to fiscal profligacy. Relying on a GVAR model including the Eurozone countries, the U.S., Japan and China, we analyze the future evolution of public debt (and other key macroeconomic variables) over time by comparing the predicted forecast in the baseline scenario and in a counterfactual scenario with the Euro-insurance bond. We find no significant differences in the future path of interest expenditures- and public debt-over-GDP ratios in the two scenarios, but a consistent reduction in the uncertainty of the estimates in the counterfactual scenario. The reduced uncertainty of forecasts of public debt and other macroeconomic variables highlights the capacity of the Euro-insurance bond to immunize the Eurozone from classical macroeconomic instability shocks that derive by the very existence of high sovereign debts and the related significant rollover risk in a framework of decentralized fiscal policies. Moreover, the proposed scheme would imply a new source of EU revenues that derives by the collection of fiscal (in)discipline premia from individual members of the Eurozone.

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1 Introduction

The reaction of the EU to COVID-19 crisis was unprecedented. The most surprising measure was the decision taken by the European Council on July 21st 2020 to finance part of the European Resilence and Recovery Fund (ERRF) by a temporary issuance of EU sovereign debt (European Council, 2020). Though this institutional experiment is a landmark in EU history, it is likely to be just a temporary break in the long-lasting, fierce dispute on pros and cons of a *true* EU fiscal policy. After the COVID-19 crisis (and provided that the ERRF is successful), structural Eurobonds or similar sovereign debt mutualization schemes are likely to regain the center of the economic policy debate in the EU.

In 2010, the surge of the European sovereign debt crisis pointed out the weaknesses of the EMU. The institutional design of the euro fostered fiscal risks in the pre-crisis period and amplified perverse financial dynamics once the crisis occurred (Lane, 2012). The reforms adopted by the European institutions in the aftermath of the sovereign debt crisis have not been sufficient to provide viable solutions to face future challenges, as the current crisis suggests. In this context, sovereign debt mutualization schemes have often been proposed as an important tool to enhance the resilience of the EMU to macroeconomic shocks and contagion risks across EU sovereigns.

As underlined by Claessens et al. (2012), the core objectives of several proposals of EU sovereign debt mutualization put forward before and after the 2010 Eurozone crisis are the enhancement of the EMU and EU economic institutions in three areas,

such as 1) monetary policy transmission; 2) financial and banking stability; 3) fiscal risk-sharing. However, the schemes that have been proposed to deliver improvements in all these areas are weak against two main critiques. The most important one is that the unique (or low) interest rate underlying several proposals of sovereign debt mutualization poses a moral hazard problem by inducing fiscal profligacy, particularly in high-debt countries (e.g., Issing, 2009). Second, many proposals would imply a politically unacceptable cross-country redistribution in the short run (e.g., Gros, 2011).

Building on Muellbauer (2013)'s *Euro-insurance bond*, we propose a new mechanism of sovereign debt mutualization which would afford the benefits of significant improvements of the EMU and EU economic institution in all the three areas highlighted above, while controlling for the main economic and political problems that may arise (i.e., moral hazard and cross-country redistribution).

Our Euro-insurance bond combines two features: bonds are issued (and traded on the secondary market) at a unique, basic interest rate; individual Member States that finance themselves by such bonds pay an interest rate that is the sum of the basic rate and a *fiscal discipline premium*. Each government of the euro area would finance (part of) its public debt through a central European debt agency that issues and manages the Eurobonds. The same institution would supervise the fiscal behavior of individual governments in order to charge differentiated fiscal discipline premia. Different from Muellbauer (2013) and similar to what European Council (2020) introduced, the EU sovereign debt would be backed by EU own revenues, particularly including the revenues from fiscal discipline premia. As highlighted in

the literature (e.g., Claessens et al., 2012), fiscal discipline premia may play an important role to keep price signals as an (ex ante) disincentive to fiscal profligacy, complementing ex ante and ex post fiscal coordination rules.

Most of the Eurobonds debate focused on the financial design and implications for financial stability of the EMU. However, considering the stabilization effect of the Eurobond may offer insights to widen the span of options of Eurobond design. Our main contribution is to show the capacity of the Euro-insurance bond to increase the stability of public debt in the future, reducing the variance of the forecast estimates with respect to the baseline scenario and the probability of disruptive and instability events. The analysis relies on a suitable Global VAR representation of the Eurozone and its links to other large developed and emerging economies. We estimate a GVAR model with ten major Eurozone countries and three key out-of-euro economies (China, Japan and USA) including five domestic variables reflecting the macroeconomic dynamics of each country over time (real GDP growth, long-term interest rate, interest expenditure, primary balance and debt-over GDP). This model specification allows us to perform a baseline (no Eurobond) and counterfactual (with Eurobond) analysis for all countries together with only two estimations, which directly report the debt-over GDP forecast in the two scenarios. Moreover, the Global VAR methodology makes possible to compute the out-of-sample probabilities (probabilistic forecast) associated with any possible positive or negative future scenarios with respect to our variables of interest.

From the best of our knowledge, the unique literature contribution performing VAR analysis to evaluate the effects of an Eurobond proposal scheme on sovereign debt-

dynamics is Tielens et al. (2014), who assess the impact of Eurobond on Greece, Portugal and Ireland fiscal dynamics. However, our paper differs from Tielens et al. (2014) in two key methodological elements. First, while they estimate three country-specific VAR models for the countries considered, we combine, as argued, all our countries in the same GVAR estimation, allowing then for any possible interdependences among individual dynamics. We do believe this framework provides a more realistic framework, taking into account potential fiscal contagion phenomena typical of the euro area. Second, they do not directly include the debt-over GDP ratio in the VAR estimation but they rather make forecast on a vector of variables which are then calibrated in a particular low of debt motion. By avoiding this second step, we are able to perform our counterfactual analysis without including in the set-up an exogenous law which drives sovereign debt dynamics over time.

Relying on a GVAR model, we show that the introduction of a Euro-insurance bond, when the calibrated fiscal discipline premium does not produce significant differences in the future path of the interest expenditures in the two scenarios, is still beneficial in terms of reduction in the overall volatility of expected future debt-to-GDP ratio when compared to the case without the Eurobond. Our idea is that this result may depend on the improved immunitization of the public debt with respect to different sources of macroeconomic instability and that, by this channel, the Eurobond would reduce the overall macroeconomic volatility of the euro area.

The paper is organized as follows: Section 2 briefly reviews the different strands of the literature our paper refers and contributes to; Section 3 describes the institu-

tional details of our Euro-insurance bond; Section 4 describes our dataset and the empirical strategy implemented; Section 5 plots and comments our main results; then, Section 6 draws conclusions.

