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Structured Common Project Financing (SCPF): Efficiency without Debt Mutualization

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Structured Common Project Financing (SCPF): Efficiency without Debt Mutualization

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Abstract

We propose Structured Common Project Financing (SCPF) as a stable, beneficial and political feasible financing tool for special purposes, e.g. Corona-Bonds, Green Deal Financing, Common Forces Budget. SCPF is an ABS-based common financing tool managed by a supranational organization like the ESM or the EIB. Our approach allows overcoming the huge and emotionally influenced political obstacle of joint liability by marginalizing the degree of jointness. SCPF creates significant interest savings compared to individual financing, 0.6% p.a. in the benchmark case. It is stable over time, robust to the emission of subgroup scenarios as e.g. a PIIGS bond and an EU-6 bond, and insensitive to the evolution of the macroeconomic environment (risk-free interest rate).

Keywords: Structured Common Project Financing, Joint Liability, Fiscal Union, EMU, Sovereign Debt, ABS, Corona-Bonds

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1 Introduction

Not just in the recent crisis common financing has been a heavily debated topic in the academic, political and public community. Yet recently, the debate has gained speed and intensity as from the need for support and solidarity from struggling countries like Italy and Spain, the term Coronabonds emerged.

Summarizing, there are two opposing views on the topic. The one side highlights the macroeconomic advantages like a true European yield curve, increased availability of a safe asset, higher stability and the removal of the asymmetry of monetary and fiscal union. A common fiscal system is seen as the necessary and reasonable next step in the evolution of the European system. The other side worries about the mutualization of sovereign debt, moral hazard and increasing debt levels and fears the loss of national sovereignty.

Structured Common Project Financing (SCPF) is a way to establish joint financing of European projects, like solidarity measures for Corona losses, the Green deal or Common Forces. It also works well for smaller groups of countries as we show below.

Typically common financing approaches come along with joint liability, moral hazard, interest saving and increased macroeconomic stability. Our approach keeps the benefits but reduces the disadvantages to a marginal minimum. SCPF allows overcoming most of the economic and political obstacles by installing an intermediary institution and an optimized small share of joint liability which still generates significant interest savings[1] and is politically feasible, stable and robust to varying macroeconomic circumstances. In contrast to the introduction of Eurobonds, SCPF is designed to finance certain European projects, and thus does avoid many of the problems assigned to the introduction of a truly joint European fiscal system. However successful SCPFs could serve as a blueprint for a joint European fiscal

[1]Interest savings reach 0.6 percentage points depending on the degree of joint liability even in the current economic environment. Based on an efficiency optimal degree of joint liability between 16% and 29% of each countries individual share, we can price the political cost of joint liability. Due to risk diversification, countries with high-interest load are most profitable for the community while AAA country participation enhances the structures credibility.

system.

The core element of SCPF is an Asset-Backed-Security (ABS) structure issued by a supranational institution like the ESM or the EIB which is additionally enhanced and strengthened by a security buffer.[2] Closest in the literature are the structured Eurobonds approaches in Hild et al. (2014), Bauer and Herz (2019) and Brunnermeier et al. (2016) where the latter can be easily extended with a security buffer. While preserving the general macroeconomic and fiscal advantages, SCPF, in addition, allow the interest gains to be redistributed or used for project purposes. Suitable distributions increase the internal stability and reduce moral hazard.

Structured Common Project Financing yields positive economic effects at low costs and enhances public opinion about the European project. As a consequence, SCPF raises expectations on economic conditions and therefore support the public opinion of both SCPF themselves and the European Union in general.

The rest of the paper is structured as follows. Section 2 presents the structure of SCPF in detail highlighting the theoretical background on advantages and disadvantages. Section 3 has a look at the data and methodology. In section 4 we discuss the optimal degree of joint liabilities, while in section 5 different settings and robustness checks are presented. Section 6 concludes our findings.

2 Theoretical Background

2.1 General approach

The approach introduces an intermediary between the originators of the debt and the capital market. This intermediary is a special purpose vehicle (SPV) established by a supranational organisation like the ESM or the EIB. By doing so, we can disconnect or marginalize most of the problems attached to common financing while

[2]In a simulation, we use an interest premium paid by the structure of 0.3% to account for potential uncertainty aversion of investors as this is a new product and still get significant interest advantages. Since all elements are standard and market depth is large, so this premium should cease within a short time, e.g. a second or third tranche should be issued without such additional costs and the interest advantage will boost.

being able to preserve most characteristics beneficial to the group as a whole. Figure 1 depicts the main elements. (1) The originators issue bonds of a common maturity and with a market conform interest rate directly to the SPV. (2) The SPV collects these bonds, builds different risk tranches of them and creates the security buffer (trust fund). (3) The refinancing is performed by selling the separate tranches to the capital market.

There are three main participants in ABS structuring as shown in figure 1: (i) an independent SPV acts as an intermediary between (ii) originators and (iii) investors. The SPV buys a portfolio of debt instruments to first pool and then tranche these assets. To finance the portfolio the SPV issues claims with different characteristics such as the level of seniority, risk, rating and yield - the tranches. In our case, the ESM takes the role of the SPV while the beneficiary countries correspond to the originators. The trust fund takes the role of the lowest tranche, the so-called equity tranche. In case of insufficient payments by the beneficiaries, losses are covered first by these funds which thereby create an additional security buffer (trust fund) for investors and thus improve the ratings of the higher tranches. Joint liability is limited to the fund which has an optimal size of 10% of the nominal volume of issued debt for each country.[3] Losses that exceed this size will cause depreciation of the junior tranches.[4]

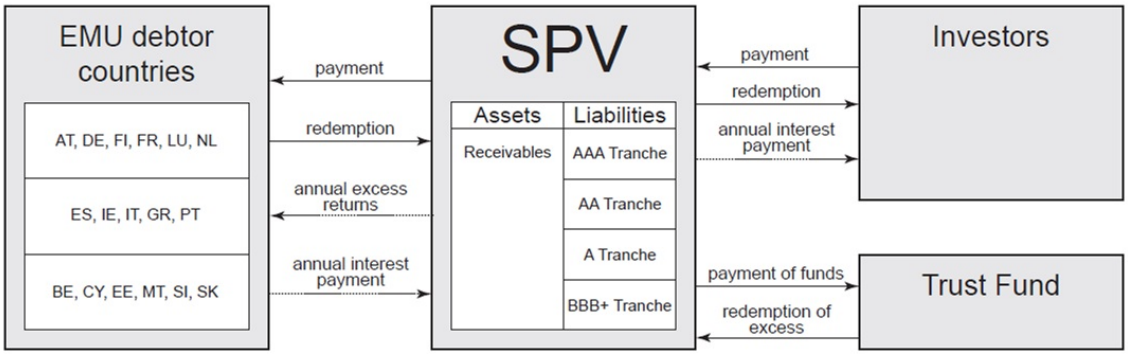

Figure 1: Structure of the SCPF

[3]In chapter 4 we discuss the optimal size of the trust fund. A size of 0 is very costly, as the so-called equity tranche is the riskiest one and investors would demand an extremely high interest rate. In private bank ABS constructs, typically this tranche is held either by the originating financial institution or by specialized hedge funds.

[4]In the appendix A we discuss the details of the ABS construction.

In the core of this construct, the SPV buys a portfolio of bonds of all participating countries.[5] After this pooling of assets, tranches with different risk and interest payments are issued. The diversification and tranching effects allow to exploit the nonlinear relation of default risks and interest rates and thus to generate interest surpluses in excess of the extra costs of the trust fund and an uncertainty premium for the first issuance.

2.2 The SPV

2.2.1 ABS: Diversification, tranching and interest rates

Markets' evaluation of bonds shows an implicit risk aversion as the expected yield of low risk (high rated) assets – including default risk – is lower than the expected yield of high risk (low rated) assets. An ABS structure allocates the original cash flow to different risk tranches and realizes an interest advantage between the refinancing cost of the different tranches and the payoff of the underlying assets. By using securitization tools net gains can be generated as new assets are created, which are better tailored to individual investors' preferences. A straightforward rationalization for these gains is related to market participants demanding increasing risk premiums above the risk neutral expected value for risky assets.

The newly issued tranches have a lower average interest rate than the weighted average of the single issuance interest rates of participating countries since sovereign yield curves clearly show the market's risk aversion. Since coupon rates on the nominal value of bonds are driven by ratings and the corresponding default probability, this advantage can also be gained with Structured Common Project Financing.

