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Consequences of Different Eurobond Proposals in the Eurozone

Abstract
We analyze economic features and consequences of those Eurobond proposals, which are in our view the most important and the most diverging ones and require different legal changes. These include all three proposals in the green book of the EU-commission, among them the Delpla von Weizsäcker proposal, the proposal for pro rata bonds and the proposal to mutualize all debts with joint liability, the proposal of the German council of Economic experts to mutualize all debts of member countries above 60 per cent of their GNP and the proposal of Favero & Missale (2012) for Eurobonds without risk shifting.

More specifically, we aim to analyze whether Eurobonds indeed imply the consequences that are often assumed to take place, such as a decreasing interest burden of distressed countries. We ask especially the following questions. Are the above proposals suited to reduce the fiscal burden of a distressed country? Do they promote or reduce reckless lending of creditors and debtors? Do they provide more safe assets in the Eurozone thus strengthening the demand from outside the Eurozone and reduce costs for issuers? Which effect has the expectation of a bail out or "ex post solidarity" (Tirole 2015) with a country in distress to avoid conflagration in other countries? Which legal changes are required to introduce different forms of Eurobonds?

Preliminary Version, please do not quote. Comments are welcome
Economic Consequences of Different Eurobond Concepts

We analyze economic features and consequences of those Eurobond proposals, which are in our view the most important and the most diverging ones and require different legal changes. These include all three proposals in the green book of the EU-commission\(^1\), among them the Delpla von Weizsäcker proposal\(^2\), the proposal for pro rata bonds and the proposal to mutualize all debts with joint liability, the proposal of the German council of Economic experts\(^3\) to mutualize all debts of member countries above 60 per cent of their GNP and the proposal of Favero & Missale (2012) for Eurobonds without risk shifting.\(^4\)

More specifically, we aim to analyze whether Eurobonds indeed imply the consequences that are often assumed to take place, such as a decreasing interest burden of distressed countries. We ask especially the following questions. Are the above proposals suited to reduce the fiscal burden of a distressed country? Do they promote or reduce reckless lending of creditors and debtors? Do they provide more safe assets in the Eurozone thus strengthening the demand from outside the Eurozone and reduce costs for issuers? Which effect has the expectation of a bail out or “ex post solidarity” (Tirole 2015)\(^5\) with a country in distress to avoid conflagration in other countries?

The risk premium as part of the interest rate of government bonds consists of two components, the default risk and the liquidity risk.\(^6\) The latter arises, if the bondholder wants to sell the bond before maturity she finds it harder to do so in a narrow secondary market with low trading volume. The same problem might occur if an investor does not wait for new bonds to be issued but wants to buy them on the secondary market. Other things being equal, the lower is liquidity the lower is the expected sale price. This risk reduces with the increasing

6 For investors outside the Eurozone there is also an exchange rate risk which we neglect.
size of the secondary market. The introduction of any type of Eurobonds would overcome the fragmentation of the European bond market and reduce the liquidity premium and the interest rate by some $\varepsilon_i$ in each of n member countries such that the issuing states of the Eurozone would make a total gain of $\sum_{i=1}^{n} \varepsilon_i D_i$ with $E_i$ being the share of an individual country of all Eurobonds. By the same token creditors are fully compensated for the lower interest rate through a lower liquidity risk. Otherwise this would increase the liquidity premium for the remaining national bonds. This makes all types of Eurobonds potentially Pareto improving for all participants. Notice however that these gains require that all national bonds are transformed into Eurobonds. Otherwise there is a countervailing effect, because the liquidity premium for the remaining national bonds will increase in the then smaller national bond markets. A positive effect can still remain and increase provided that the net effect of a decreasing liquidity premium for Eurobonds and the increasing liquidity premium for national bonds is positive. This common feature has not to been analyzed for the different types of Eurobonds. As this effect applies to all forms of Eurobonds and can have only very limited impact on the important other factors related to Eurobonds we disregard it in further considerations, keeping however in mind that it is one of the main rationales for the introduction of such bonds.

Another feature of all types of Eurobonds is their potential stabilizing effect in case of speculation against the existence of the Euro. In an existential Euro crisis with the danger of a state breaking away or a collapse of the Euro-system the economic consequences of Eurobonds are however anything but clear. The argument of the proponents of Eurobonds as “stability bonds” is this. Without Eurobonds asset holders in a distressed country fear that their financial assets are devaluated after the introduction of a national currency and shift their assets to countries which would not leave the Eurozone, or which in case of a break up might evaluate their new national currency against the Euro. This is a risk free speculation because in case of a breakdown it leads to a gain and to no loss otherwise. One can argue that Eurobonds will reduce this speculation, because they are safe against the risk of devaluation. This is however uncertain. A country leaving the Eurozone can by national legislation decide to devalue its obligations from a credit contract. This legal norm would be binding for national citizens. And any sovereign country can by new legislation cut into existing private contracts with foreign private persons without violating international law as long as this is not regarded as an expropriation, for which damage compensation has to be paid. But the hurdles for this legal requirement to be met are very high. If the obligation were based on a treaty between sovereign states such as the member states of the Eurozone such legislation would violate international law. But the enforcement mechanisms are weak and nobody can foresee what a distressed country would do in such a catastrophic crisis. These cumulative uncertainties make it probable that the stabilizing effects of Eurobonds on markets in an existence crisis of the Euro are small if they exist at all. The argument for Eurobonds as “stability bonds” is on shaky ground and we discard it from further consideration.
In what follows we neglect the consequences of Eurobonds for liquidity and speculation but instead focus on the questions whether the above Eurobond proposals would indeed reduce the cost of debt for sovereign bonds and whether they would increase the debt capacity as conventional wisdom assumes. We first lay out the assumptions of our model and analyze the status quo, that is, the case without Eurobonds.

1. Assumptions

- **Two countries.** We construct the model as simple as possible. There are two countries which finance all of their sovereign debts with bonds. All public debts are taken up at the beginning of a period and are paid back with interest at the end of this period. The interest rate consists of the risk free interest rate \( r \) and a mark-up \( m \) for the sovereign default risk.

- **Eurobonds.** The two countries may mutualize all or parts of their public debts as Eurobonds and are roughly of equal size but of unequal economic strength (see Beetsma and Mavromatis, 2014). We express this feature by the assumption, that when the two countries decide to issue Eurobonds, each country receives half of the credit.

- **Risk neutrality.** Borrowing countries and creditors are risk neutral.

- **No hidden information.** We assume that creditors are well informed about the debtor country’s economic strength and debt service capacity. There is no hidden information in the pre-contractual situation other than between banks and private debtors. Organizations such as the European Commission, the European Central Bank, the ESM, the IMF, Eurostat as well as rating agencies continuously monitor debtor countries and provide publicly available information about the countries’ debt service capacity. Moreover, the consequences of hidden information ex ante and hidden action ex post have been studied in previous papers, for instance by Beetsma and Mavromatis (2014) and emphasized by Panizza, Sturzenegger, and Zettelmeyer (2009).

- **Opportunistic behaviour.** Even though our model will allow the countries to behave opportunistically, we exclude the possibility that a member state of the Eurozone can simply run away from its debts, regardless of its debt service capacity – as some countries with few ties to the rest of the world did in the past.\(^7\) We think that this might be a defendable assumption in a region in which interdependence and even integration is higher than in any other supranational zone in the world.