2 Related literature

Given the paper's objectives and the empirical methodology, we contribute with different emphasis to three strands of the literature. First, we insert our Euro-insurance bond proposal in the wide but controversial Eurobond debate, which is still an open discussion since none of the suggested alternatives was formally implemented so far. Second, the policy motivations (and implications) of our analysis provides results which enrich the ongoing dispute on pro and cons of a true common fiscal policy at European level as an instrument to reach consolidated and widespread public-debt stability in the Eurozone. Finally, this paper joins the literature on GVAR forecast application at a country levels, being the first GVAR application aimed at evaluating the introduction of a common debt-instrument in the Euro area in a counterfactual framework.

2.1 The Eurobond debate

In the two decades lasting from the introduction of the Euro and the COVID-19 crisis, economists and politicians has hotly debated about the opportunity to complete the European Monetary Union (EMU) with a common fiscal policy including the possibility to issue common European sovereign debt or, at least, some sort of sovereign-debt mutualization mechanism. The 2010 Eurozone sovereign debt crisis showed how risky such unfinished framework is for the very existence of the EMU

and, probably, of the EU economic institution. The European institutions solved that crisis with a mix of enhanced procedures to coordinate Member States' fiscal policies and *ad hoc* (and very controversial) tools, such as the European Stability Mechanism (ESM) and sovereign-bond purchasing programs of the ECB.

The first Eurobond proposal was put forward by Giovannini Group (2000), aiming at improving sovereign debt management cooperation and the integration and liquidity of sovereign debt market. The proposal was criticized by many authors (e.g., Issing, 2009). The most important critique was that the unique interest rate underlying the Giovannini Group (2000)'s proposal would pose a moral hazard problem by inducing fiscal profligacy, particularly in high-debt countries. Moreover, such a proposal would imply a politically unacceptable cross-country redistribution in the short run in favour of countries with scarse fiscal discipline (Gros, 2011; Cioffi et al., 2019).

Afterwards, many Eurobond proposals tried to build up a mutualization scheme able to deal with the limits presented. De Grauwe and Moesen (2009) proposed a collective debt instrument whose emission is managed by the European Investment Bank (a central organization involving all EU members as shareholders) and which is traded on the markat at a unique interest rate calculated as the weighted average of interest rates on member states' bonds. According to De Grauwe and Moesen (2009), each member state should transfer part of his public debt to the EIB receiving financial resources on which a differentiated spread according to their fiscal position is paid (the same it would pay on the financial markets). This design protects member countries from shifts in market sentiments and contagion effects

in case of liquidity crisis, preserving correct incentives to fiscal discipline. Even the latter approach was criticized arguing that if the spreads payed to receive financial resources were the same as on the markets, interest expenditure for many countries would remain unsustainable, therefore the stability issued would not be settled (Boonstra, 2011).

Differently, Delpla and Von Weisacker (2010) propose the *Blue Bond-Red Bond* mutualization scheme. It is a voluntary program which would split the public debt of countries in two different tranches: a senior tranche up to 60% of the total stock, emitted in Blue bonds, which are safe and guaranteed at European level; the remaining part, the Red Bonds, covered by national guarantee. According to the authors, the strengths of this scheme are the differentiation in the cost of borrowing of individual States, which avoids the convergence to a unique interest rate, and the capacity to mitigate the risk of contagion from countries facing difficulties in refinancing on the markets. Unfortunately, the reliance on market discipline was one of the main downsides of this proposal. Indeed, Boonstra (2011) points out that, looking at empirical data, markets completely mispriced national bonds in the decade 2000-2010. Moreover, since participation is voluntary, the most stable countries may not join the program and the whole system would become unsustainable.

Boonstra and Bruinshoofd (2013) advanced the proposal of the transitional regime of Euro-Treasury Bills, the collectively guaranteed (cross-guarantee) short-term Eurobonds. The latter is a programme whose participation is subject to solvency conditions: countries that already need financial support do not qualify and my join only after solving their instability problems. Financially stable countries can finance

themselves over a period of four years through collectively guaranteed short-term bonds issued by a new agency, the EMU Fund. Financing costs may vary from country to country according to an interest rate premium which is a weighted average of the deviations to target debt and deficit levels and part of the resources collected through this process become as reserves in the EMU Fund balance sheet. One of the main advantages of the scheme is its the temporary nature of the program, since it would be fast to introduce and it gives the opportunity to experience a *trial period*. Moreover, it has a very strong disciplinary effect: the moral hazard issue is contained differentiating financing costs through the mechanism mentioned above. However, the exclusion of an undisciplined member state would imply non-negligible effects on the stability of the mechanism.

Another proposal from De Haan et al. (2012) employed a scheme in which the European budget authority is in charge of emitting bonds on the markets on behalf of euro zone countries. Member countries qualify only if they prove to keep their fiscal position on a sustainable path as defined in the Maastricht Treaty or according to monitored adjustment programs followed by the ESM. The mechanism has been criticized because it would require a deep degree of fiscal integration between state members, which is far to be reached in the current EMU situation.

The ones presented were only the bulk of the proposals which have been advanced in the last decade by the scientific literature. They are all attempts to provide the EMU with a mechanism that increases liquidity in government bond markets while decreasing financing costs and keeping public debt levels on a sustainable path. Of course, everything containing moral hazard and dealing with imperfect fiscal inte-

gration of the union. The key aspect emerging from the review is that the design and the methodologies characterizing any common debt mutualization mechanism crucially influences the feasibility and the success of the project. Indeed, the EMU did not accept and implement any of these proposals so far, since all of them incorporate different but unacceptable shortcomings which would compromise the positive effect of the realization.

2.2 GVAR empirical applications

After GVAR models were firstly introduced by Pesaran et al. (2004), the number of contributions exploiting this approach in the academic literature has progressively grown in the last decades, covering various fields and applications[1] (e.g., financial markets and international business cycle, output gaps linkages, trade imbalances, credit risk and portfolio analysis).

As proposed by Chudik and Pesaran (2016), the GVAR empirical literature may be split in different branches depending on the type of cross-section units (global or sectoral applications) and depending on whether the GVAR estimation is exploited for forecasting. Focusing on GVAR forecasting global applications, in line with the purposes of our paper, the first contribution belongs to Pesaran et al. (2009) who exploit the GVAR general representation to compute one and four quarter ahead forecasts for classical real and financial macroeconomic variables. Afterwards, other applications found that taking into account the rest-of-the-world's dynamics may improve the performance of a macro model estimated to forecast domestic variables (Schanne, 2011), even in the case of regime switching analysis (Gross and Binder,

[1]For a detailed review of the main GVAR empirical applications we refer the reader to the GVAR handbook by Di Mauro and Pesaran (2013).

2013).