Tranching of assets is basically a process of risk allocation. Instead of issuing one bond with a given rating, risk and yield, the ESM-ABS offers several tranches with different priority, creditworthiness and thickness. In this cascading structure

[5]To avoid additional uncertainty and issuer risks, these portfolios must be filled with physical bonds and not through synthetic contracts like credit default swaps (CDS). Collateral Default Obligations (CDOs) are a special type of ABS which uses sovereign bonds as collateral. A deeper explanation of CDOs, their pricing and the correlation effects can be found in Longstaff and Rajan (2008), Coval et al. (2009b) and Coval et al. (2009).

high-rated tranches pay lower yields than tranches with a high risk and low rating. The highest-rated senior tranche has priority on cash flows and therefore carries the lowest risk. Subordinated tranches receive cash flows only after the senior tranche is fully served. Their rating is lower and due to higher risk, they deliver higher yields.

Although ABS are commonly associated with both tranching and diversification, it is the tranching procedure and its efficiency gains that are at the core of ABS. The diversification effects support and amplify these tranching effects. The higher the diversification the larger the AAA tranche and the higher the interest gains. Hence, ABS with a low number of assets as in our case are nothing unusual in structured finance. Obviously, the current ESM financing structure is subject to the same diversification effects.

2.2.2 The trust fund

The trust fund is one of the innovations of our approach. It is equivalent to the equity tranche in standard ABS constructs and takes first losses in case of a default. Since the trust fund is financed through a part of the government debt it bears financing cost in the form of the interest rate difference between the individual countries rates and the risk free rate. On the other hand, it increases the risk structure of the SCPF significantly, improves the structure of the tranches and thus lowers the interest costs of the SCPF. In chapter 4, we show that cost optimal levels of the trust fund range from 16% to 29%. We also show that a fixed rate of 10% shows only marginal losses in efficiency. A fixed rate, however, is politically more feasible than individual optimizes estimates which are sensitive to the model calibration and thus subject to possible debates.

In the benchmark scenario, the interest gain of the 10% trust fund is 0.6% relative to the no trust fund scenario. The optimized reserve level is 29% in absolute gains. Relative to the nominal, the gains are slightly lower with 0.5%. Thus the additional absolute gains reached by fully optimizing is relatively low compared to the potential political cost of an argument about the exact value.

The trust fund is the only element that resembles a sort of joint liability since it is a jointly financed fund that covers first losses and losses only occur in case of sovereign defaults. Since the "joint liability - moral hazard" problem[6] is one of the largest political barriers to the introduction of any common financing, our SCPF approach yields a convincing counter narrative. Usually, in the political debate issuing bonds with joint liabilities comes down to the argument "We [the 'strong' countries] will have to pay for your [the 'weak' countries'] debt." E.g., in September 2011 German Chancellor Angela Merkel said in the German Parliament that Eurobonds are only a "communitisation of debt" and a "way into a debt union". One year later she said that Eurobonds will not be established "as long as I live". In the current debate on Corona bonds, this position again outmatches any solidarity and economic efficiency arguments.

2.2.3 The supranational institution and sovereign issuance

An important element of SCPF is the direct issuance of sovereign bonds to the SPV of the supranational organization. By directly selling the bonds to the SPV two main advantages can be established. Firstly, there are no friction losses nor incentives of market participants for speculation or price manipulations. Secondly, since SCPF is strictly project oriented the influence on the individual bond market should be very small. Thereby the problems coming along with the introduction of Eurobonds will not apply. There will be a market for sovereign bonds and thus a market measure

[6]Of course, joint liability means an additional risk and thus hard financial costs and there is a serious academic and political discussion about the moral hazard involved in common financing. The debate whether full common issuance will set negative incentives for countries with refinancing problems, e.g. through a financial crisis, is controversial. More stable countries, e.g. Germany, fear a situation in which they de facto have to pay for countries which use SCPF as a cross-financing instrument. This means that countries with refinancing problems can borrow money from the capital market in a higher volume than in a single issuance scheme. This is due to a good rating and a high nominal volume which allows borrowing money at a low interest rate and the effect of one country needing more money is not crucial for the whole SCPF scheme. If they cannot repay the debt, they default and the other countries in the SCPF system, e.g. the more stable countries and especially their taxpayers, have to repay the debt of the defaulted country. The joint liability of SCPF is widely seen as the demise of a common budget authority. Also, the design of the SCPF system has to account for defaults of single countries to prevent negative impacts on the credibility of the system itself with a subsequent probability of super-contagion-like effects. The SCPF approach with its only marginal level of jointness is not subject to these fears.

for interest rates and bonds prices. In contrast to a transformation of the entire sovereign financing to a common structure, SCPF does not entail market liquidity and market depth problems distorting the residual bond markets.[7] Since SCPF targets financing of large projects, market liquidity is ensured.

Also, since bonds issued to ESM or EIB are not part of the collective default clause, a settlement of these debt are possible even in case of a sovereign default. Therefore, the default risk for SCPF debt would de facto be lower than the default risk on regular bonds. In our simulation study, we cannot account for this additional advantage since there is no reasonable measure for this effect.

2.3 Advantages and disadvantages of the approach

General advantages of common financing in Europe are as vast as the literature on it. Most of it is connotated with the term Eurobonds.[8] While we will not enter the discussion of the political advantages of a deeper integration or the disadvantages of a loss of sovereignty, the economic consequences are much clearer to analyze.

Common financing reduces interest expenses and deepens the market for sovereign bonds. In our benchmark scenario, the share of AAA bonds is 77% and thus more than twice as high as with single issuance.[9] Another advantage is the creation of an equivalent to the US-American T-Bill market and supply the financial markets with a new market based and tradable Eurozone wide yield curve.[10] A higher share

[7] On the national level, after the introduction of full common financing, the decreasing liquidity in the remaining sovereign country-specific bonds will be challenging for the fiscal authorities. Also, there will be increased uncertainty in rating single country bonds when liquidity is low in the remaining individual markets. Due to lower liquidity, existing bondholders will face some liquidity premia which lowers their yield. Also, new issuances will be more costly for issuing countries - if they don't want to be part of the common financing programme - since the demand is lower with existing common bonds.

[8] First ideas of joint issuance of sovereign bonds have already been published by the Giovannini Group (2000). The variety of approaches proposed thereafter is wide. The Securities Industry and Financial Markets Association (2008) and Claessens et al. (2012) give overviews of the proposals. Brunnermeier et al. (2016) elaborates on the macroeconomic advantages.

[9] Typical advantages of a broader switch to common financing, like higher liquidity in the sovereign bond market due to a less fractionated bond market or a strengthened role of the Euro as an international reserve currency, only partially apply.

[10] To create a yield curve, issuance has to be in various maturities. Given the project character of SCPF this might be possible only for certain large or continuous projects like the Green Deal or common Forces.

of common finance bonds in banks' balance sheets might even be able to solve the sovereign-bank nexus. Cronin and Dunne (2019) use the approach of Brunnermeier et al. (2016) as the basis to show that tranching is advantageous to the senior bond holders. They found that the spillover effects from higher-risk countries are reduced and the effect declines during the time of a financial crisis. This can be beneficial for banks holding the senior tranche. They see the same affects for an additional mezzanine tranche which indicates that the advantage is also observable for SCPF-ABS structures.

In contrast to a standardized system of common financing with full joint liability, the strict limitation of joint liability marginalizes the risk of moral hazard. Since the SCPF is a strict project oriented form of financing, the benefits from a sovereign default are limited to the involvement to this project but the cost include not only the typical political and economic cost of a default but also the lost revenues of participation on future SCPFs. In addition, since bonds issued to ESM or EIB are not part of the collective default clause, a settlement of these debt are possible even in case of a sovereign default.

Finally, SCPF creates significant net interest advantages over the individual issuance. Even after subtracting expected losses from defaults[11] and the interest cost for the financing of the trust fund, the net profit is 0.6% p.a. in the benchmark case.

The interest savings can be distributed according to a predefined scheme. Possible distributions include a cashback for all participating countries, bonuses dependent on political goals like meeting targets of the stability and growth pact, support for countries with special needs, the general support of the SCPF project goal or increase the financial base of the supranational organization that handles the SPV to ease the emission of the following SCPF.

The result is very insensitive to the riskless interest rate, as we see from the

[11]We use a conservative market based measure for the default probability which does not account for the reduced the default probability for ESM/EIB bonds. While such an estimate would significantly boost our results we have found no scientifically reliable way to estimate this political variable.

analysis in chapter 4. The interest advantage increases approximately by 0.01% per percentage point increase of the risk-free rate. Therefore our analysis also applies for negative AAA interest rates.

3 Methodology and Data

3.1 Methodology

Our analysis follows the model introduced by Hild et al. (2014). A SPV is established which buys a portfolio of bonds of the participating countries and sells different tranches with different interest rates to the capital market. A trust fund (in the benchmark model 10% of the issued nominal volume) absorbs first losses and invests the capital at the risk-free interest rate. If a country defaults and the cash flows cannot be served, the trust fund steps in while the recovered nominal value is transferred to the trust fund and the country drops out of the scheme.