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\(^7\) Examples are Soviet Union after the October Revolution and Nazi Germany. We also rule out that a government change in a member country of the Eurozone will lead the new government not to pay for the debt taken up by of the old government, may be because it has less gain from them than the old government and therefore repudiates them. If a Eurozone country were not willing to pay even though it had the debt capacity to do so, this would make it more difficult to introduce Eurobonds.
• Debt service capacity. We assume that factors different from a country’s sovereign debts determine the Gross National Income ($Y$), which lead it to be either high ($Y_h$) or low ($Y_l$), for instance in boom and recession times, respectively. We also assume that a country’s debt service capacity is limited by its economic, political and institutional constraints and common knowledge and that the limit is an increasing function of its national income. For every realization of the national income there exists a maximum possible debt service $S_{(\text{max})}$, which increases with Gross National Income, i.e. $dS_{(\text{max})}/dY > 0$. The debt service capacity is for the realization of a low or high National Income

$$S_{(\text{max})} = \{S_l, S_h\}.$$ 

The stronger country 1 has a bigger debt service capacity in a good and in a bad period than the weaker country 2. $S_{1h} > S_{2h}$ and $S_{1l} > S_{2l}$. The probability of low National Income and low debt service capacity is $q\epsilon[0,1]$ for either country, the probability for high debt service capacity is the two realizations of the National Income leading to a high or low debt service capacity occur with probabilities for the bad state $q\epsilon[0,1]$ and for the good state $(1 - q)$. When public debt is issued, these probabilities are known to both the debtors and the creditors. We also assume that the borrowing country can and will fully pay its debt if the National Income is high. Thus, a default risk may only occur with low National Income.

In what follows, we first analyse the benchmark scenario where there are national bonds only. Later, we extend the analysis to different forms of Eurobonds in combination with national bonds.

2. Analysis if all government debts are national bonds

2.1. Determination of the default risk premium

Since we now abstract from Eurobonds, the analysis is very similar for both countries and consequently, we skip the indices “1” and “2” to characterize the country-specific debt service capacity.

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8 As a consequence, we assume that a country’s maximum debt level is linked to the debt service capacity given that there is high National income.
As long as the country’s debts are so low that it can service all of its debts even in the bad case of a crisis the debt service \(S\) is equal to

\[
S = D(1 + r).
\]

This equation follows from the assumption that a member country of the Eurozone does not run away from the credit contract. \(D\) is the country’s total debt. The maximal debt service at which the country can lend without paying a risk premium is then \(S_t\). The highest level of debts leading to this debt service is therefore \(S_t/(1 + r)\). As long as a country’s debts are not higher than this level it pays only the risk free interest rate \(r\) and services its debts.

If the debt increases above \(S_t/(1 + r)\) the creditor faces a default risk and demands a mark-up premium \((m)\). The interest rate increases then above the risk free interest rate and becomes \(r + m\).

By assumption the debtor can and will fully pay his debt if the realization of the national income is high which implies a maximum debt level of \(S_h/(1 + r + m)\). In the event of low National Income the borrowing country is only able to pay \(S_t\) such that the creditors’ default risk is \(D(1 + r) - S_t\). The debt service \(S\) is then

\[
S = \begin{cases} 
D(1 + r) & \text{if } D \leq \frac{S_t}{1 + r} \text{ regardless of National Income} \\
D(1 + r + m) & \text{if } \frac{S_t}{1 + r} < D \leq \frac{S_h}{1 + r + m} \text{ with high National Income} \\
S_t & \text{if } \frac{S_t}{1 + r} < D \text{ with low National Income}
\end{cases}
\]

We calculate the risk premium for risk neutral creditors.\(^9\) If the debt is risky investors will demand a risk premium such that the expected return from the debt service equals the risk-free interest rate \(r\). This is expressed by the following indifference formula, which gives the condition under which the investor is indifferent between a safe and a risky investment with an equal expected payoff.

\[
D(1 + r) = (1 - q)D(1 + r + m) + qS_t
\]

\(^9\) We made the equivalent calculations also under the assumption of loss aversion according to Prospect Theory (Kahneman and Tversky, 1979). Qualitative results are the same then.
Solving this equation for $m$ yields the risk premium. Equation 4 also shows that one should not work with a risk free interest rate of 0 because the mark-up increases with the risk free interest rate as this also increases the debt payment and the risk.

$$m = \frac{q((1 + r)D - S_i)}{(1 - q)D}$$

The mark-up increases with the level of debts and approaches asymptotically a constant value of \( \frac{q(1+r)}{1-q} \) if \( D \to \infty \) as in that case debtors know that in case of a bad period they will lose almost all their investment per share.\(^{10}\)

Figure 1: Risk premiums and debt level

With increasing debt the loss quota in a bad period becomes higher and the mark-up premium approaches the value of \( q(1+r) / (1-q) \).

2.2. Credit limit if all credits are national bonds

\(^{10}\) In fact, there is an upper limit on $D$ as will be shown in the following section 5.2.2.
Risk neutral creditors will not finance debts above an upper limit, which is determined by a country’s total expected debt service capacity of \((1 - q)S_h + qS_l\). \(S_h\) is the maximal debt service capacity in good periods. The maximal debt risk neutral creditors are prepared to offer is then

\[
D^{\text{max}} = \frac{(1 - q)S_h + qS_l}{1 + r}
\]

This value is in between \(S_l\) and \(S_h\) depending on the parameter values of \(q\) and \(r\). This “credit rationing” is not the same as in the Stiglitz & Weiss (1981) model, in which credit rationing is a consequence of asymmetric information or moral hazard. Here we assume neither asymmetric information nor moral hazard. “Credit rationing” occurs because a higher debt level than \(D^{\text{max}}\) is not sustainable. Therefore, the supply of debts is (see also Figure 1):

\[
\begin{aligned}
\text{Supply of debt at interest rate} & = \begin{cases} 
 r \text{ if } D \in \left[0, \frac{S_l}{1 + r}\right] \\
 r + \frac{q((1 + r)D - S_l)}{(1 - q)D} \text{ if } D \in \left[\frac{S_l}{1 + r}, \frac{(1 - q)S_h + qS_l}{1 + r}\right] 
\end{cases}
\end{aligned}
\]

maximal debt supply at

\[
D = \frac{(1 - q)S_h + qS_l}{1 + r}
\]

2.3. The country’s demand for debts

A country’s debt demand is difficult to conceptualize because the borrower is not a profit maximizing company. As a perfect agent of its citizens the country would increase debts if its marginal costs were higher than the social return of a debt-financed project, or if during an economic slump the Keynesian multiplier would be high and additional debt would then partly or fully finance automatically. Both types of debt increase would lead to a lower and not higher quota of debts over GNP. In the above formula (6) we rule out implicitly these possibilities by assuming that other factors and not sovereign debt determine the Gross National Product. If these conditions were met all or most of the time Eurobonds would face much less critique. These conditions were not met over the last 30 years in several Euro countries, where the debt over GNP ratio increased continuously and doubled or tripled.\(^{11}\) This indicates that much of the debts were used to finance consumption\(^{12}\) or socially


\(^{12}\) Not all debt financing of consumption is economically problematic though, for instance debts for financing the consequences of catastrophic events or military operations can smoothen consumption between generations.
unproductive investment or subsidies. This is the case we have here in mind. It has been argued that the growing interest rates as a result of increasing debts are an automatic brake against too much sovereign debts. This proposition can however be flatly rejected.