Global trade imbalances were also object of forecasting GVAR applications by using a mixed conditioning information sets (Bussiere et al., 2012) and computing event-related probabilistic forecasts (Greenwood-Nimmo et al., 2012). More recently, Bayesian estimation of GVAR applications for forecasting were implemented, also allowing for time-depending variance-covariance matrix (Huber, 2016; Cuaresma et al., 2016). As far as we know, the unique forecasting applications estimating a GVAR model in the Euro area comes from Favero (2013) and Favero and Missale (2016) investigating the role of different spread determinants over time.

In the next section we provide the motivations and technical details of our proposal for a new Euro-insurance bond trying to deal with the issues presented above.

3 The Euro-insurance bond

To trade off the objectives of fiscal discipline and macroeconomic stability, our Euro-insurance bond combines two features: bonds are issued (and traded on the secondary market) at a unique, basic interest rate; individual Member States that finance themselves by such bonds pay an interest rate that is the sum of the basic rate (which replicates the German bund rate in our assumption) and a fiscal discipline premium. Each government of the euro area would finance part of its public debt through a central European debt agency[2] that issues and manages the Eurobonds. The same institution would supervise the fiscal behavior of individual governments in order to charge differentiated fiscal discipline premia. The fiscal dis-

[2] Alternative "decentralized" mechanisms could be conceived to issue our Euro-insurance bond.

cipline premium should be conceived as a (simplified) translation of the existing EU regulations aiming at inducing fiscal solvency of member States. Following Boonstra and Bruinshoofd (2013), the equation we adopt to compute the fiscal discipline premia for each country i in the specific quarter t, $\pi_{i,t}$, is:

$$\pi_{i,t} = \alpha max[0, \frac{1}{4}\sum_{n=1}^{4} b_{i,t-n} - b^*{}_{i,t-1}] + \beta max[0, d_{i,t-1} - d^*{}_{i,t-1}] \tag{1}$$

where α is the (non-negative) weight of deviations of the average debt-to-GDP ratio of the country i in the previous four year (i.e., a 4-year moving average) with respect to the target for the same year (i.e., $b^*{}_{i,t-1}$) and, similarly, β is the (non-negative) weight of deviations of the deficit-to-GDP ratio of the same country (i.e., $d_{i,t-1}$) with respect to the target (i.e., $d^*{}_{i,t-1}$).

The parameters α and β would be determined in the framework of a technical and political bargaining process, much in the same way coordination procedures of fiscal policies are currently implemented within the EU. In our empirical framework, we estimate them from the results of a panel regression model which relates the deviations of GDP-ratio and deficit-ratio from the target to the country-specific spread relative to the German long-term rate. Formally, we estimate by OLS the linear regression:

$$spread_{i,t} = \sigma + \alpha(b_{i,t} - b^*{}_{i,t}) + \beta(d_{i,t} - d^*{}_{i,t}) + \epsilon_{i,t} \tag{2}$$

where σ is an intercept, α and β are the parameters of interest and ϵ represents a general error term. This mechanism is able to replicate the disciplining effect of markets, without incurring in the short-term mispricing that were observed in the

euro area in the last two decades (e.g., De Haan et al. (2012)), giving rise to contagion problems. Indeed, if we graphically represent the long-term interest rate of each country compared with the basic rate plus the fiscal discipline premium in the last decades (Figure 1), during the great recession and the sovereign debt crisis long term rates significantly higher especially in high-debt countries (e.g., Italy, Portugal, Spain).

The flexibility of the fiscal discipline premium may also afford a second result. Fixing at an appropriate level the parameters and the targets determining the fiscal discipline premia, it is possible to avoid undesired excessive reduction of interest rate expenditure in high-debt countries, which would prevent that they implicitly benefit from redistribution from low-debt countries because of the introduction of the Eurobond.

In the long Eurobond debate, some contributions have already underlined that even if redistribution across countries is prevented, which means that high-debt countries could not benefit of lower interest outlays, still such an instrument would be beneficial for all euro area countries (e.g., De Grauwe and Moesen, 2009; Brunnermeir et al., 2011). Indeed, without any significant changes in the average level of interest expenditure in all countries, still it is possible that the described mechanism induces improvements in the level of macroeconomic stability in terms of debt sustainability over time.

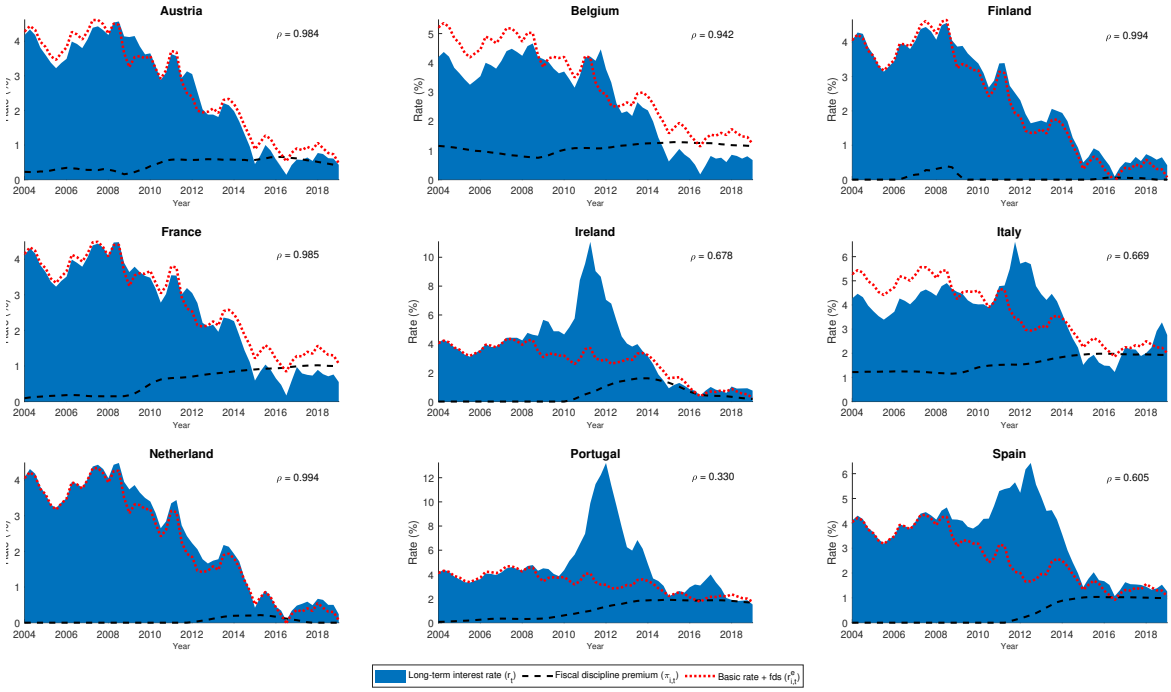

Figure 1: Long Term interest rate and Fiscal Discipline Premium in the period 2004-2019 for the Eurozone countries considered.