The probability of default of every country is calculated using the method of Sturzenegger and Zettelmeyer (2010). They use CDS-spreads and recovery rates to calculate the default probability. As a benchmark, we use a fixed recovery rate of 50%. Other possible methods to calculate a default probability have been shown by Polito and Wickens (2015) and Bi (2012). In the first article a rolling-window VAR model has been used while in the second risk premia are matched to default probabilities in a closed economy model. Polito and Wickens (2015) mainly focus their analysis on the possibility of countries to repay the debt by tax revenues and Bi (2012) uses a model with several macroeconomic factors. Since none of them presents a connection to the recovery rate, we stick to the method of Sturzenegger and Zettelmeyer (2010) and assume that the market appropriately displays the default probability.

We apply the strongest possible parameter values for contagion effects to present the most conservative model. For this, we assume the highest possible correlation without violating the default probabilities of every participating country. This

means that if one country defaults all countries with a higher default probability also default. Also, we do not allow a member to come back into the SPV after defaulting once. If a country defaults, it falls out of the SPV and the nominal which can be recovered is transferred to the trust fund.

In this paper, we present results for a period of ten years to model long-term refinancing. After this time the remaining capital in the trust fund is redistributed to the non-defaulted countries. We allow for two different distribution methods of the net surplus, even or relative, although other distribution schemes are possible to set political incentives. In this context, an even distribution means that the net surplus is allocated according to the individual debt level. In the relative case, the funds are distributed in relation to the interest payments. The first method is better for countries with high nominal volume and low-interest rates, i.e. AAA countries, whereas the second method is advantageous for countries with a high-interest burden, e.g. PIIGS countries. Therefore, it is a political topic to decide between the methods of distribution. The direct economic advantage, i.e. the average interest reduction for the debtors, is independent of this distribution. But the indirect advantages, e.g. higher economic stability through repayment schemes based on prudential economic policies or low budget deficits, do indeed depend on the outcome of the political bargaining process defining the distribution schemes.

We run Monte-Carlo simulations to find the structure and calculate the extra costs and gains/losses. The simulation is done with m=100,000 loops.

3.2 Data

For the calculation, we need the yields of the government bonds of every single member country of the EMU. We additionally need the CDS-spreads for different rating classes to calculate the interest outflows from the SPV to the capital market. We thus include the issuer risk assigned to non-sovereign bonds into our model. Since these spreads are not available for every single possible rating, we use a spline interpolation to approximate the few that are missing. The 10-year CDS-spreads for

every member country are taken to derive their probability of default. These datasets and the rating of every member country are taken from Reuters Datastream for the end of August 2018, the end of December 2012 and the end of December 2008. The three dates are chosen to represent current circumstances, the European sovereign debt turmoil and the financial crisis starting in 2008, respectively. The individual interest rates of every participating country can be found in the appendix table A.1. Sovereign debt and GDP to calculate the issued volume of debt are also taken for the end of July 2018 or the latest possible date from Eurostat, the European statistical centre.

3.3 The Benchmark Case

For the calculation of the benchmark case, we apply a maturity of 10 years. With regard to the current Corona crises shorter maturities seem not reasonable.[12] Since the SPV is set up by an international organization like the ESM or the EIB, we assume that interest payments by the structure for the AAA share are equivalent to German rates.

In the benchmark case, we get the following results:

- Average interest rate paid by the structure: 0.4 %
- Average interest rate paid by countries: 1.1%
- Net expected interest savings: 0.6%
-

Rating	AAA	AA+	AA	AA-	A+
Thickness	77%	4%	14%	2%	3%

As a first robustness check, we added a risk premium estimated from sovereign CDS spreads resulting in net savings of 0.4%. Even after additionally correcting for an uncertainty premium of 0.3% for a new product we face a positive net savings of approximately 0.1% per year.

[12] In our robustness check, we also analyzed shorter maturities. The p.a. interest gains decrease with the maturity, i.e. our benchmark case is a very conservative estimate.

Since all three scenarios deliver positive results and we assume an issuance through an supranational organization, we will stick to the benchmark case. This is the basis for further analysis.

4 Optimal degrees of joint liability

The initial trust fund volume is a crucial determinant of both the political bargaining process and the economic advantages of Structured Common Project Financing. The trust fund is equivalent to the degree of joint liability every country is willing to choose. The main implications of a larger trust fund are (1) an increased security buffer for the investors resulting in a more efficient tranching and lower average interest rates, (2) an increase of the void interest payments of the participating countries as the trust fund share is also credit financed and (3) an increase of the risk of the participating countries to lose money in case of a default of a member and thus a potential increase of moral hazard. The financial net effect of the trust fund for the participants is nonlinear in the size of the trust fund and also depends on other parameters like the global financial situation and the recovery rate.

In the efficiency optimum, the positive marginal interest rate reduction is offset by the marginal financing cost of the trust fund. The political and economic risk is an additional argument in the political bargaining process that determines the realization of the trust fund size. Therefore the optimal level of the security buffer is below its efficiency optimum. The deviation from the optimum is the political price for the joint liability risk. To minimize political frictions in the initiating process, we argue that a fixed rate is to be preferred to an dynamically adjusted one.

First, we examine the effects of the trust fund on nominal gain and interest rate advantages generated by SCPF. In figure 2 we have a look at three benchmark shares - 5%, 10%, and 20% - and their impact on the nominal gains as a function of the recovery rate and the risk-free interest rate. In all scenarios, the recovery rates have a qualitatively similar positive effect. The sensitivity to the recovery rate, however,

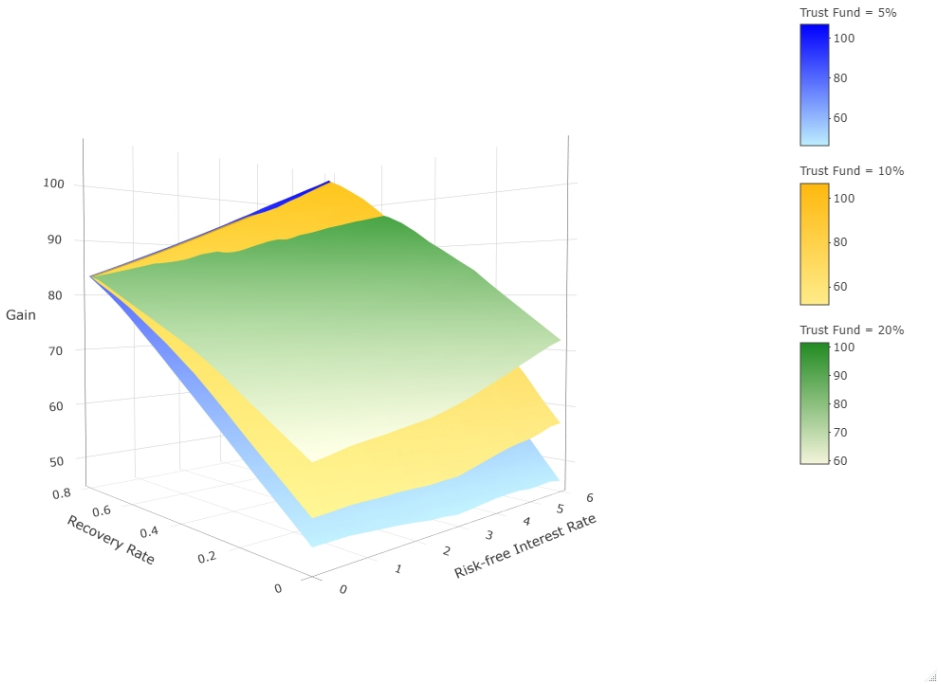

Figure 2: Nominal gains in a SCPF scenario with different trust fund shares over a grid of several recovery values as well as risk-free interest rates.

decreases with the trust fund size, since a larger trust fund stabilizes the repayment cash flow and thus enhances the structuring. The effect of the risk-free interest rate is dependent on several factors. It is neither strictly positive nor strictly negative. For low recovery rates, the effect is negative with decreasing gains for growing interest rates. For higher recovery rates we can observe a change and the effect is strictly positive for increasing interest rates. The respective reversal point in the recovery rate is dependent on the initial trust fund share. For a trust fund of 5% the reversal takes place at a recovery rate of 10% whereas for a 20% trust fund share the effect is positive for every recovery rate. This can be explained by the interest generated within the trust fund which depends on the risk-free interest rate. In addition, a larger initial trust fund can even bear losses when the recovery rate is low. In this case, the sensitivity to the risk-free interest rate decreases with the trust fund size. For an assumed total issuance of 10% of GDP (1240 billion Euro), the gains reach from 46.60 billion Euro to 106.78 billion Euro. These extremes both happen in a 5% trust fund and 6% risk-free interest rate scenario with the recovery rate ranging from 0% to 80%.