The increasing interest rate caused by a higher debt level reflects neither an additional cost for the state nor an additional income for the creditors. For the creditors it is only an ex ante compensation for the increasing loss they might incur in case of a default as a consequence of higher debt. Consistently, what the borrowing country has to pay in terms of higher interests is equal to what it saves in a default period after increasing the debt level. Not the market interest rate but the expected additional service of more debts affects the debtor’s choice for or against more debts. The expected payment for all debts \( ES \) is

\[
ES = (1 - q)D \left[ 1 + r + \frac{q((1 + r)D - S)}{(1 - q)D} \right] + qS, \quad \text{with} \quad \frac{dES}{dD} = 1 + r
\]

Therefore, the marginal expected cost of a unit of additional debt is – after payment of the principal – the risk free interest rate \((r)\) even though the additional debt increases the market interest rate. This result is not dependent on the simplicity of our model but only on the fact that the default premium is a compensation for the creditors’ losses in case of default and that these losses increase with the level of debts. The result would persist if one allows for a continuum of possible National Income realizations and not only for low and high National Income as we assume. Therefore, there is no sound economic reason to believe that rising interest rates as a consequence of increasing government debt can lead to more fiscal discipline. They do not influence the total costs of borrowing. Consequently, they can have no incentive effect whatever the utility function of the government might look like.

One might argue that a debt restructuring comes at a huge social cost for the borrowing country and that this cost is not in the model. This is correct and the costs might rise with the debt level and the related size of a haircut. Still, the argument holds that the rising interest rate as such has no impact on the debt level, if the states correctly calculate their borrowing costs.

The country’s demand for debt is difficult to conceptualize without resorting to a political economy model, which is outside the scope of this paper. Important research results on this question exist (Alesina and Tabellini 1990), however, results are sensitive to small changes in the assumptions. Even without endogenizing the political economics of a country’s demand for debt there are only two scenarios possible. If the government’s bliss point for the preferred

\[13\] For an overview on the social costs of a sovereign debt default see Panizza et al. (2009).
level of debt is higher than the maximum supply offered by creditors, the government will only get the maximum debt level $D^{\text{max}}$ offered by the creditors, see formula (5). If the government’s bliss point for the preferred level of debts is below the level $D^{\text{max}}$, the expected marginal costs of debt equal the risk free interest rate $r$ (even though the nominal risk premium $m$ is increasing in the debt level. Figure 2 depicts both cases. Thus, in neither case the increasing nominal sovereign interest rate from more debts can have an effect on the demand for debts. This point is straight-forward from an economics perspective but often overlooked in the political discussion.\footnote{In an influential book titled „Der Euro“ (2015, p.436) Hans Werner Sinn uses this argument, „Eurobonds werden zu einer noch höheren Schuldenaufnahme verführen, da die überschuldeten Länder wissen, dass sie von den Kapitalmärkten nicht durch höhere Zinsen bestraft werden. „Eurobonds will lead to even higher debts because the overindebted countries know that capital markets will not punish them with higher interest rates.“} 

Figure 2: A country’s demand for debt (blue functions), nominal cost of debt ($m$) and expected cost of debt ($r$)

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\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure2}
\caption{Credit Supply}
\end{figure}

In Fig. 2 the three graphs represent the three sections of the supply curve described in Formula (8).

The two marked points represent two potential bliss points for the government’s preferred level of debts (at the risk free interest rate of $r$)

2.4 The impact of a bail out on the interest rate and the maximum debt level

In case of a low National Income the debt servicing capacity is limited ($S=S_l$) such that a sovereign debt crisis may occur which is likely to affect financial institutions and thereby can spill over to other “neighbor” countries. To reduce such social losses for their own economy “neighbor” countries might be willing to bail out banks. Creditors and debtor states foresee
this “ex post solidarity” (Tirole 2015) which increases the maximum debt supply and reduces the risk premium charged.

In case of an expected bail out with the size of $B^{15}$ the maximum debt level offered is

$$D_{\text{Max}} = \frac{(1 - q)S_h + q(S_t + B)}{1 + r} \text{ with } \frac{dD_{\text{Max}}}{dB} = \frac{q}{1 + r} > 0.$$  

Thus, the expected bailout increases the maximum supply of debts because creditors expect a higher debt service in a “bad” scenario with low National Income. Creditors are therefore willing to extend their credit limit to an unsustainable level. The reaction of the risk premium to an expected marginal bailout is given by:

$$\frac{dm}{dB} = \frac{q}{(q-1)D} < 0.$$  

Ex ante, the expected bailout decreases the nominal cost of sovereign debt. Therefore, its effect is comparable to a subsidy, similar to the implicit guarantees for “too-big-to-fail” banks (see, e.g., O’Hara & Shaw 1990, Davies & Tracy 2014). The bailout implies lower cost of debt as some of the costs are externalized. Ex post, the bailout leads to a wealth transfer from a third party for the creditor and leaves the debtor’s wealth unaffected.

The effects of a bail out to the stronger country are symmetric mirror images of those for the debtor country and therefore need not be modeled. They increase the risk premium and lower the credit line. Only in the case where the stronger country’s debt is so low such that it can finance the bail out at a risk free interest rate, these effects do not occur.

3. Analysis of the blue bond and red bond proposal

In this proposal (Delpla & von Weizsäcker 2010 and EU Commission 2011) a fixed amount of all public debts of the member countries is mutualized. This mutualized debt is called blue bonds, has high seniority, is subject to joint liability and is supposed to be risk free. The rest of the public debt remains national and junior (red bonds). The states of the Eurozone can fix the amount of blue bonds for each participating country in such a way that the debt service can be paid even in a time of economic slump or depression.\(^\text{16}\) The default risk concentrates on the red bonds because the blue bonds are meant to be served even in case of a sovereign insolvency. The joint liability will then not become effective except for a low probability catastrophic event, which is not part of this analysis.

\(^{15}\) Note that this formula requires that the stronger country can still pay its own debt obligations and bail out part of the debts of the distressed country.

\(^{16}\) There is the idea that blue bonds should only be issued only up to 60% of GDP.
3.1. Determination of the default risk premium

The highest amount of debt service which a country can pay at the end of the period regardless of whether the National Income turns out to be high or low is $S=S_t$. We assume for convenience that the countries of the Eurozone agree on an amount of (blue) Eurobonds ($E$), which leads exactly to this debt service. We get then the following formula for the amount of the senior blue bonds. As these consideration are identical for each member country—even though they might differ with respect to the values of $D$ and $S_t$—we abstain from using a country index. The debt service of the (blue) Eurobonds ($E$) is then

$$E (1 + r) = S_t \text{ with } E = \frac{S_t}{1+r}.$$  

Note that there is no risk premium for the Eurobonds because they are safe assets which are repaid even when the National Income is low. In contrast, there is a default risk with national red bonds. The country’s total debt consist of Eurobonds and (red) national bonds, that is, $D = E + N$. Given condition (10), the indifference equation for risk neutral investors for total public debt is

$$D (1 + r) = S_t + (1 - q)(D - \frac{S_t}{1+r})(1 + r + m).$$

In (11) the face value of national red bonds is reflected by the term $D - \frac{S_t}{1+r} = D - E = N$. Solving (11) for the risk premium for the red bonds yields $m$ as a constant parameter

$$m = \frac{q(1 + r)}{1 - q}.$$  

Figure 3: Risk premium for national bonds without (black) and with Eurobonds (red)
The risk premium of national bonds is strictly higher with Eurobonds than without (see (6)). The reason is that for the red national bonds there exists no debt service with low National Income. All debt service capacity is then reserved for the senior Eurobonds. For the same reason, the debt level does not affect the risk premium for the red bonds. If one assumes that debt servicing capacity with low National Income exceeds the face value of Eurobonds, the risk premium of national bonds will increase with their level. Still, risk premiums of national bonds will be strictly higher than in the scenario without Eurobonds simply because national bonds are junior.

**Proposition 1:** Given that (blue) Eurobonds are risk free, the risk premium charged will be zero. Interest rates for national (red) bonds include a higher risk premium than for the same amount of debts without Eurobonds.