4 Model Specification: Global VAR

To empirically meet our objectives, we estimate a GVAR model employing data on the Eurozone countries, the U.S., Japan and China and including five domestic variables reflecting the macroeconomic dynamics of each country over time. The main advantage of this framework is the ability to describe straightforwardly the connection between each country and the rest-of-the-word, thus defining spillover effects based, for each country dynamics, on international variables that are considered weakly exogenous. In our context, this allows us to jointly consider the macroeconomic dynamics of all eurozone countries and to account for potential debt externalities among them in the whole EMU system. We exploit the parameters estimated

to analyse the future evolution of public debt over time by comparing the predicted forecast in the baseline scenario and a *conditional forecast* in the Euro-insurance bond scenario. In the following, we briefly survey the bulk of the GVAR foreacsting empirical literature and we then present the technical details of the estimated model.

4.1 General representation and counterfactual analysis

The GVAR model is built in two steps: first, a VARX dynamics is considered and estimated for each country; second, all of the individual VARX are combined and solved contemporaneously, to obtain a unique VARX dynamics to describe global macroeconomic fluctuations.

In the first step, each country $i = 1, \ldots, N = 13$ is described by a VARX(1,1) model

$$\boldsymbol{x}_{it} = \boldsymbol{\alpha}_i + \boldsymbol{\beta}_i t + \Phi_{i1}\boldsymbol{x}_{it-1} + \Lambda_{i0}\boldsymbol{x}^*_{it} + \Lambda_{i1}\boldsymbol{x}^*_{it-1} + \epsilon_{it} \tag{3}$$

where ϵ_{it} is an exogenous and gaussian vector of shocks, $\boldsymbol{x}_{it}$ is a vector of country specific variables, whereas $\boldsymbol{x}^*_{it}$ is a vector of foreign variables, obtained by a linear combination of the corresponding variables for the other countries with given weights $w_{ij},\ i, j = 1, \ldots, N$, i.e.,

$$\boldsymbol{x}^*_{it} = \sum_{j=1, j\neq i}^{N} w_{ij}\boldsymbol{x}_{jt}. \tag{4}$$

As a second step, all the individual VARX are stacked and solved. Specifically, $\boldsymbol{x}_t = (\boldsymbol{x}_{1t}, \ldots, \boldsymbol{x}_{1t})$ is the stacked vector of all the *internal* variables, that can be

proved obeys the following dynamics (Chudik and Pesaran, 2014)

$$\boldsymbol{x}_t = \boldsymbol{a} + \boldsymbol{b}t + \boldsymbol{F}\boldsymbol{x}_{t-1} + \boldsymbol{u}_t \tag{5}$$

where $\boldsymbol{a}$, $\boldsymbol{b}$ and $\boldsymbol{F}$ are parameter's matrices that can be obtained form the parameters of the individual VARX models and the weights matrix W. The error term $\boldsymbol{u}_t$ is a linear combination of $\epsilon_t = (\epsilon_{1t}, \ldots, \epsilon_{Nt})$.

From a practical point of view, GVAR allows to describe in a unified framework the global economy, avoiding the course of dimensionality issue, caused by the large dimension of $\boldsymbol{x}_t$. In fact, each individual VARX is estimated independently from the others even though is solved globally.

We use the GVAR to implement a counterfactual analysis, to evaluate the impact of the Eurobond introduction. We base our exercise on Pesaran et al. (2007), by comparing the conditional probability distributions of forecasted macroeconomic variables in case of the introduction of Eurobonds (counterfactual), compared with the *regular* predictions.

The counterfactual is thus based on a conditional forecast, in which we assume interest rates for each countries are determined by a benchmark rate (here, we consider the German rate) plus a spread defined in Section 3. This corresponds to imposing a constraint on future predictions

$$\Psi_{T+h}\boldsymbol{x}_{T+h} = \boldsymbol{d}_{T+h}, \quad h = 1, \ldots, H \tag{6}$$

where Ψ_{T+h} is a selection matrix, $\boldsymbol{d}_{T+h}$ is a vector of predetermined spreads and H is the forecasting horizon. Here, we deviate from Pesaran et al. (2007), by assuming the spread is not fixed at T and kept constant all over the forecasting horizon, but is updated on the basis of past deficits and debt/GDP ratios. Implicitly, we do not assume a long term commitment for all the euro countries, but a deal that is renewed at each time (or for a limited amount of time). Provided the prediction based on the past I_T for $\boldsymbol{x}$ under the *regular* scenario, is $\hat{\boldsymbol{x}}_{T+h} = \mathrm{E}[x_{T+h}|I_T]$ with forecasting error Ω_{hh}, it can be easily proved that the counterfactual predictions are

$$\begin{aligned} \hat{\boldsymbol{x}}^c_{T+h} &= \mathrm{E}[x_{T+h}|I_T, \Psi_{T+h}\boldsymbol{x}_{T+h} = \boldsymbol{d}_{T+h}], \quad h = 1, \ldots, H \\ &= \hat{\boldsymbol{x}}_{T+h} + \Omega_{hh}\Psi'_{T+h}(\Psi_{T+h}\Omega_{hh}\Psi'_{T+h})^{-1}(\boldsymbol{d}_{T+h} - \Psi_{T+h}\hat{\boldsymbol{x}}_{T+h}) \end{aligned} \tag{7}$$

and prediction accuracy given by

$$\Omega^c_{hh} = \Omega_{hh} - (\Omega_{hh}\Psi'_{T+h})(\Psi_{T+h}\Omega_{hh}\Psi'_{T+h})^{-1}(\Psi_{T+h}\Omega_{hh}) \tag{8}$$

It can be also proved that the forecast differential $\delta_{t+H} = \hat{\boldsymbol{x}}_{T+h} - \hat{\boldsymbol{x}}^c_{T+h}$ is Gaussian

$$\delta_{T+h}|I_T \sim \mathcal{N}\left(\hat{\boldsymbol{x}}_{T+h} - \hat{\boldsymbol{x}}^c_{T+h},\ \Omega_{hh} - \Omega^c_{hh}\right), \quad h = 1, \ldots, H. \tag{9}$$

This differential represents, in our exercise, the impact of the introduction of the Eurobond.

4.2 Data

The main sources of the data employed in our model are the OECD database and the ECB data warehouse. In order to increase the quality of our specification in terms of variability, we decided to collect data on quarterly basis, considering a total of 68 quarters going from 2002-Q4 to 2019-Q3[3]. Specifically, we estimate a GVAR model with 5 different domestic variables:

- the real GDP growth rate g_t[4];
- the debt-over GDP ratio b_t (in %);
- the nominal interest rate on 10-years bond r_t;
- the interest expenditure-over GDP ratio ie_t (in %);
- the primary balance-over GDP ratio pb_t (in %).