Recovery rates used in the literature and which are implied in market estimates from CDS spreads typically lie between 40% and 60%. For these rates the sensitivity of the gains with respect to the risk-free interest rate is marginal. The maximum difference between a crises environment with risk-free rate of 0% and a macroeconomic boom scenario with a rate of 6% is 19.66 billion Euro or 0.03% p.a.

For recovery rates below 60%, gains rise with the initial trust fund share but this effect is reversed for higher recovery rates. The marginal effect of the trust fund share on the average rating of the structure declines while the individual countries' marginal interest rate burden to finance it remains constant.

We also see that excess returns of the SCPF are closer to each other for low risk-free interest rate and diverge stronger for higher values. For low interest rates the differences range only from 0.03 to 0.17 billion Euro, i.e. the structure is not sensitive w.r.t. the trust fund share in a low-interest rate environment.

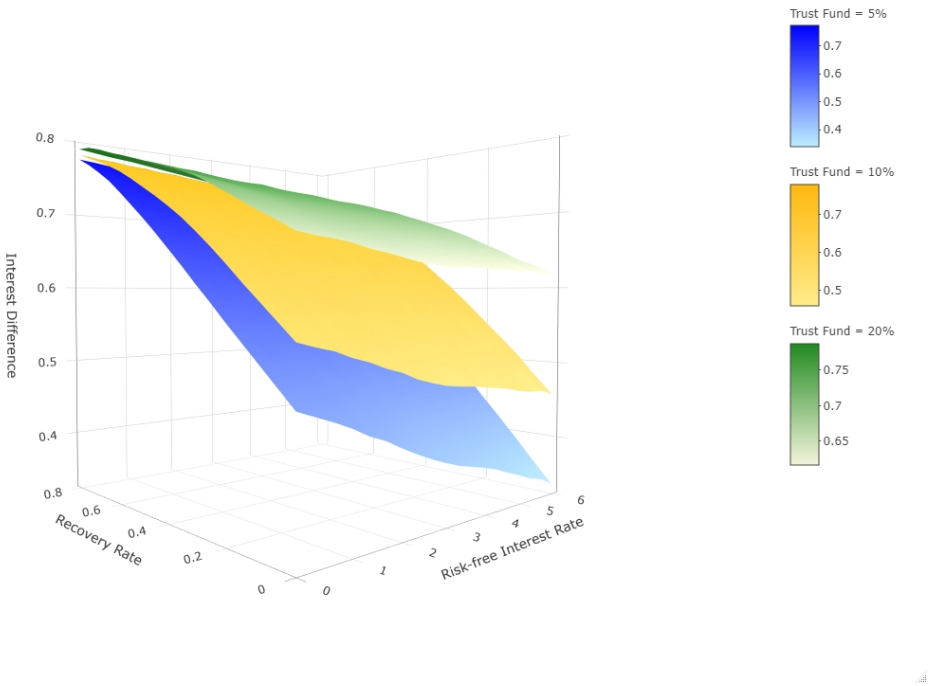

Figure 3: Interest rate difference in a SCPF scenario with different trust fund shares over a grid of several recovery values as well as risk-free interest rates.

The results highlighted in figure 3 present the interest savings of SCPF, i.e. the net gains displayed in figure 2 less the financing cost of the trust fund. We see that the topmost layer, which is representing the 20% initial trust fund rate, has

the flattest slope and the lowest layer (5%) the steepest slope. Low trust fund structures are more sensitive to changes in recovery rate and risk-free interest rates. This interest advantage (of a smaller initial trust fund) is decreasing with higher recovery rates because the risk structures and thus the tranching converges with growing recovery rates.

We turn to optimize the trust fund size w.r.t. the countries' net gain. We use a benchmark recovery rate of 50%[13] and vary the trust fund shares between 5% and 30%. The result can be seen in figure 4.[14]

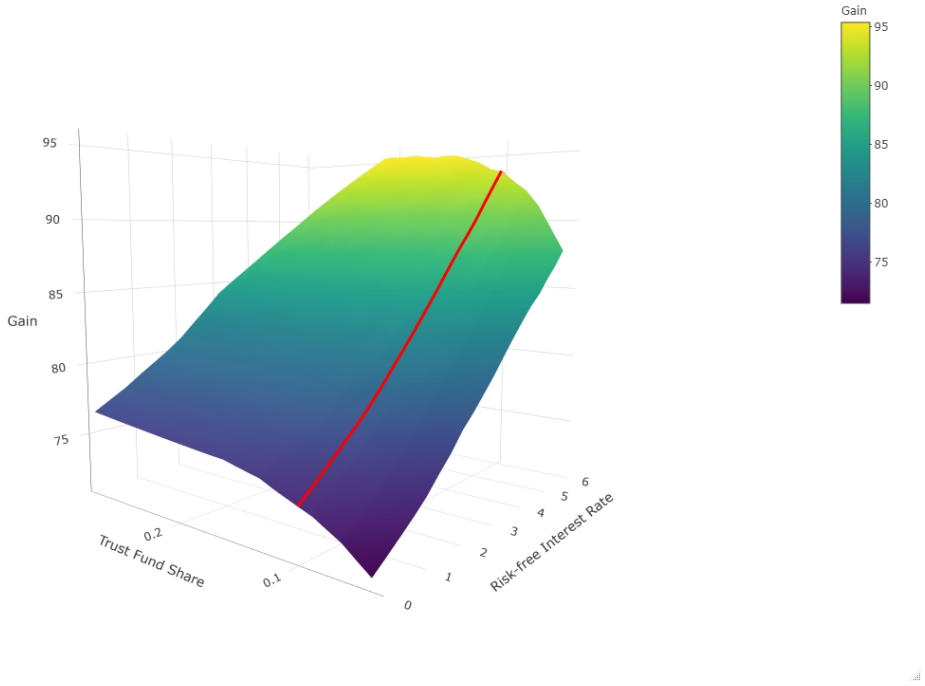

Figure 4: Sensitivity of gains for different trust fund shares and risk-free interest rates in a fixed recovery rate scenario where it is fixed to 50%. Red line: Gains for a fixed trust fund share of 10%.

We see that the net gain as a function of the trust fund share is nonlinear, asymmetrically inverse U-shaped and has a unique maximum. Dependent on the risk-free interest rate, the efficiency optimal trust fund size is between 18% and 29%. The results are also absolutely supported for other recovery rates (see the Appendix). We also see that the U-shape is quite flat in an environment of the

[13]Meyer et al. (2019) and Cruces and Trebesch (2013) estimate haircut sizes of 44% and 40%, respectively. This is equivalent to a recovery rate of 56% and 60%. We use a more conservative assumption and fix the recovery rate at 50%.

[14]Robustness checks with 40% and 60% recovery rate can be found in the appendix.

efficiency optimum, i.e. not too large deviations from the optimum induce only marginal efficiency losses. To illustrate our point, figure 4 depicts the gains of a fixed trust fund share of 10%. We see that efficiency losses are below 3 billion Euro which is about 0.025% p.a. Relative to the uncertainty involved in estimating the relevant parameters like the recovery rate or changes in the macroeconomic environment (risk-free interest rate), the efficiancy loss seems marginal.

Summarizing, the recovery rate increases the monetary advantages of SCPFs whereas the risk-free interest rate has a mixed effect which in addition is small for intermediate values of the recovery rate. The higher the trust fund share, the higher is the interest advantage and the lower is the sensitivity of gains to the recovery rate and the global economic situation. But in the current low interest rate environment the structure is not sensitive w.r.t. the trust fund share, i.e., in and after a global recession it appears not advantageous to have a high degree of joint liability. On the other hand, when interest rates return to normal levels again interest advantages of SCPFs would decrease and the decline is faster the lower the degree of joint liability. In the same instant, interest increases deteriorate the economic situation of struggling members potentially decreasing their expected recovery rate and thus inducing a very steep reduction of the SCPFs' advantages if the level of joint liability is low. It might currently appear reasonable to establish SCPFs with a very low degree of joint liability, e.g. 5% or less, since there are only little losses in efficiency compared to higher joint liabilities. This parametrization certainly is politically much easier feasible and eventually the only way to overcome current reservations against such structures in the northern countries. However, only sufficiently high degrees of joint liabilities, 10% to 15%, ensure that the system remains significantly advantageous (in financial terms) if the global economic situation returns to normal. The efficiency of SCPF, i.e. the net gain which equals the interest advantage less the financing cost for the trust fund, depends on the size of the trust fund. The optimal degree of joint liability lies between 10% and 15%, dependent on the recovery rate and the risk-free interest rate. However, the efficiency losses between the optimum

and more extreme cases, like 5% or 30%, are quite moderate and remain below 20% of the maximal gains. The results indicate that optimizing common liability has positive effects on the gains of SCPF and the stability of these gains to economic shocks despite the political costs that may arise.