However, the higher *nominal* interest rate for red bonds has no impact on the costs of lending for the same reason explained above, because for the creditor the higher interest is a compensation for higher losses in case of a default and for the borrowing country these payments are compensated with a higher debt relief in case of a sovereign insolvency. The expected debt service (ES) of a debtor state with Eurobonds is

\[
ES = S_t + (1 - q) \left( D - \frac{S_t}{1 + r} \right) \left( 1 + r + \frac{q(1 + r)}{1 - q} \right) \quad \text{and} \quad \frac{dES}{dD} = 1 + r
\]

This is the same result as without Eurobonds. The increase of the national red bonds leads to *expected* additional costs equal to the risk free interest rate. The introduction of Eurobonds provides therefore no incentives for governments to change the level of debts.

**Proposition 2:** The replacement of national bonds by senior blue Eurobonds and junior red national bonds provides no incentives for national governments to change national debts.\textsuperscript{17}

### 3.2. The blue bond-red bond proposal cannot reduce a distressed country’s debt burden

\[\textsuperscript{17} \text{This result is in contrast with Beetsma and Mavromatis (2014) p.103.}\]
We now turn to a related aspect, which we would not mention in a scholarly paper, had it not been part of the public debate on Eurobonds. In this debate one argument for the blue bond/red bond model was that it would lower the interest rates for blue bonds and therefore bring a relief to the distressed countries Italy, Spain and Portugal during the Euro Crisis, especially in the years 2011-2012. In this public discourse, the interrelation between the interest rate for blue and the interest rate for red bonds was neglected. It is however obvious that the split up of all bonds into risky red bonds and risk free blue bonds does not reduce the total risk and cannot at all affect the burden from debt service. To show this within our model, we compare the debt service of a country, when its debts consist of national bonds only and when the debts are mutualized blue Eurobonds and national red bonds.

Assume for both cases that the government debt service obligation is higher than the debt service capacity in a bad period. Then the debt service with low National Income is $S_l$ regardless of the (higher) obligation.

With high National Income the total debt service for purely national bonds (without Eurobonds) is

\[
D \left[ 1 + r + \frac{q((1 + r)D - S_l)}{(1 - q)D} \right] = \frac{D(1 + r) - qS_l}{(1 - q)}
\]

In the case of Eurobonds the amount of total bonds is the sum of blue Eurobonds $E$ and red national bonds $N$

\[
D = E + N = \frac{S_l}{1 + r} + \left( D - \frac{S_l}{1 + r} \right).
\]

The debt service for the blue bonds is at the risk free interest rate and therefore $\frac{S_l(1+r)}{1+r} = S_l$.

The debt service for the blue and red bonds taken together is then given there is high National Income:

\[
S_l + \left( D - \frac{S_l}{1 + r} \right) \left( 1 + r + \frac{q(1 + r)}{1 - q} \right) = \frac{D(1 + r) - qS_l}{(1 - q)}.
\]

Comparing the right hand side of (15) and (16) one sees that with high National Income the debt service with and without Eurobonds is the same. With low National Income the debt service is $S_l$ with and without Eurobonds. Any presumed debt relief as a consequence of this type of Eurobonds disappears in the thin air. This result is by no means dependent on the specificity of this model. It is a general insight, which goes back to the famous and decades old Modigliani Miller theorem (see also Baglioni & Cherubini 2011). By making some assets
risk free, one has to make others riskier and the total value of assets remains the same. This would only be different if the face value of blue bonds would exceed the debt service capacity with low National Income and – in addition – other countries meet their obligations from joint liability. However, subsidies of stronger countries would increase their risk premiums resulting in a zero-sum game. Moreover, it was the explicit aim of this proposal to avoid just this, for instance by limiting the amount of blue bonds to the Maastricht criterion of 60 per cent of GDP, which tried to define a safe level of sovereign debts for the Eurozone.¹⁸

Proposition 3: The introduction of risk free Eurobonds with joint liability, that is senior blue Eurobonds and junior red national bonds has no influence on the debtor country’s total debt service.

3.3. The impact of a bail out on the interest rate and the maximum debt level

Let us suppose that the amount of blue bonds is given as a result of a political decision of a European body and is \( S/(1+r) \). This is the highest possible level for risk free bonds, which every borrowing country is able to serve even in the event of low National Income. Then the financial markets will define the following credit limit for the red bonds of any country:¹⁹

\[
D^{\text{max}} = \frac{(1-q)S_t + qS_l}{1+r} - S_l.
\]

In case of a bailout this level increases to

\[
\frac{(1-q)S_t + q(S_l+B)}{1+r} - S_l.
\]

The reaction of the credit limit to a marginal increase of the bailout sum is then

\[
\frac{dD(\text{max})}{dB} = \frac{q}{1+r} > 0.
\]

This is the same increase as in the absence of Eurobonds (see formula (8) above).

In case of a bailout of \( B \) the indifference equation (see (11)) changes to

\[
D(1+r) = S_l + (1-q)\left(D - \frac{S_l}{1+r}\right)(1+r+m) + qB
\]

Solving this for the risk premium (\( m \)) yields

\[
m = -\frac{S_q(1+r) - D_q(1+2r - r^2) + B_q(1+r)}{(q-1)S_l + ((1-q)r - q + 1)D}
\]

¹⁸ As proposed by the chairman of the Eurogroup Claude Juncker.

¹⁹ As the following considerations apply for each member country we skip the country indices from the variables and parameters for convenience.
the risk premium is lower than without the bailout (see Appendix) and the reaction of the default risk premium to a marginal bailout increase is

\[
\frac{dm}{dB} = \frac{q}{(1-q)(\frac{D}{1+r} - S_t)} < 0
\]

It is easy to see that a bailout with blue and red bonds reduces the mark-up for red bonds more than with only national bonds under reasonable parameters \((\frac{q}{(q-1)D})\), if \(D\) is sufficiently higher than \(S_t\). The reason is that now the economic consequences of a bailout on the mark-up premium concentrate fully on the red bonds and not on all bonds.

**Proposition 4**: A bailout anticipation reduces the interest rate of “red” national bonds more than the interest rate of national bonds without the existence of Eurobonds. The possibility of a bailout can increase the credit level of red bonds to an unsustainable level.

### 3.4. Shielding against a breach of promise

An important feature of the blue bond/red bond proposal is the absence of strategic interaction between member countries. Once the decision of a European body on the amount and distribution of blue bonds with joint liability has been taken each country decides on the amount of red bonds. This decision is not dependent on what other countries decide –except for a bail out.

There exists however another problem of credible commitment. The concept of mutualized Eurobonds with joint liability depends on the promise that a state will service its blue bonds even in a bad period with debt restructuring and give the servicing of blue bonds absolute priority over servicing red bonds. This feature of the proposal makes payments from the joint liability obligation a very low probability event reserved for unforeseeable catastrophic risks. However, this promise between member states is not enforceable like a contract between private persons. In the Eurozone a breach of this promise by a distressed member state would trigger procedures, which have so far not been effective in matters of sovereign finance. It is unlikely that countries would trust these procedures, when signing the blue bond arrangement and agree to joint liability. It is then equally unlikely that an agreement on the proposal might evolve in spite of the mutual advantages.

Either an economic or a legal mechanism can solve or alleviate this problem. Hellwig and Philippon (2011) proposed an economic mechanism. The scope for opportunistic behavior of a borrowing country increases with the debt maturity. Therefore, they propose to reduce debt
maturity to a year or less. Consequently, they do not suggest (blue) Eurobonds but *Eurobills* with a maturity of less than a year. With Eurobills, a breach of contract becomes manifest in a short period before it can cause much harm to other countries, and it would exclude the contract breaching country from further participation in the Eurobills program. In the shadow of this course of events a debtor country in crisis would have more incentives to service the Eurobills rather than Eurobonds where there is ample time for opportunistic behavior.\(^20\)

A legal mechanism would be to make the promise fully credible. Member states could give up national sovereignty on parts of their tax incomes and automatically transfer them to a European fiscal agent, who issues and services the blue bonds. We cannot elaborate on this difficult legal problems of European and national Constitutional Law. But we point to the fact that such a construction already exists within the European Union. Import duties on non-EU products are automatically transferred to the EU and outside the competence of national governments or parliaments.