Countries included in the sample are ten major Eurozone countries[5], for which data are fully available on the entire time period for all the domestic variables, and other three out-of-Euro countries (China, Japan and USA) for which only some of the variables considered have been included in the sample[6] due to data availability.

Concerning the country-specific weights (exploited to build the country-specific foreign variables included in the GVAR model), we opt for a series of time-invariant weights $w_{i,j}$ computed according to the trade shares of the i country with respect to

[3]Our estimates are therefore exempted from all the strong economic consequences occured in the last months due to Covid-19.

[4]Growth rate is computed comparing one observation with the same observation of the previous year

[5]Austria, Belgium, Finland, France, Germany, Ireland, Italy, Netherlands, Portugal and Spain

[6]g and r for Japan and USA and only r for China

all the other j countries in the sample on worldwide basis, which have been finally scaled-up to one, as required by the methodology. Specifically, we computed trade shares as the average direction of trade statistics (exports) over last five years (2015-2019) provided annually by IMF, in line with Pesaran et al. (2007). Once scaled-up to one, our final matrix of time-invariant weights is the one reported in the table 1.

Country	Austria	Belgium	Finland	France	Germany	Ireland	Italy	Netherl.	Portugal	Spain	China	Japan	USA
Austria	0.000	0.028	0.082	0.051	0.192	0.031	0.129	0.032	0.021	0.033	0.036	0.028	0.047
Belgium	0.063	0.000	0.100	0.156	0.100	0.074	0.093	0.185	0.040	0.047	0.024	0.023	0.036
Finland	0.063	0.072	0.000	0.040	0.108	0.084	0.063	0.135	0.026	0.040	0.088	0.077	0.064
France	0.057	0.135	0.082	0.000	0.097	0.094	0.150	0.063	0.085	0.145	0.055	0.040	0.055
Germany	0.382	0.073	0.180	0.105	0.000	0.110	0.115	0.128	0.063	0.070	0.102	0.050	0.073
Ireland	0.019	0.206	0.040	0.040	0.039	0.000	0.040	0.074	0.022	0.038	0.033	0.062	0.168
Italy	0.167	0.067	0.081	0.135	0.089	0.067	0.000	0.046	0.079	0.107	0.042	0.049	0.075
Netherl.	0.085	0.195	0.181	0.091	0.143	0.110	0.078	0.000	0.053	0.054	0.026	0.018	0.026
Portugal	0.042	0.037	0.078	0.119	0.061	0.069	0.062	0.055	0.000	0.395	0.016	0.033	0.030
Spain	0.057	0.056	0.072	0.172	0.069	0.089	0.154	0.057	0.569	0.000	0.027	0.057	0.032
China	0.013	0.022	0.043	0.023	0.032	0.032	0.042	0.079	0.021	0.031	0.000	0.281	0.217
Japan	0.015	0.021	0.015	0.013	0.022	0.026	0.016	0.038	0.007	0.010	0.316	0.000	0.177
USA	0.038	0.087	0.047	0.056	0.048	0.214	0.056	0.108	0.014	0.031	0.235	0.282	0.000

Table 1: Matrix of countries-specific weights employed in the GVAR estimation

5 Results

Estimating a GVAR (1,1) model for the period 2002Q4-2019Q3, we forecast the future dynamics of public debt-over-GDP ratio within a time horizon of 5 years (20 quarters starting from 2019-Q4) for all Euro zone countries in the sample. Specifically, we estimate *regular* forecasts including in the GVAR model observable data for the variables considered, and *conditional* forecast in the counterfactual scenario with Eurobond by restricting the values of the long-term interest rate to the ones obtained with the application of the fiscal discipline premia described in section 3. Practically, we impose a constraint on future predictions as in Pesaran et al. (2007), but we deviate from their assumption of fixed binding by letting the fiscal discipline premia (our spreads on German bund rate) to move over time according to debt

and deficit dynamics. Forecasts obtained are plotted in Figure 1 with shaded areas indicating the 95% confidence intervals of the estimates. For the sake of simplicity, and to avoid the combination of macroeconomic dynamics and micro-finance issues into the same analysis, the conditional forecasts are build and estimated under the assumption that the countries considered issue the totality of their public debt by exploiting the Euro-insurance bond, starting from the first quarter of the forecast period.

Results shows no significant differences in the future path of public debt-over-GDP ratio in the two scenarios for all countries in the sample, but a consistent reduction in the level of uncertainty of the estimates in the counterfactual analysis with the Euro-insurance bond with respect to the regular forecasts (confidence intervals of the estimate are clearly narrower in the conditional forecast for all countries). The lower volatility of future estimates indicates an higher stability of public debt dynamics in the next 5 years for all the Euro area in the Euro-insurance bond scenario. Moreover, the validity of these results is confirmed by the fact that the forecasts (regular and conditional) estimated for interest expenditures (see Figure 2) behave similarly, showing no significant difference in the point estimate in the two scenarios. As a consequence, the increase in future public-debt stability is reached without any redistribution effect across countries, since in the Euro-insurance bond scenario the path of interest expenditure over time reports no significant deviations with respect to the regular estimate for all countries in the sample.