5 Alternative scenarios and Robustness checks

In this section, we present some alternative scenarios and robustness checks for SCPF and give a brief overview on the effects. This includes country subsets and variations in macro- and country-specific factors. An extensive explanation and more robustness checks can be found in the Appendix.

5.1 EMU-wide with different introduction dates for the SCPFs

Firstly, we vary the general economic environment by altering the date for the introduction of SCPF. As in the benchmark case, we look at an EMU-wide introduction where every country is participating and 10% of GDP is issued. The three different scenarios where the dates for introduction are August 2018, December 2012 and December 2008, respectively, yield heterogeneous results for the structures and the gains. The differences in the results are mainly driven by changes in three factors. The first factor is the risk-free interest rate, the second are the CDS-spreads, which changes the default probability of the countries, and the third are the interest rate spreads every country and the SPV have to pay. The net gains reach from 1.44% of issued nominal for Germany to 66.54% for Greece dependent on the time of issuance and distribution method (relative and even). This can be achieved when SCPF are issued through a supranational institution like the ESM.

5.2 Country subsets

Next, we focus on several country subsets with an introduction in 2018. The subsets consist of an EMU-wide introduction without (1) Italy or (2) Germany, an intro-

duction in only (3) the so-called PIIGS-countries and (4) the EU6 countries, the founders of the European Economic Community. In case (1) the proceeds drop. The maximum gain that can be reached is for Greece with 20.41% and the lowest is for Germany with 1.20%. This shows that the inclusion of a relatively high share of low rated countries like Italy has large advantages for other participating countries due to the average cash inflow. Case (2) draws a contrary picture. Here the gains rise. The average rating of the structure decreases only very little since the trust fund can easily bear first losses. Therefore the structure's capital outflows are significantly reduced due to a lower nominal volume (Germany has a share of approximately 29%) while the inflows stay nearly the same since the German interest payments would have been very low. Summarizing, the diversification and tranching effects of SCPF imply a high relevance of the participation of low rated countries for the advantageousness of this financing instrument. Top-rated countries like Germany, on the other hand, are less important for the economic performance of SCPF, but undoubtedly inevitable for their political credibility.

In case (3), gains grow significantly compared to our base scenario. The average rating of the structure declines but the interest rate differential stemming from the diversification effect is stronger than the rating effect. The proceeds reach from 4.57% for Ireland to 28.41% for Greece. Savings per year can reach 1.4% of issued nominal for all of the five participating countries in the even distribution scheme. Case (4) shows the best average rating with all tranches rated AA-. However, the gains are on average 30 basis points lower due to the already high average rating of the participants. This result supports the notion that the countries which founded the predecessor of the European Union can again play a pioneering role in establishing new European cointegration measures like common debt financing.

5.3 Comparison

All of these alternative scenarios show the robustness of the model. We can also see that even with small country-subsets gains can be achieved and that they are

sometimes larger than for an all Euro-area scenario. Italy, as a large low rated country, has a crucial impact on the gains as can be seen in the calculation where Italy is missing. Politically it might be more feasible to start with a subset of the Euro-area and extend afterward. As we see, there will be no economic disadvantages with a smaller initial group and the process is open for other countries to join after realizing the advantages.

Also, capital market trust and fiscal discipline indirectly determine the economic efficiency of SCPF as is shown in the results regarding the sensitivity to the risk-free interest rate and recovery rate. A high fiscal discipline can boost both capital market trust and the expected recovery rate.

6 Conclusion

The European Commission pushes forward the joint issuance on sovereign bonds as a vehicle to deepen integration and foster financial stabilization in the European Monetary Union. The joint liability problem, however, makes any general approaches to common financing void. In current crisis, the need for and willingness to show solidarity might open a window of opportunity to establish a strictly project focused type of common financing which avoids joint liability. Structured Common Project Financing (SCPF) is such a tool. It comes with the advantages of common financing, marginalizes the problem of joint liability and increases political room for maneuver due to free distributable interest savings. Due to the strict focus on single projects like economic support for heavily Corona hit countries, Green deal financing or a stable Budget for Common Forces, SCPF avoids to be a threat to national budget sovereignty as Eurobonds would be.

SCPF is an ABS-based approach that yields fiscal advantages for all(!) participating countries. An endogenously financed trust fund enhances the overall risk structure of the SPV and thus creates a significant net interest saving. Under the global economic circumstances in 2018, the issuance of SCPF creates gains for participating countries of around 0.6% p.a. The structures efficiency is very insensitive

to the risk-free interest rate (about 0.01% per percentage point) but sensitive to the recovery rate in case of a default. The presented results are based on very conservative assumptions with a low recovery rate and maximized contagion effects and are thus a lower bound to real life savings to be expected.

Based on our results, we propose a fixed trust fund share of 10%, which is below the economic efficiency optimum to (1) avoid misspecifications due to calibration uncertainties and (2) account for the politically problematic issue of joint liability. The efficiency losses are marginal and a price for the political cost of the degree of joint liability.

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A Appendix: Content

Collateral Default Obligations

Collateral Default Obligations (CDOs) are a special type of Asset-Backed Securities (ABS). They are built of a portfolio of loans which is bought by a Special Purpose Vehicle (SPV). The SPV buys the portfolio and structures it into different tranches. The ratings of these tranches depend on the default risk and correlation of the underlying credit facilities. In our case, the SPV buys sovereign bonds. Since the ratings of the tranches are different, their cash flow from interest payments are also different. The highest-rated tranche normally receives a rating of AAA - the best possible rating - and faces the lowest interest payments. The lowest rated tranche has to pay the highest interest rate. Investors in this part of the CDO are first to face losses whereas investors in the AAA part are last to do so. The lowest rated tranche, called "equity tranche", often remains in the holdings of the SPV.

A deeper explanation of CDOs, their pricing and the correlation effects can be found by Longstaff and Rajan (2008), Coval et al. (2009b) and Coval et al. (2009). An exact clarification of SCPF in a SPV as well as the cascading effects can be found by Hild et al. (2014).

Principles of Asset-Backed Securities

Since its beginning in the 1970s the phenomenon of securitization became increasingly important in financial markets. The ancestor of ABS transactions originated in the United States in the form of mortgage-backed securities. Asset-backed securities were first issued in the 1980s in the US and about 10 years later in Europe. Since then the global ABS-market constantly grew until the financial crisis in 2007. Today ABS are typically collateralized by a number of different assets, like credit card receivables, home equity loans, auto loans or student loans.[15] In regard to asset-backed securities typically three main participants take part in the structure:

[15]For more detailed information about the development of the ABS market see Agarwal et al. (2010).

The originators, an independent separate institution the so called Special Purpose Vehicle (SPV) and the investors. The SPV buys a portfolio of debt instruments, and then pools and tranches the assets. To finance itself the SPV issues claims with different characteristics related to level of seniority, risk, rating and yields against the pooled portfolio. Within this type of structure, two key ingredients play a major role: (1) The pooling of the assets, and (2) the tranching of the liabilities.

The first key ingredient of securitization is the pooling of assets. This pooling can either be cash based or synthetical[16]. The pooling matters because it introduces diversification as long as the correlation between the pooled assets is not perfect ($|\rho| < 1$). By pooling the variance of the asset pool is reduced, in other words, the variance of the single assets is higher than the variance of the pooled assets. The lower the variance, the lower the risk of assets. Correlation matters because lower asset correlation implies a bigger part of risk-free AAA-rated securities within the structured product. By reducing risk with diversification senior tranches issued enjoy a higher credit quality than the average obligor in the pool.[17]

The second key element is the tranching of the assets. Tranching the portfolio is nothing else than a mathematical optimization. By doing so, the SPV slices the product into 1 to n tranches with different characteristics related to level of seniority, risk, rating and yields. Depending of the repartition method of the cash flows (pay-through- or pass-through-structure) securitization results differ. Within a pass-through-structure interest and capital repayments from the underlying asset pool are transferred to the investors without modification. All investors are in an identical position, related to risk and yield. Within a pay-through-structure the pooled assets are sliced into tranches with different priority and credit-worthiness. Instead of issuing one bond with a given rating (depending on a given risk) and a given yield several tranches with different ratings and characteristics (risk, yield) are

[16]Cash based means the credit sensitive assets are purchased into a pool. Synthetic could refer to a synthetic Collateralized Debt Obligation (CDO) where the assets are originated synthetically by issuing credit default swaps.