Conclusion: If this problem were solvable the blue bond red bond concept would generate three mutual gains. It would provide safe assets for European and international investors and at the margin reduce issuers’ costs. It could reduce the liquidity premium, and it would check one way speculation and stabilize the Euro in times of an existential crisis. Also it has been correctly argued that blue bonds would strengthen the independence of the European Central Bank, which could use the blue Eurobonds for its open market operations and avoid national red bonds. This would end speculation that the Central Bank makes fiscal politics in disguise of monetary policy.

3.5. A possible advantage of the blue bond/red bond proposal: reduction of transaction costs

Given that there are national bonds only, we considered creditors as a homogenous group. However, sovereign bonds usually are sold to thousands of creditors. Each creditor is unsecured and is self-interested. In case of a country’s financial distress creditors would want to lose as little as possible.

With financially distressed corporations it is well known that creditor conflicts prior to bankruptcy may induce a “rat race” where unsecured creditors spent time and money to be served first. The analysis of a financially distressed corporation will provide insights into the creditor’s behaviour in the sovereign debt crisis.

---
\(^20\) The Eurobill idea also mitigates another problem with the Delpla and von Weizsäcker proposal which is that national bonds could be made *effectively* senior if they have shorter maturity than Eurobonds. If blue Eurobonds are not senior anymore, this may cause a default risk and trigger joint liability. Even worse, it might undermine fiscal discipline in the first place.
Let us assume that the corporation has debt with face value of \( D \) due at the time \( t=1 \). In case of financial distress, the firm’s net assets are only \( S_l \) with \( S_l < D \). There are two creditors who – for simplicity – have the same claim of \( D/2 \). Both creditors foresee in \( t=0.5 \) that the firm is likely to go bankrupt. The debt contracts grant the right of calling the loan at \( t=0.5 \) for reasons that are important to both creditors, e.g. if bankruptcy is likely. 21 Creditors decide simultaneously on calling the loan. In this situation, a creditor faces expected costs of \( T (T \geq 0) \) from calling the loan, such as transaction costs and, possibly, the foregone profits stemming from future business with the entrepreneur. 22 Without positive transaction costs, creditors would always call their loans when expecting financial distress.

Both creditors need to decide at \( t=1.5 \) whether to call the loan given that they foresee the bankruptcy state of nature at \( t=1 \).

Let us assume that the firm’s assets are sufficient to pay-off one claim, but not both of them: \( D/2 < S_l < D \). The normal form of the game for sub-case \( IR < D/2 \) is depicted by Table 1.

**Table 1: Payoffs to creditors in the firm’s financial distress**

<table>
<thead>
<tr>
<th></th>
<th>Creditor 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Call the loan</td>
</tr>
<tr>
<td><strong>Creditor 1</strong></td>
<td>( S_l/2 - T; \ S_l/2 - T )</td>
</tr>
<tr>
<td><strong>No call</strong></td>
<td>( S_l - D/2; \ D/2 - T )</td>
</tr>
</tbody>
</table>

\( S_l \): Assets of borrowing firm; \( D \): total debt; claim of creditor 1 = claim of creditor 2 = \( D/2 \). \( T \): costs to creditor in case of calling, e.g. transaction costs and foregone profits.

Both creditors receive the payoffs denoted in the Southeast cell if they do not call the loan and wait for redemption until \( t=1 \). All other cells contain payoffs if at least one creditor calls the contract prior to \( t=2 \). Each creditor is afraid that the other creditor will call the loan first; as such, that creditor would therefore liquidate first. Both creditors pursue a dominant strategy to call the loan if the following holds:

\[
(1) \quad D/2 - T \geq S_l/2 \quad \land \quad S_l/2 - T \geq S_l - D/2
\]

21 Smith (1993) observes that in the US, covenant violations give creditors the option of requiring immediate loan repayment. Dichev & Skinner (2002) find covenants in approximately 30% of private loans registered in the Dealscan database. In Germany, General Terms and Conditions allow banks to call a loan at any time if a borrower’s financial situation deteriorates, without the ability of granting sufficient additional collateral, see Leuz et al. (1998: 123).

22 The entrepreneur might switch to another bank for future projects (Longhofer & Santos, 2000).
\[ T \leq T^* = \frac{D - S_i}{2}. \]

If transaction costs exceed \( T^* \) both creditors will pursue the dominant strategy \emph{not} to call the loan.

The bad news is that both creditors call the loan if transaction costs are sufficiently low. This is an equilibrium with an unwanted outcome (a prisoner’s dilemma) because it implies a social waste of \( 2T \).

Now let us switch to a scenario where creditor 1 holds a senior possibly secured claim of \( S_i \), and creditor 2 holds junior debt with a face value of \( D - S_i \). In such a scenario it does not payoff for creditor 1 to call the loan because his claim is not risky and he gets \( S_i \) anway. The transaction costs would simply reduce his benefit. The same holds true for the junior creditor. He gets zero anyways even when calling the loan and just suffers from the additional transaction costs.

How is that now related to Eurobonds? First, one needs to make a qualification since bondholders cannot simply seize assets of a sovereign state. Since it is hard to enforce claims ex post, it becomes more important to assess the sovereign’s default risk ex ante. These costs of getting and evaluating information are transactions costs and they are likely to increase with the country’s default risk. An additional component of transaction costs are the time and effort spent to limit the loss once bondholders foresee a country’s financial distress, such as quickly selling the bonds at the market before others will do.

With the blue and red bonds proposal, the creditors of Eurobonds supposedly do not suffer from default risk. Without default risk there is no need to get informed about the default risk and there is no need to quickly sell the bonds. Thus, blue bond creditors do not incur any transaction costs given that blue bonds are risk-free. The creditors of red national bonds face a default risk. The above prisoner’s dilemma might occur given that their transactions cost are not too high. However, given that there is a sovereign default risk, transaction costs are limited to “red” bondholders while in the absence of Eurobonds all creditors may incur transaction costs.

4. Analysis of Eurobonds with pro rata liability for capital

4.1. Description of proposal and assumptions

Under this proposal, which is also part of the green book on Eurobonds of the European Commission, member states agree on a volume of Eurobonds \( (E) \). Each member state receives a quota of the total credit and is liable only for this quota. Consequently, in case of a
sovereign default of one country there exists no legal obligation of any country to pay for the
debts of any other country.

In addition, the Eurobonds (E) and the national bonds (N) have the same seniority such that
the pari passu rule applies. In case of a state insolvency (which occurs with low National
Income), the remaining debt service (S) is split between national bonds (N) and Eurobonds
with the shares \( N/(N+E) \) for the national bonds and \( E/(N+E) \) for the Eurobonds. We analyze
this for the case of two countries, whose governments agree on the amount of Eurobonds. We
assume that the debt is split equally between the two countries. Consequently, each country is
liable for its half of the debt.

For the debt service capacities there are four different combinations possible depending on
whether low and high National Income realizes in the two countries. The indices \( h \) and \( l \) again
denote the debt service capacity with high and low National Income. The indices 1 and 2
denote the respective countries. We thus get four different debt service capacities.

\[
S \in \{ S_{1h}, S_{1l}, S_{2h}, S_{2l} \}
\]

As we are interested in understanding how this version of Eurobonds works between two
countries of different economic strength we postulate that

\[
S_{1h} > S_{2h} \text{ and } \ S_{1l} > S_{2l}
\]

For convenience, we stick to the assumption that in case of high National Income either
country is able to fully redeem both the Eurobonds and the national bonds. With low National
Income there is a default risk, though. For the further analysis, it is important to make an
assumption on the probabilities, with which the combination of the related debt service
capacities will occur. The probabilities of low National Income and low debt service capacity
are now reflected by \( q_1 \) and \( q_2 \) for countries 1 and 2, respectively.