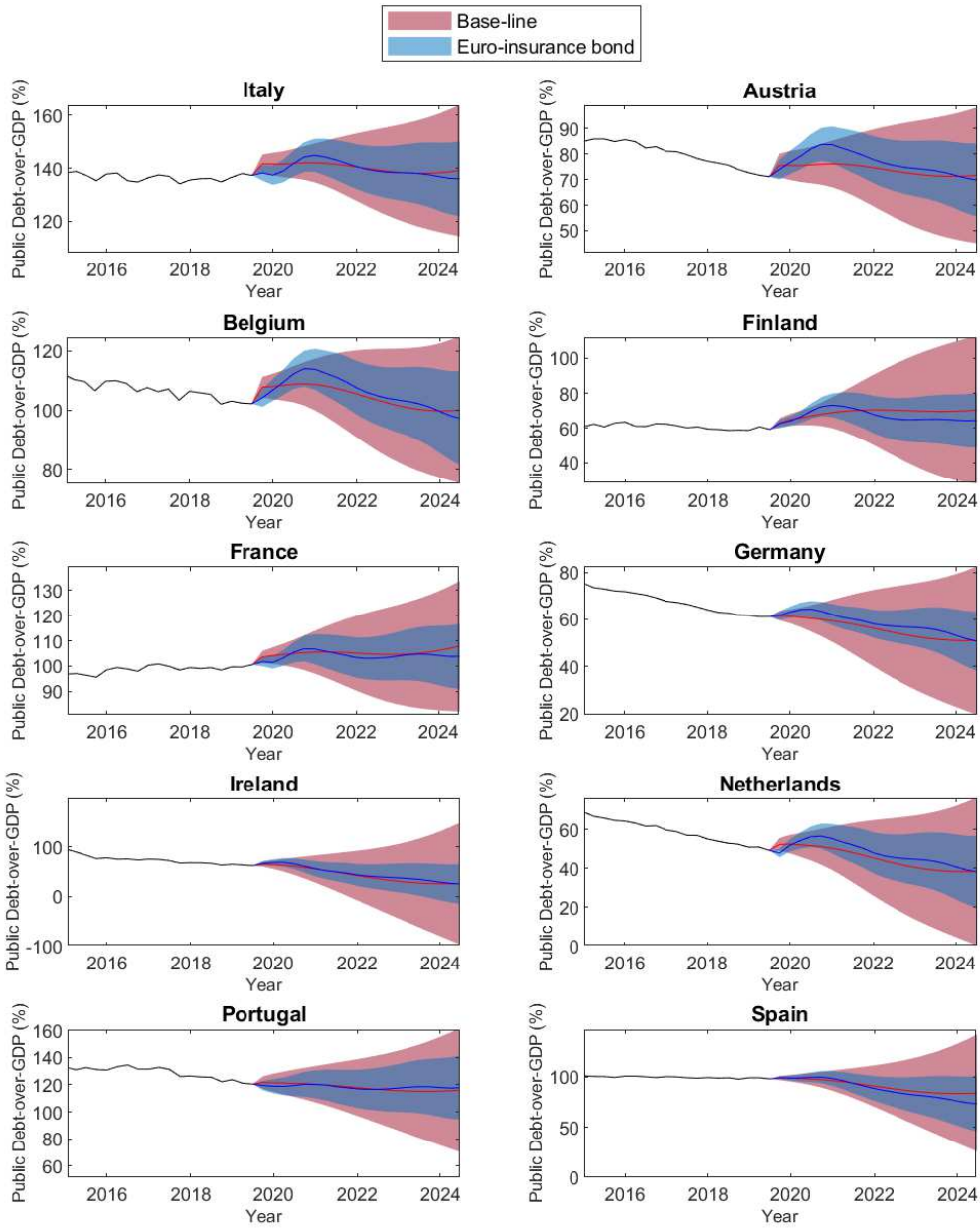

Figure 2: Public debt forecast in the two scenarios for the Euro Area countries. The shaded area indicates the 95% confidence interval of the GVAR estimations.

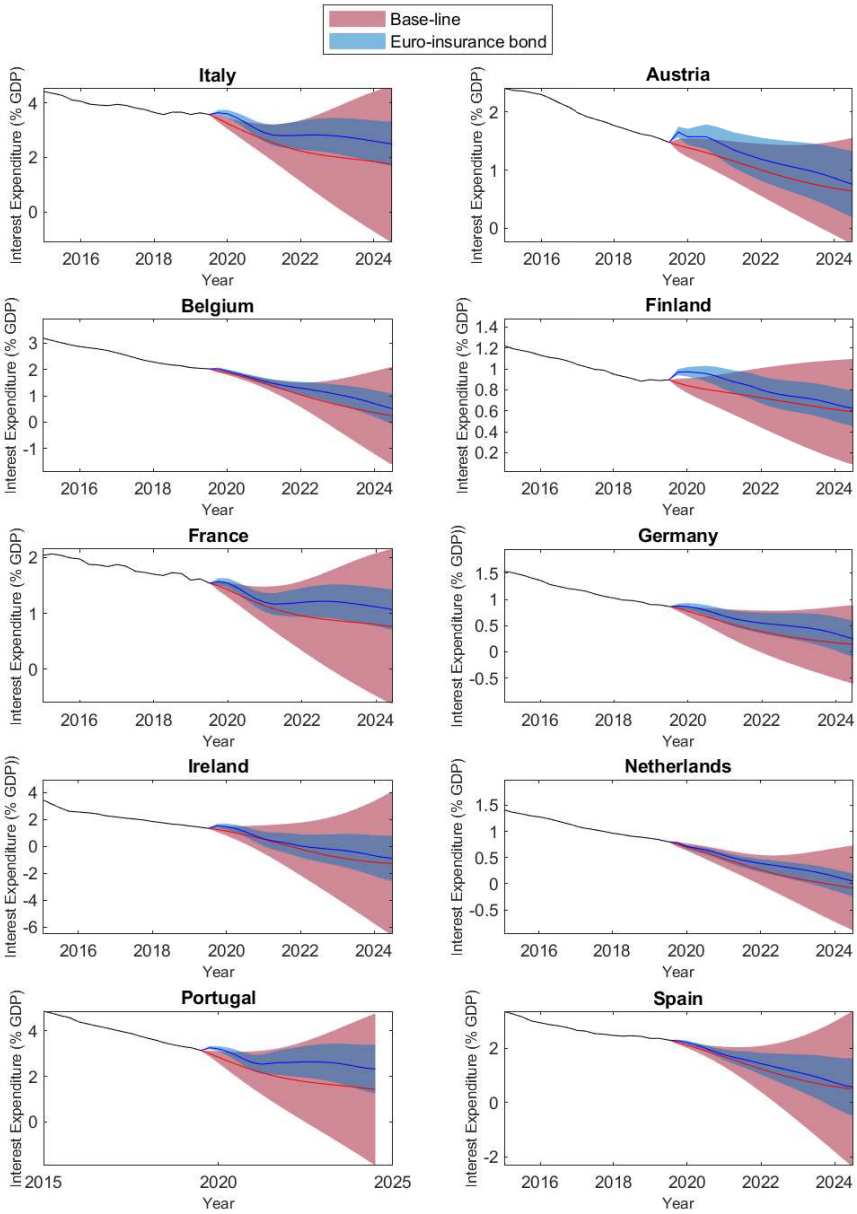

Figure 3: Interest expenditure forecast in the two scenarios for the Euro Area countries. The shaded area indicates the 95% confidence interval of the GVAR estimations.