[17]For SCPF the correlation of defaults is a measure for contagion within Europe. In our simulation studies we precautionarily used the maximal correlation values possible for the given default probabilities (see Bauer and Herz (2019) for details).

issued. Tranches with a high rating pay lower interest rates and are less risky than tranches with a low rating. The senior tranche with the best rating has the highest priority on cash flow and therefore carries the lowest risk. The next class receives a lower rating. This tranche is subordinated to the senior tranche and pays higher interest rates due to higher risk. The lowest tranche implies the highest risk. After the payment of all costs related to the SPV[18] interest is paid to the most senior tranche before the remaining interest is paid to the subordinated tranches. In case of default on participating bonds, the lowest tranche is hit first, if the structure does not have a trust fund, which covers first losses[19]. Because of the cascading effect in an ABS structure this kind of structuring is also knows as cash flow waterfall illustrated in figure A.1.

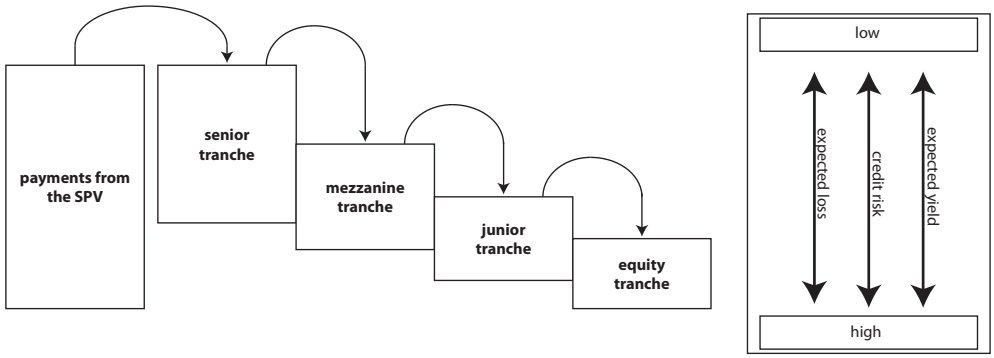

Figure A.1: Cascading effect in an ABS transactions

Furthermore the thickness of the tranches differs. The rating of each tranche (and thereby also the number and thickness of the tranches) is based on a complex calculus of the rating agencies. In general, the rating of a tranche depends on its expected loss probability. A tranche is eligible for a specific rating if the tranches default probability is lower than a predefined idealized default rate. The expected loss of a tranche (probability of a tranche being hit) decreases with increasing subordination and/or increasing tranche thickness[20]. The main focus here is on the question as to "how thick can a tranche be to attain a given rating?".

[18]With this kind of structure administrative costs can be kept low.

[19]If a trust fund has been installed, it is in a first loss piece position. It covers all first losses, before the lowest rated tranche is hit. In this way, even investors of the lowest tranche benefit from a certain security.

[20]Increasing the fixed recovery rate also leads to a decrease of the expected loss.

Financial Data

Country	Interest Rate 2008	Interest Rate 2012	Interest Rate 2018
Belgium	3.77%	2.05%	0.70%
Germany	2.95%	1.31%	0.33%
Estonia	4.95%	2.41%	0.78%
Ireland	4.44%	4.56%	0.86%
Greece	5.20%	11.92%	4.40%
Spain	3.81%	5.27%	1.49%
France	3.41%	2.00%	0.69%
Italy	4.38%	4.51%	3.24%
Cyprus	4.60%	7.00%	2.30%
Latvia	6.43%	3.24%	0.80%
Lithuania	5.61%	4.00%	1.20%
Luxembourg	4.61%	1.43%	0.47%
Malta	4.81%	3.79%	1.50%
Netherlands	3.55%	1.49%	0.45%
Austria	3.84%	1.75%	0.55%
Portugal	3.96%	7.05%	1.92%
Slovenia	5.15%	5.03%	0.95%
Finland	3.69%	1.51%	0.52%
Slovakia	4.64%	3.92%	0.79%

Table A.1: Interest Rates per country

Simulation Results

Optimal degrees of joint liability

A crucial and very much political topic is the choice of the initial trust fund volume or, to put it precisely, the trust fund's percentage share of the whole nominal volume. The choice displays the joint liability every country is willing to enter. We examine the effects of different trust fund shares on the nominal gain as well as the interest rate differential of the complete EMU. At first, we have a look at three different possible trust fund shares - 5%, 10% and 20% - and their impact on the nominal gains. The results are presented in figure A.2. The gain can be understood as a function of the degree of joint liability since a higher joint liability is connected with a higher trust fund share and a higher trust fund share is equivalent to a

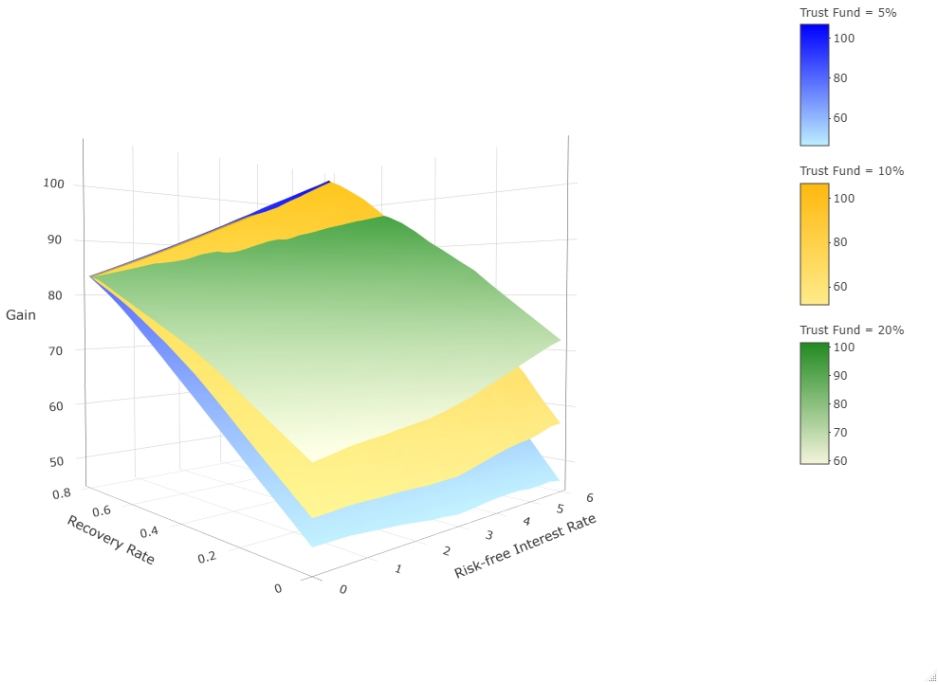

Figure A.2: Nominal gains in a SCPF scenario with different trust fund shares over a grid of several recovery values as well as risk-free interest rates.

better average rating of the structure. The attributable profit resulting from this connection is also highly dependent on the chosen initial trust fund share. On the other hand, political costs are also directly related to joint liability. Higher liability delivers higher moral hazard. In this case, we assume an issuing of 10% of the GDP with SCPF. The effects of variations in the risk-free interest rate and recovery rates are the same for all three possibilities of trust fund shares. The gain reaches from 46.60 billion Euro in a 5% trust fund scenario with 0% recovery rate and 6% risk-free interest rate to 106.78 billion Euro with a 5% trust fund, 80% recovery rate and 6% risk-free interest rate. It is remarkable that the lowest, as well as the highest gains, are achieved with a trust fund share of 5%. We can see this in figure A.2 where the other two layers are not as sensitive to the variables "risk-free interest rate" and "recovery rate" as the 5% layer.

We have to split our observations into different areas of interest. When we face recovery rates below 60%, the gains depend strongly on the initial trust fund share. Here we can conclude that the higher the trust fund share is the higher the gains are. As long as the recovery value is between 60% and 75%, SCPF with an initial trust

fund of 10% can deliver the highest gains. This is dependent of the risk-free interest rate. In a low risk-free interest rate environment, a larger initial trust fund delivers larger gains but this changes as the interest rate rises. At last, when recovery values are above the 75% threshold the 5% trust fund will generate the highest gains. This can be explained by a declining effect of the trust fund rate on the average rating of the structure. Also, the interest rate burden is growing for every country due to their payment on the whole debt. Notably, the results for a low risk-free interest rate are close to each other whereas they diverge stronger for higher values in the interest rate. The differences for low-interest rates range from 0.03 to 0.17 billion Euro. This is an indication that the system is not sensitive to the trust fund share in a low-interest rate environment. The 5% trust fund share is relatively sensitive to a change in the recovery value or the risk-free interest rate. The above mentioned results can be combined with figure A.3.