There exist three constellations.

1. The realization probabilities for low and high National Income in countries 1 and 2 are
totally unrelated.\(^{23}\)

2. Low and high National Income are perfectly correlated. Consequently, there exists
only one probability for low National Income in both countries (\( q_1 = q_2 = q \)) and one
probability for high National Income in both countries (\( 1-q \)).

3. Low and high National Income are correlated but not perfectly, consequently, there
exist positive but small values for diverging economic states in both countries.\(^{24}\)

\(^{23}\) Then we get 4 different realization probabilities, \((1-q_1)(1-q_2); (1-q_1)q_2; q_1(1-q_2); q_1q_2\). This is an unrealistic
case for the countries of the Eurozone.
In this paper we confine ourselves to an analysis of the second scenario, which is much closer to reality than the first scenario but might sacrifice some insights. Especially it cannot provide insights into the potential gains of Eurobonds as an instrument of insurance if creditors would be risk-averse.

We assume that the two countries issue –through an agent– Eurobonds and that each country gets half of the credit and is -without joint liability- liable only for this half.

4.2. Determination of the default risk premium for pro rata bonds

Since Eurobonds do not enjoy higher seniority, there is a default risk attached to them – different to the blue and red bond proposal discussed above. Thus, we have to determine three different mark-ups, the mark-up for the Eurobonds ($m_E$), and the mark-ups for the national bonds in country 1 and country 2, ($m_1$) and ($m_2$). Equal seniority and the interaction between the two countries will make the analysis more complex than in the blue and red bond model.

Since we assume that each country is only liable for its share of the Eurobonds the markup for the Eurobonds will be the average between the two national mark-ups weighted with country’s share of the receipts from the credits, because this reflects the total risk for the investor. Since we assume that each of the two countries 1 and 2 receives 50 per cent of the Eurobond proceeds, we get

$$m_E = 0.5m_1 + 0.5m_2 = \frac{m_1 + m_2}{2}.$$

The indifference equation, which makes risk neutral investors of Eurobonds indifferent between buying safe assets and this type of Eurobonds reads

$$E(1 + r) = (1 - q)E(1 + r + m_E) + q(S_{1t}\frac{0.5E}{0.5E + N_1} + S_{2t}\frac{0.5E}{0.5E + N_2})\quad (21)$$

---

\(^{24}\) This is the realistic case, which we discard in this paper as it blows up the mathematical apparatus but adds only few additional insights especially because this type of Eurobonds cannot provide much insurance effect across the countries.

\(^{25}\) This effect of pro rata bonds can already be observed for the interest rates of ESM bonds, which was 1.37 per cent for bonds with maturity of 6 years and between 0.1 and 0.2 per cent for German bunds in December 2015. For ESM bonds the states of the Eurozone are liable in proportion to their capital key at the European Central Bank. These differences lead however not to a transfer payment from economically stronger to economically weaker states, because the interest has to be paid by states in distress, which take up an ESM credit. Therefore the constitutional problems of pro rata bonds as analyzed in this section do not apply for ESM bonds. http://www.deutschefinanzagentur.de/fileadmin/user_upload/institutionelle-investoren/pdf/kredit_renditetabelle.pdf and http://www.finanzen.net/anleihen/Europaeischer-Stabilitaetsmechanismus-ESM-Anleihen
with \( E \) being the face value of the Eurobonds and \( N_1, N_2 \) being the face values of the national bonds in country 1 and 2, respectively.

The two fractions on the right hand side of equation (21) are a consequence of the pari passu rule of international law, which requires not to discriminate against any creditor in case of a crisis and a debt relief, here not between holders of Eurobonds and national bonds. Then the debt service \( S_1 \) and \( S_2 \) is lower than the contractual debt service. Therefore the Eurobond holders receive a quota of payments, which is equal to the quota of Eurobonds to all bonds in each of the countries.

A second indifference equation asks for the mark-ups, which a creditor would demand, who buys all bonds, that is Eurobonds, national bonds of country 1 and national bonds of country 2 (or a share of them). Condition (22) shows the result of arbitrage between the three different types of bonds.

\[
(E + N_1 + N_2)(1 + r) = (1 - q)E(1 + r + m_E) + \\
+(1 - q)N_1 (1 + r + m_1) + (1 - q)N_2(1 + r + m_2) + qS_{1t} + qS_{2t}.
\]

Solving these equations yields for \( m_1 \) and \( m_2 \):

\[
(23.1) \quad m_1 = \frac{q[(1+r)(0.5E+N_1)-S_{1t}]}{(1-q)(0.5E+N_1)} > 0, \\
(23.2) \quad m_2 = \frac{q[(1+r)(0.5E+N_2)-S_{2t}]}{(1-q)(0.5E+N_2)} > 0.
\]

The risk premium increases with more national bonds, if the amount of Eurobonds is held constant.

\[
(24) \quad \frac{dm_1}{dN_1} = \frac{q4S_{1t}}{(1-q)(0.5E+N_1)} > 0, \quad \frac{dm_2}{dN_2} = \frac{q4S_{2t}}{(1-q)(0.5E+N_2)} > 0.
\]

**Numerical Example:** Face value of Eurobonds: 2, share of each country: 50 per cent. Face value of national Bonds of country 1 and country 2: 1 and 3, respectively. Risk free interest rate: 5%. Probability of default in both counties: 0.1. Debt service capacity in of country 1 and country 2 in default event: 0.4 and 1, respectively.
4.3. The strategic character of pro rata Eurobonds and their impact on the level of national debts

Unlike the red bond blue bond concept pro rata Eurobonds lead not to liability for the debts of another state. Therefore these bonds would not directly violate Art. 125 TFEU. However pro rata bonds lead to a certain transfer payment from the stronger to the weaker state in every period because the stronger state pays an interest rate, which is higher and the weaker state pays an interest rate, which is lower than the interest rate for national bonds. It is questionable, whether such a transfer between two states, which would nowhere be visible in a national budget except in the entitlement to issue such bonds is in line with national constitutional rules. We cannot elaborate on this problem here and only state that the pro rata bond concept leads to a lower debt service of the weaker country not because some of the risks miraculously disappear as some propagandists of the blue/red bond proposal insinuated, but because of a steady flow of transfer payments.

If one asks how pro rata bonds would affect the level of debts and fiscal discipline, one effect is straightforward another is more subtle and strategic.

Pro rata bonds reduce the total debt service for weaker countries and increase it for the stronger countries. Therefore they increase the amount of national debts, which the weaker country can take up because it expands the credit limit of investors for the purely national bonds. Pro rata bonds decrease the equivalent amount for the stronger country. Pro rata bonds might therefore have an unwanted consequence and can negatively affect the fiscal discipline of the weaker country whereas they can tighten it for the stronger country.