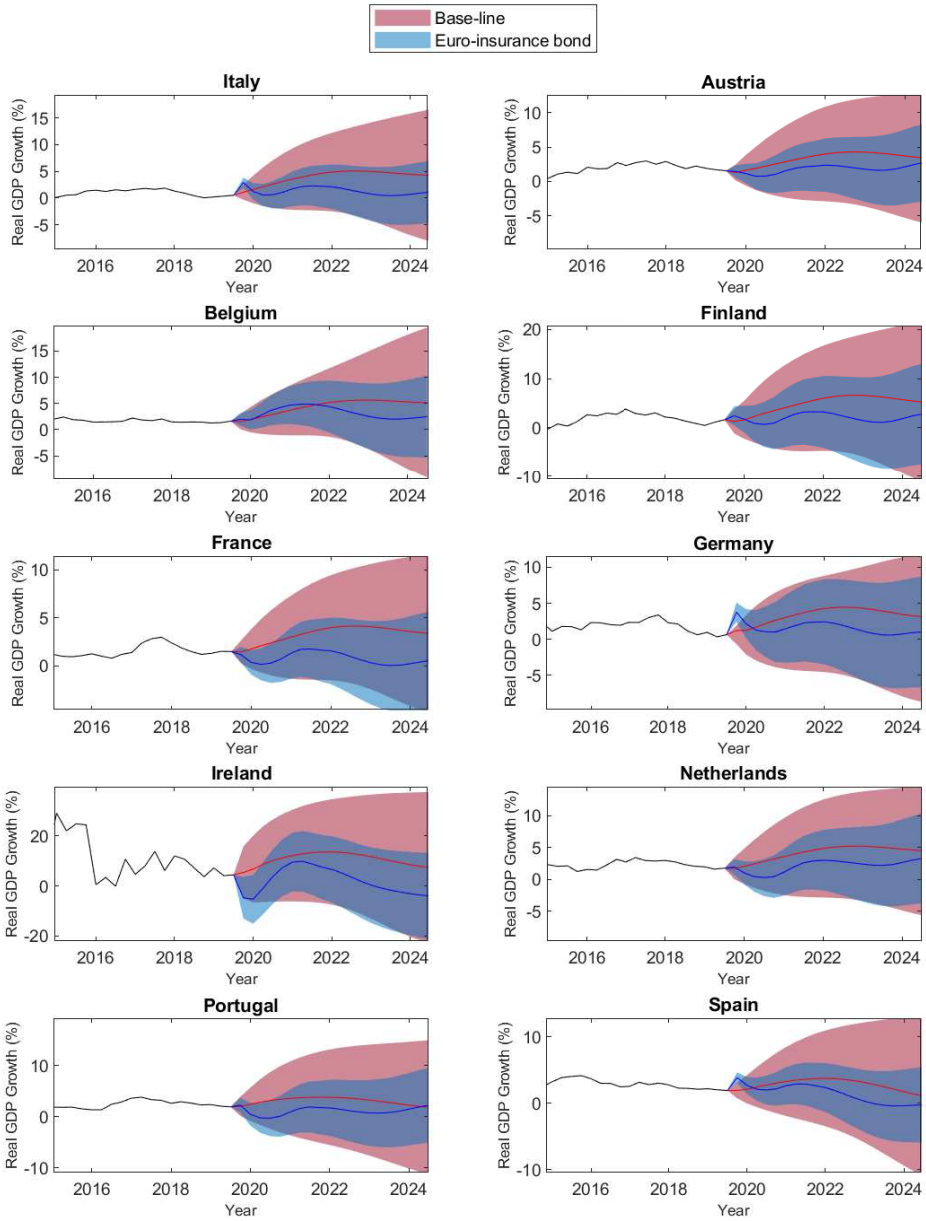

Figure 4: Real GDP growth forecast in the two scenarios for the Euro Area countries. The shaded area indicates the 95% confidence interval of the GVAR estimations.

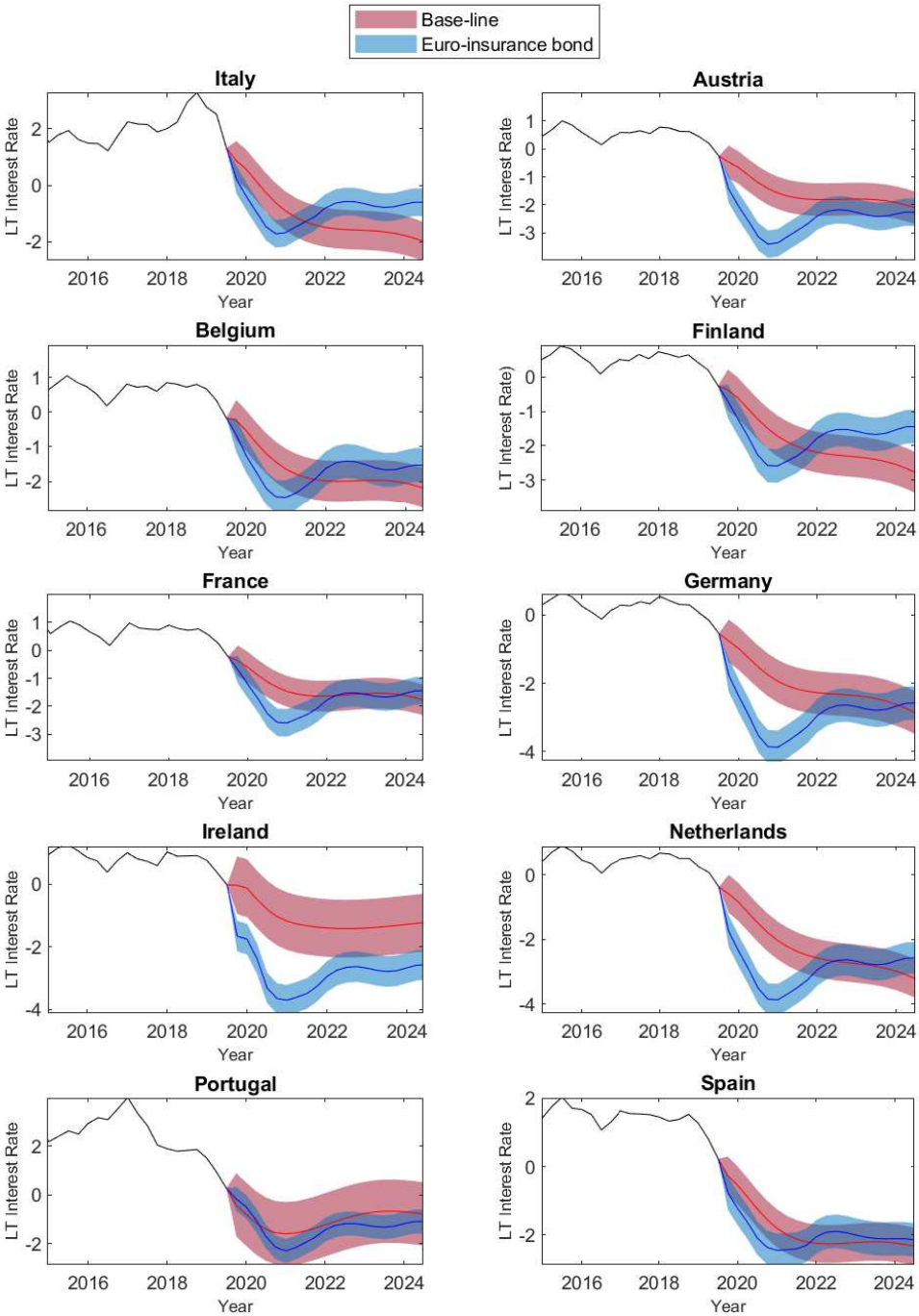

Figure 5: Long-term interest rates forecast in the two scenarios for the Euro Area countries. The shaded area indicates the 95% confidence interval of the GVAR estimations.