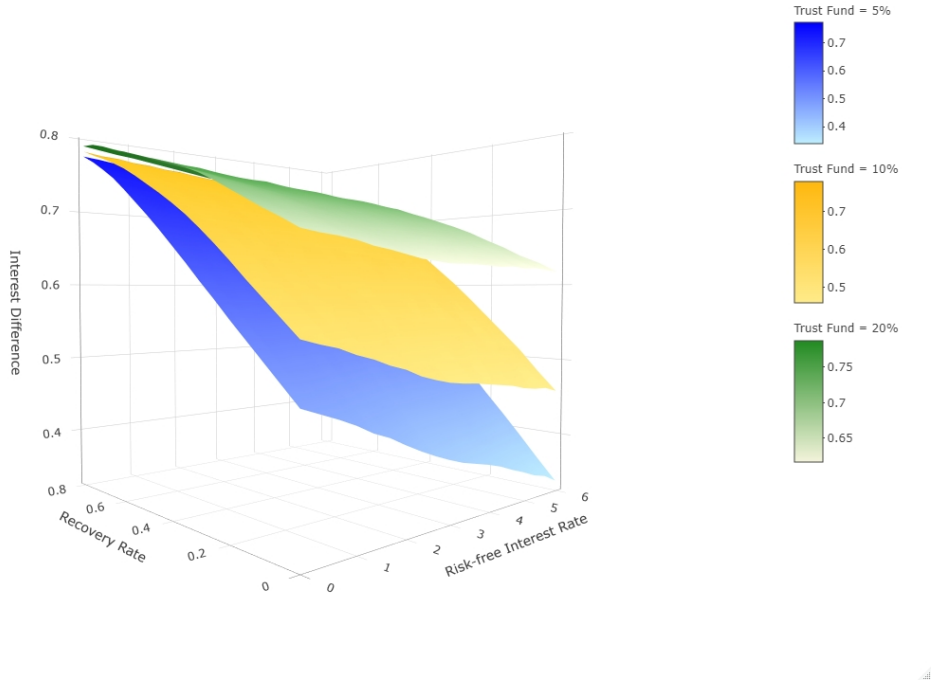

Figure A.3: Interest rate difference in a SCPF scenario with different trust fund shares over a grid of several recovery values as well as risk-free interest rates.

We can see that the topmost layer, which is representing the 20% initial trust fund rate, has the flattest growth and the lowest layer (5%) the steepest growth. It is noticeable that the difference is decreasing for higher recovery rates with a fixed

risk-free interest rate. This is due to converging structures for different trust fund rates with growing recovery rates. The 20% trust fund layer is the topmost since the reached structure is better than for the 10% case. As a result, the interest rate from the SPV to the investors is lower and the capital inflows from the EMU countries to the SPV stay the same. Besides, it is relevant to remark that for lower recovery rates, especially below a rate of 40%, the jump in the interest difference from a 5% to 10% trust fund share is lower than from a 10% to a 20% share. This is in line with the results from figure A.2. For higher recovery rates, e.g. 65%, it is the reverse and the jump in the interest difference from 5% to 10% is higher than from 10% to 20%. The first increase in the trust fund share from 5% to 10% is enough to offset the cost of joint liability, which is reflected in the higher interest payments from every country, against the higher interest payments of the SPV. The second jump in the trust fund share from 10% to 20% is not enough to offset the additional payments of every country against the advantages of a larger joint liability. Due to this, the gains for a 10% trust fund share are above the ones in a 20% scenario. We also have to mention that the interest differences are converging for higher recovery values. This can be explained by a declining effect of structuring in the ABS-approach as well as a declining effect of the trust fund.

Now we want to analyze at which trust fund rate we can reach the maximum gain when the recovery rate is fixed. We start with a fixed recovery rate of 50% and initial trust fund shares between 5% and 30%. The result can be seen in figure A.4.

We can conclude that the gain is a parabola function of the trust fund share. The gains are rising from a trust fund share of 5% until we reach a maximum of 95.37 billion Euro with an initial trust fund of 18% and a risk-free interest rate of 6%. Afterwards, the gains are declining for higher trust fund shares. It is noticeable that the decline is getting stronger the larger the initial trust fund is and that it depends on the risk-free itnerest rate. When the interest rate is low, the gains are rising for a larger trust fund share whereas the effect is inverted in a high interest-rate environment. For comparison, we take a look at a trust fund of 30% and a

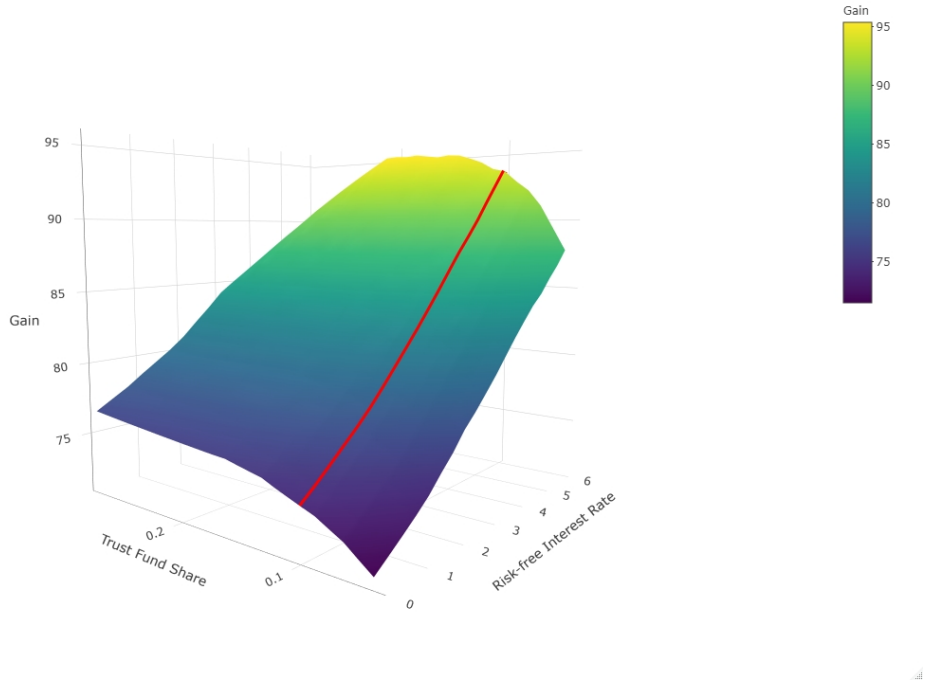

Figure A.4: Sensitivity of gains for different trust fund shares in a fixed recovery rate scenario where it is fixed to 50%.

risk-free interest rate of 6%. Here, the gain is 90.93 billion Euro which is about 4.5 billion Euro or nearly 5% smaller than in the optimal scenario. We also want to examine the gains arising from higher political costs which is equivalent to higher trust fund shares and common liability every country wants to enter. In a 5% trust fund scenario with a risk-free interest rate of 6% the gain is 87.79 billion Euro. In our optimal scenario, that has a higher common liability and therefore higher political costs, the gains are about 7.6 billion Euro or 8.6% higher. Also, we want to evaluate the results for a lower risk-free interest rate with a value of 0%. The results are staying the same with an optimal gain for a trust fund of 29% but the sensitivity is lower. The optimal gain is 76.67 billion Euro in this case and declines to 71.53 billion Euro or about 6.7% in a low trust fund case of 5%. The results indicate that a higher common liability can have positive effects on the gains of SCPF despite the political costs that may arise.

This can be seen in figure A.8. It starts at 29% in a 0% interest rate scenario and declines to 25% at 4.3% interest rate. Afterwards, it is again steadily declining down to 18% which is reached at a risk-free interest rate of 6%.

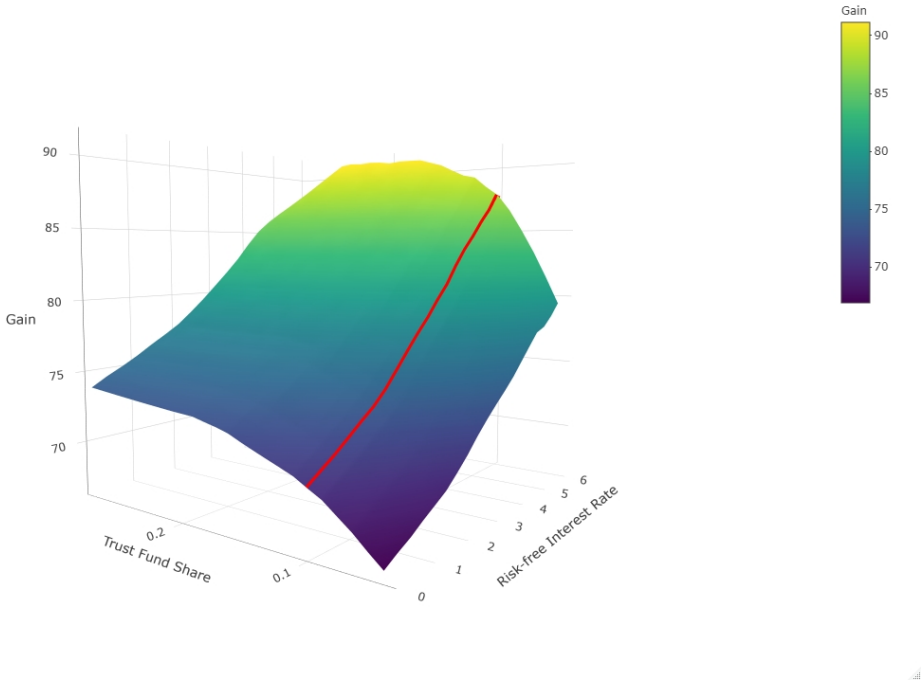

Figure A.5: Sensitivity of gains for different trust fund shares in a fixed recovery rate scenario where it is fixed to 40%.