We concentrate on an aspect of strategic interaction related to pro rata bonds (but not to red and blue bonds), which is from an economic perspective more disturbing than a yearly lump sum transfer payment to a distressed country. The states of the Eurozone or some European body would fix the volume and distribution of these Eurobonds by consensual agreement or by majority decision. National governments and parliaments decide however autonomously on the level of remaining national bonds. This combination of decision rules can lead to adverse effects. The increase of national debts increases the mark-up premium in the country. But some of the additional risks are automatically transferred to the other country. The increase of national bonds in country 1 increases the mark-up premium for Eurobonds through two channels. The first is straightforward. From equations 23.1-24 we know, that the markups for national bonds increase with the amount of national bonds. This leads directly to a
spillover effect for country 2, which has to pay a higher interest rate as the risk premium for the Eurobonds is the weighted sum of the national risk premiums. The second and indirect effect is that with more national bonds in country 1 and a fixed amount of Eurobonds in country 2 the pari passu rule of non-discrimination of creditors requires that in a default period the defaulting country pays a lower quota of debt service for Eurobonds than in the case in which the level of national bonds is held constant. We give here an illustrative example of country 1 doubling its national bond debts, after the decision of the amount of Eurobonds has been announced.

**Numerical Example**: If country 1 doubles its national debts from $N_1=1$ to $N_2=2$ with all other parameters being the same as in the above example the sovereign risk premium for country 1, $m_1$ increases from 3.37 per cent to 6.70. The mark-up for Eurobonds $m$ increases from 7.59 per cent to 10.82 per cent. But the yearly transfer payment from country 1 to country 2 reduces by one third, from 0.645 to 0.412.

The consequence is that parliament of country 1 can reduce its transfer payment to country 2 by increasing ex post its national debts and shifting costs to country 2. It can thus reduce the transfer payments on which it agreed in the decision to issue pro rata Eurobonds. And country 2 can increase the transfer payments by doing unilaterally the same if it has the intention to increase the transfer payment above the amount on which the states agreed. This can lead to an unwanted expansion of national debts for all countries. It is difficult to model such a process because one has to determine payoffs of state actors in power. A state is however not
a profit maximizing or cost minimizing actor. It is difficult to model its utility function. Models of the state are often not robust with regard to small changes of the assumptions. Yet we propose here a possible dynamics, which might result in a race to the bottom. We keep in mind that it is quite specific. On the other hand it is difficult to imagine a state of stability and low levels for national bonds if state 1 and 2 agree to transform large parts of their state debts into pro rata bonds. The reader should keep in mind that in our one period model the following sequence of decisions must take place in a very short span of time, ideally in a logical second. Otherwise interest payments for Eurobonds and national bonds in both countries would be different due to the different length of the period for Eurobonds and national bonds, thus blowing up the mathematics unnecessarily.

**Step 1:** The council of finance ministers of the stronger country 1 and the weaker country 2 decides on the level of pro rata Eurobonds and their distribution between the two countries (which is half-half in the model). When finance ministers take the decision they have in mind a particular default risk premium for national bonds in country 1 and country 2, the related risk premium for pro rata bonds and the resulting transfer payment from country 1 to country 2.

**Step 2:** National parliaments in both countries decide on the level of national bonds $N_1$ and $N_2$. These decisions fix the mark-up premiums in country 1 and country 2 $m_1$ and $m_2$ and implicitly the mark-up for the Eurobonds $m_E = \frac{m_1 + m_2}{2}$. Parliament of country 1 has a payoff if it can reduce the transfer payment and parliament in country 2 has a payoff if it can increase increasing the transfer payment. Both parliaments have therefore an incentive to increase their national budgets. The related increases of the mark-up premiums achieve just that. This also leads to the highest possible level of debts and the mark-up premium for country 1 and country 2.

**Step 3:** By backward induction Finance ministers will foresee this chain of events, calculate the resulting mark-ups in both countries, which determines the level of transfers per unit of pro rata Eurobonds and will then fix the amount of Eurobonds up to the level, which the government of country 1 is willing to pay. The unwanted consequence is the expansion of national debts in both countries.

We may illustrate the strategic interaction by a simple example. Let as assume that countries 1 and 2 both have the choice to either increase national debt ($\Delta N_1 = \Delta N_2 > 0$) or not to increase it. Let us assume that increasing national debt increases the government’s utility by $\Delta U_1 = \Delta U_2 > 0$. An increase in national debt will increase the risk premium by $\Delta m_1$ and/or $\Delta m_2$, respectively which we assume still can be paid in the solvency state of nature (probability: $q$). Due to (20), the risk premium of the Eurobonds will be affected as well.
Recall that each country’s share on the Eurobonds is 50%. Thus, we get the following game in normal form.

Table 1: Change in pay-offs to countries 1 and 2 dependent on whether they increase national debt or not

<table>
<thead>
<tr>
<th>Country 1</th>
<th>No increase of national debt</th>
<th>National debt increase: $\Delta N_2 &gt; 0$</th>
</tr>
</thead>
<tbody>
<tr>
<td>No increase of national debt</td>
<td>$0/0$</td>
<td>$-12q\Delta m_2 E/$</td>
</tr>
<tr>
<td>National debt increase: $\Delta N_1 &gt; 0$</td>
<td>$\Delta U_1 - q\left[\Delta m_1 N_1 + \frac{1}{2} \Delta m_1 E\right]$</td>
<td>$\Delta U_1 - q\Delta m_1 N_1 + 12\Delta m_1 + m_2 E/$</td>
</tr>
</tbody>
</table>

If the government’s utility from increasing debt exceeds the expected increase in interest payments for national bonds and half of the interest payments for Eurobonds, that is, if $\Delta U_i > q\left[\Delta m_i N_i + \frac{1}{2} \Delta m_i E\right]$ holds ($i = 1, 2$), both countries have the dominant strategy to increase their national debt. If the countries would have to fully bear the consequences of increasing debt, that is if $\Delta U_i < q\left[\Delta m_i N_i + \Delta m_i E\right]$ holds, they might not want to increase national debt. Thus, the presence of Eurobonds would imply a prisoner’s dilemma, that is, a situation where countries take suboptimal decisions. Since the countries partly share the increasing interest burden via Eurobonds they are more likely to take up additional national debt than without Eurobonds. It is obvious that the incentive to take up additional debt becomes the stronger the more the additional interest burden can be transferred to other countries, that is, the larger is the volume of Eurobonds outstanding ($E$) and the bigger is the number of countries involved in the issue of Eurobonds. For instance, with three countries with equal shares, a country would only bear one third of the increase in interest payments for the Eurobonds. With $n$ countries having equal shares, it would be $1/n$.

Proposition 4: Pro rata bonds lead always to a transfer payment from the stronger to the weaker country. They increase the maximal possible debt for the weaker country and reduce it for the stronger country. They can provide incentives for any member country to increase the volume of its national debts as parts of the additional lending risks are shifted to other countries. These incentives become stronger with a larger volume of Eurobonds and with a larger number of participating countries.

Conclusion: This type of pro rata bonds does not include joint liability. Therefore it might be arguable that these pro rata bonds do not violate Art. 125 TFEU. However they lead to international transfer payments via the interest rate and might therefore violate national constitutions. And they lead to incentives, which might undermine fiscal discipline in all
5. Eurobonds with pro rata liability for capital and for interest payment

This idea, originally from Favero & Missale (2012) concentrates exclusively on the mutual advantage of all states in the Eurozone and contains no element of solidarity or redistribution. Eurozone members commonly issue sovereign debts based on their proportion of Eurozone GDP and receive the related cash flow. The interest rate on this pooled Eurobond would be the weighted average of the interest rates observed in each sovereign bond market at the moment of issue and therefore include the risk premium of each country. The countries would pay the same interest rate to a European Debt Agency (EDA) as they pay for their national bonds. After collection of the payments, the EDA would pay interest and principal to the investors. If a country is not able to pay interest or principal, there is no obligation for other countries to step in.26