5.1 EU revenues from the Euro-insurance bond

The introduction of an Euro-insurance bond, as the one proposed, would lead to an accumulation of resources in the balance sheet of the central European debt agency that issues the common debt instrument and charges tailored premia. Indeed, the Eurozone countries that have to pay a fiscal (in)discipline premium (in our example, those with debt-to-GDP and deficit-to-GDP ratios above the targets set by the central European debt agency) would face an interest expenditures larger than the level that is sufficient to balance the interest payments on the Euro-insurance bonds. The latter is a crucial point of the analysis, since the reduction in future uncertainty of the public debt ratio (and the other macroeconomic variables included) and the improved stability reached by the system with the introduction of the Euro-insurance bond must be evaluated bearing in mind that, with respect to the regular scenario, what is changing is also the existence of these financial resources available to the central authority.

To provide an empirical idea of the amount of EU revenues that would be accumulated over time, we report in Table 2 the time series of the extra interest expenditures-over-GDP (%) paid due to the fiscal discipline premium (i.e., the amount of resources collected by the European debt agency) by the euro zone countries in the sample. The values are dynamic over time and there is a general and strong tendency to improve fiscal discipline over time, that is to reduce the value of the fiscal discipline premia. In the last column we provide a more wide measure representing the EU revenues collected from the whole euro area as percentage of real GDP.

Time	AUS	BEL	FIN	FRA	IRE	ITA	NED	POR	SPA	**EU REVENUS**
2019-Q4	0,25	0,77	0,00	0,59	0,08	1,92	0,00	1,55	0,82	0,86
2020-Q1	0,19	0,62	0,02	0,50	0,30	1,64	0,00	1,42	0,72	0,74
2020-Q2	0,17	0,54	0,04	0,43	0,20	1,41	0,00	1,22	0,65	0,64
2020-Q3	0,16	0,48	0,07	0,36	0,06	1,21	0,00	1,00	0,58	0,54
2020-Q4	0,16	0,44	0,09	0,32	0,04	1,10	0,00	0,84	0,52	0,49
2021-Q1	0,17	0,42	0,10	0,30	0,02	1,05	0,00	0,75	0,47	0,46
2021-Q2	0,18	0,39	0,09	0,29	0,01	1,06	0,00	0,74	0,42	0,45
2021-Q3	0,19	0,39	0,08	0,30	0,00	1,08	0,00	0,79	0,38	0,45
2021-Q4	0,19	0,39	0,07	0,31	0,00	1,12	0,00	0,83	0,35	0,46
2022-Q1	0,19	0,40	0,07	0,34	0,00	1,18	0,00	0,89	0,33	0,48
2022-Q2	0,18	0,39	0,07	0,36	0,00	1,23	0,00	0,93	0,31	0,49
2022-Q3	0,17	0,38	0,06	0,36	0,00	1,24	0,00	0,94	0,28	0,49
2022-Q4	0,15	0,35	0,05	0,36	0,00	1,23	0,00	0,94	0,25	0,48
2023-Q1	0,14	0,32	0,04	0,35	0,00	1,20	0,00	0,92	0,23	0,46
2023-Q2	0,12	0,29	0,03	0,34	0,00	1,16	0,00	0,90	0,21	0,44
2023-Q3	0,11	0,26	0,03	0,33	0,00	1,13	0,00	0,88	0,19	0,43
2023-Q4	0,11	0,23	0,03	0,33	0,00	1,11	0,00	0,87	0,16	0,42
2024-Q1	0,10	0,20	0,03	0,33	0,00	1,11	0,00	0,87	0,13	0,41
2024-Q2	0,09	0,17	0,03	0,33	0,00	1,11	0,00	0,86	0,10	0,40
2024-Q3	0,08	0,14	0,03	0,32	0,00	1,08	0,00	0,85	0,08	0,39
2024-Q4	0,07	0,11	0,03	0,31	0,00	1,06	0,00	0,84	0,07	0,38
2025-Q1	0,06	0,09	0,03	0,30	0,00	1,03	0,00	0,83	0,06	0,36
2025-Q2	0,05	0,06	0,03	0,29	0,00	1,01	0,00	0,82	0,05	0,35
2025-Q3	0,05	0,04	0,03	0,28	0,00	0,98	0,00	0,81	0,05	0,34
2025-Q4	0,04	0,03	0,03	0,26	0,00	0,94	0,00	0,80	0,05	0,33

Table 2: Extra interest expenditures paid by each euro-area country considered (as % of GDP) due to the fiscal discipline premia in the Euro-insurance bond scenario for the first 25 quarters of the forecast period.

6 Conclusions

In this working paper, we propose a new scheme of sovereign debt mutualization in the Eurozone which does not involve neither significant short-term redistribution across countries nor perverse incentives to fiscal profligacy. Our Euro-insurance bond is issued and traded (on the secondary market) at a unique basic interest rate (which we proxy using the German bund rate) but individual states who finance themselves using such bonds have to pay an extra premium related to their fiscal discipline level over time. The extra payments induced by the existence of country-specific spreads would be accumulated as EU own revenues.

We provide empirical support to our model by estimating a GVAR (1,1) including the Eurozone countries, the U.S., Japan and China which is able to analyse the future evolution of public debt over time in two different scenario: a baseline scenario (employing current observable data on macroeconomic fundamentals) and a Euro-insurance bond scenario. We find no significant differences in the future path of public debt-over-GDP ratio in the two scenarios but a consistent reduction in the level of uncertainty of the estimates in the conditional forecast obtained with the Euro-insurance bond assumption. Constraining the interest rate values to the ones computed in our model by applying a fiscal discipline premium to the German bond, we obtain an improvement in the stability of the future evolution of public debt conditional to the same path of interest expenditure in the two scenarios, avoiding therefore fiscal redistribution across countries.

Future steps of our research include the assesment of the capacity of the considered mechanism of (structural) sovereign debt mutualization for the Euro area to immunize the system against standard macroeconomic instability shocks. If this is the case, there is scope to think that a Eurobond scheme as the one we propose may be able to reduce the overall macroeconomic volatility of the Euro area.

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