To recall the mutual advantage resulting from this proposal one has to keep in mind that the mark-up premium in any country is determined by the sovereign default risk and the additional liquidity risk (see above p.1). The latter decreases with the size of the market if countries pool their bonds. Therefore in each of $n$ countries the liquidity premium would decline by a small value $\epsilon_i$, which decreases with the size of the country. If $E$ is the face value of all such Eurobonds and the share of country $i$ is $E_i$ the total gain from these types of Eurobonds is —as for any other type—

$$\text{Total Gain} = \sum_{i=1}^{n} \epsilon_i E_i .$$

Notice that this gain requires to replace all national bonds to be transformed to Eurobonds. Otherwise a tradeoff between liquidity premiums of national and of Eurobonds exists.27 The gain can be distributed among the member countries after the European debt agency has

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26 The proposal by Favero & Missale (2012) is similar to the ones set out by Beck et al. (2011) and De Grauwe and Moesen (2009), but still different. Beck et al. (2011) suggest that a so-called European debt mutual fund should hold a mixture of the debt of Eurozone members and then issue tradeable securities whose payoffs are the joint payoffs of the bonds in its portfolio. The Beck et al. proposal implies that national bond markets still exist and thus, national bonds still suffer from high liquidity risk premia which in turn reduces the value of bond portfolio held by the European debt mutual fund. With the Favero & Missale proposal, national bonds would not exist or to a much smaller extent such that the liquidity premia on national bonds hurt less. Moreover, Beck et al. implicitly assume that all sovereign debt will be turned into structured Eurobonds. De Grauwe and Moesen (2009) suggest to structure the Eurobonds according to the countries’ equity shares in the European Investment Bank (EIB), not to GDP. More importantly, De Grauwe and Moesen (2009) suggest joint liability according to the equity shares in the EIB, while several liability would be better suitable to reduce moral hazard.

27 There is also evidence that mutualized bonds are unlikely to decrease the overall interest burden. In Germany, in June 2013, the German states (the Länder) issued a bond together with the federal government (on the basis of proportionate liability). While the federal states saved 13 million € on interest expenses and fees, the German federal government had to pay 14 million € more.
serviced the debts. For countries with thin bond markets the interest rate reduction might reach 0.2-0.5% percentage points per year. The proposal suggests a mutualisation of sovereign bonds trading but not a mutualisation of sovereign bonds default risks. It thus rules out any additional free rider problem and any additional incentive to lower fiscal discipline. Also a country like Germany with a heavy bond market and a small liquidity premium can benefit, because the participating states are free to distribute the total gains as they prefer. This proposal would also be the least demanding in terms of the required legal changes. We cannot see any reason, why it should violate the TFEU, a national constitution or international law. It would only require an international treaty between member states to establish a European Debt Agency with the competence of a fiscal agent. Its only difficulty is to find a reliable formula to disentangle statistically the two elements of the risk premium, namely the sovereign default risk and the liquidity risk. But even this is not technically necessary to realize the gains. The participating states can demand the same interest from any member state, which this pays for national bonds and can later distribute the resulting total gains in any way they can agree on.

The economic consequences of this type of Eurobonds would be the same as if Eurobonds would not exist, that is the consequences we have discussed in section 5.2.

6. Mutualization of all public debts in the Eurozone with joint liability of member states

This is one of the proposals in the green paper of the EU-Commission.\textsuperscript{28} It is obvious that this solution cannot co-exist with national fiscal sovereignty. If all debts are mutualized and each member state is jointly liable for all debts of all other states the decision to issue new debts must be transferred to a European body. This would end national decisions on fiscal deficits. Member states would not have legal access to debts any more. The proposal is therefore often combined with considerations to establish a Eurozone parliament with the competence to decide with majority of its members on the issuance of bonds and their distribution among member states. Another possibility would be to let finance ministers take such decisions consensually, which would give a veto position to any country. Either way this would replace fiscal sovereignty of member states by a fiscal centralism, which does not even exist in federalist countries like Switzerland, Germany or the USA. Only in cases of fiscal crises can federal governments in these countries manage state debts or cantonal debts. A consensual

agreement on debts between ministers of finance would hand over the decision to the
government of that one country, which mostly embraces fiscal austerity. We question,
whether this would be in line with any constitution of a democratic state. And in a Eurozone
parliament weak states might gain a structural majority for ever increasing debts for which all
states are jointly liable. Both such institutions might lead to angry reactions of agonized
citizens. They would not unite but divide the peoples of Europe. For this reason we dismiss
them without going much into the details of such proposals.

The same arguments apply to the proposal of Weder di Mauro from the German Council of
Economic experts\textsuperscript{29} according to which all national debts of member states above 60 per cent
of the GNP (the Maastricht criterion) should be mutualized and transferred to a fund, jointly
guaranteed by all member states and paid back in a period of 25 years. This is combined with
a similar proposal for fiscal centralism, for which the same reservation applies as for the
mutualization of all public debts. Such proposals require far reaching changes of the TFEU
but also of national constitutions. If they are not combined with a democratic parliament for
the Eurozone but a committee of ministers they might violate fundamental characteristics of
any democratic constitution.

Summary

\begin{itemize}
\item The Favera & Missale proposal of Eurobonds with pro rata liability and no cross
subsidization of interest payments, requires no changes of constitutions or the
European treaties and creates no adverse effects or additional opportunities for
opportunistic behavior. It can lead to a joint gain from lower liquidity risks for all
participating countries, if the quota of Eurobonds is high enough. It is therefore the
least controversial proposal. However it does not provides safe assets, and for this
reason can also not contribute to avoiding one way speculation in an existential crisis
of the Euro.

\item The blue bond red bond proposal with senior blue Eurobonds and national junior red
bonds with joint liability is much more difficult to realize. It faces problems of
international law, cannot be realized without changes of the European treaties and
possibly needs constitutional changes in member states. It is not certain and depends

\textsuperscript{29} \url{http://www.sachverstaendigenrat-wirtschaft.de/fileadmin/dateiablage/Sonstiges/chapter_three_2011.pdf} \ and
\url{http://www.sachverstaendigenratwirtschaft.de/fileadmin/dateiablage/download/publikationen/arbeitspapier_01_2_012.pdf}
on parameters, whether it can bring down the sum of liquidity risk premiums for all bonds in the Eurozone. However it would create additional safe assets and curb one-way speculation in a Euro crisis. Moreover, creditors’ transaction costs might decrease since creditors of blue bonds do not need to collect and evaluate information on the default risk, given that blue bonds are risk-free. It might also strengthen the autonomy of the ECB if the central bank restricts its open market operations to blue bonds. This type of bonds would not provide additional incentives for the states to extend their national debt. Joint liability of all member states can be factually avoided except for catastrophic risks by giving blue bonds priority over the national bonds and limiting their volume to a debt level, which each country can service even in times of severe crisis. A weak point of the red and blue bond concept is the difficulty to guarantee that the blue bonds are actually serviced with priority even during a debt crisis. This problem can be alleviated by issuing short-term bills rather than bonds or by shifting revenues from a national tax directly to a European debt agency similar to the shifting of customs duties in the EU.

- Pro rata bonds with a common interest lead to a transfer payment from stronger to weaker countries. They probably require a change of the TFEU. They can lead to lower total liquidity premiums depending on parameters. They are not safe assets and can therefore not contribute much to stabilization. The main deficiency of this type of pro rata bonds is that they provide incentives for member states to extend their national debts, because each member state can under this construction shift some of the costs to all others. Therefore they carry an additional risk for fiscal discipline, which makes them not recommendable. In the light of the Pringle decision of the ECJ they might also violate EU law.

- The mutualization of all government debts with joint liability, proposed in the green book of the EU commission would require fundamental changes of the institutional structure of the Eurozone, which would end national fiscal autonomy. In our view this is not politically practicable. It would also impose on the member states an iron fiscal centralism, which does not even exist within federalist states as the USA, Switzerland or Germany.

List of references