The results are also supported for other recovery rates. This can be seen in figures A.5 and A.6.

Again, the connection between the trust fund share and the gains is parabola-like. It is noticeable that the optimal trust fund share is changing for different recovery values. When the recovery rate is fixed at 40% the optimal trust fund is between 24% and 29% of the issued nominal volume. When the recovery rate grows to 60% the picture is changing with an optimal share between 18% and 29%. From these findings, we can conclude a negative connection between the fixed recovery rate and the optimal trust fund share, representing the common liability.[21] We can explain this connection with a higher average rating resulting from structuring. Due to this, the impact of the trust fund share on the average rating is highly dependent on the recovery rate. The higher the recovery rate is, the lower the trust fund share is allowed to be to reach the optimal outcome. A further increase of the trust fund share brings with it an additional interest burden that is higher than the advantage

[21] The connection is also supported for other fixed recovery rates. They can be delivered upon request.

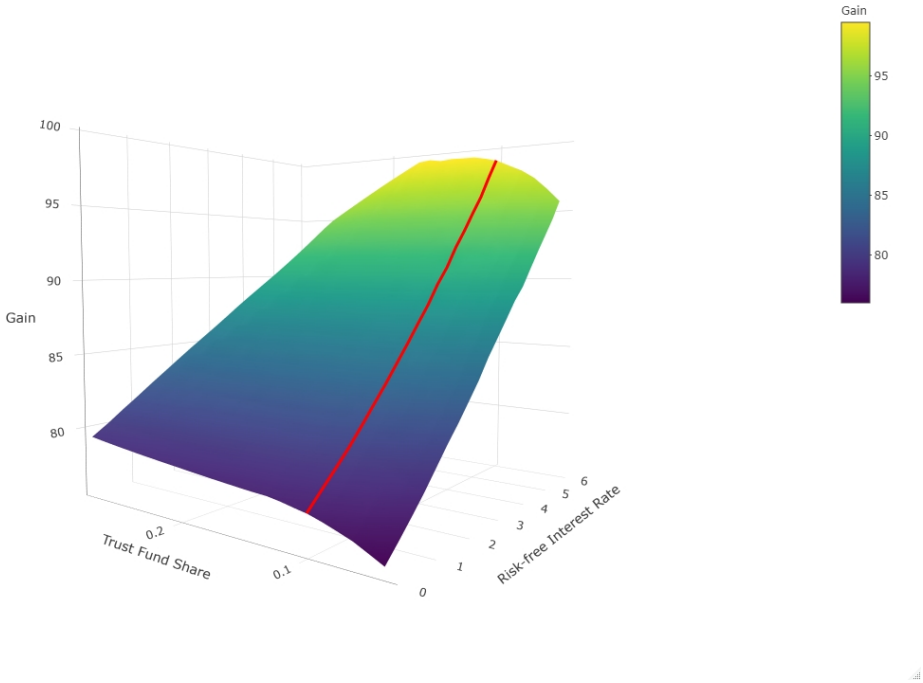

Figure A.6: Sensitivity of gains for different trust fund shares in a fixed recovery rate scenario where it is fixed to 60%.

from a better rating.

We start with a deeper examination of the results for a fixed recovery rate of 40%. As mentioned before, the optimal share is around 25% and we can see that the impact of the right choice of the initial trust fund share can be crucial. A lower trust fund with an initial volume of 5% delivers gains which are about 11.7 billion Euro or 13% lower than in the optimal scenario with gains of 91.14 billion Euro in the highest interest rate case. When the initial trust fund rises to 30% we face a drop of the gains to 88.71 billion Euro which is equivalent to a decline of 2.43 billion Euro or nearly 3%. The effects in a lower interest rate scenario are the same but not as strong as in the recently discussed case. The optimal gain is now 73.92 billion Euro and the decline is 7.02 billion Euro which is equivalent to a 9.5% decline.

In a 60% recovery rate scenario, the gains are also stricly positive connected with a higher common liability for a low risk-free interest rate. The maximum gain occurs at a risk-free interest rate of 6% with a trust fund size of 16%. Again, the differences in the results for a low-interest rate scenario are not as large when compared to the higher interest rates. The gains resulting from a higher joint liability, which is

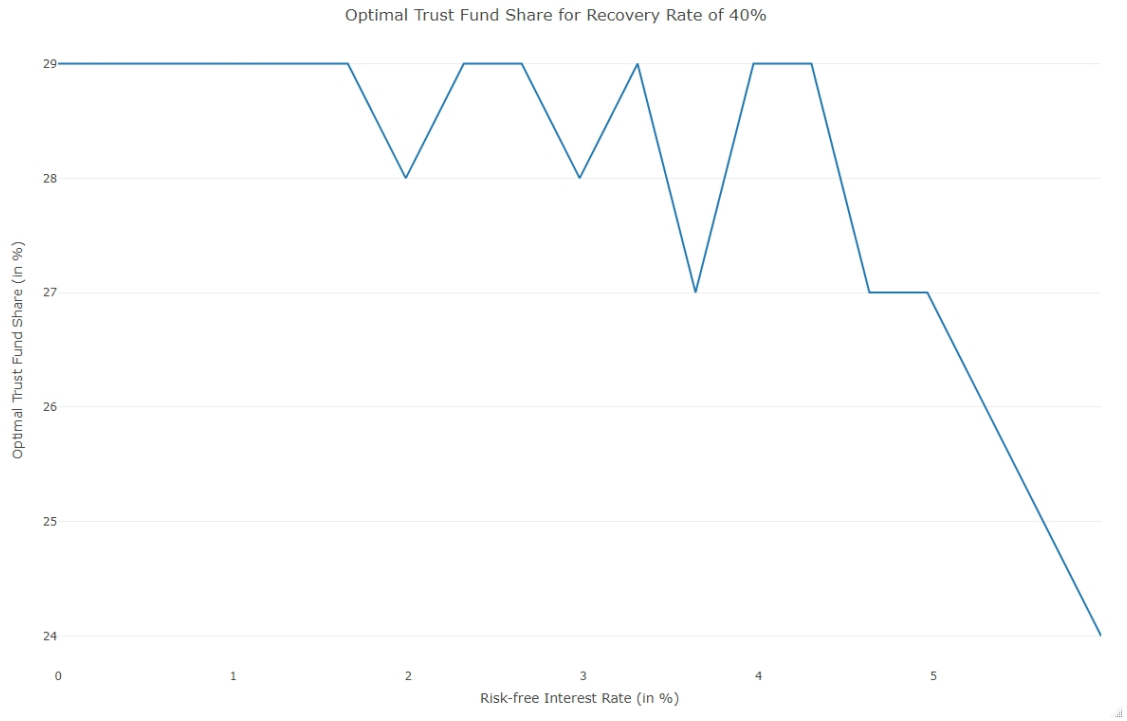

Figure A.7: Sensitivity of the optimal initial trust fund share in respect to the risk-free interest rate with a fixed recovery rate of 40%.

equivalent to higher political costs, rise from 95.67 to 99.47 billion Euro which is a rise of 4%. Also, when the common liability grows above this optimal share of 16% to 30%, the gains decline to 92.65 which is equivalent to a decrease of 6.9%.

Summarized, this points at a crucial political question of how large the initial trust fund has to be chosen. The larger the initial trust fund the larger is the common liability, but due to a decreasing effect of improvement in the average rating of the structure, the effect of a rising trust fund share declines. The gains do not rise infinitely when the common liability rises. It can be seen that the gains are more sensitive to changes in the parameters the lower the common liability is. Also, the gains depend on recovery values. When we focus on the results for an optimal trust fund share with a fixed recovery rate the gains are higher for higher recovery values whereas the optimal trust fund share is lower. This is a direct consequence of higher nominal volumes that flow into the trust fund after default. When we combine these insights an optimal trust fund share would be between 10% and 15% with lower sensitivity in a low risk-free interest rate scenario.

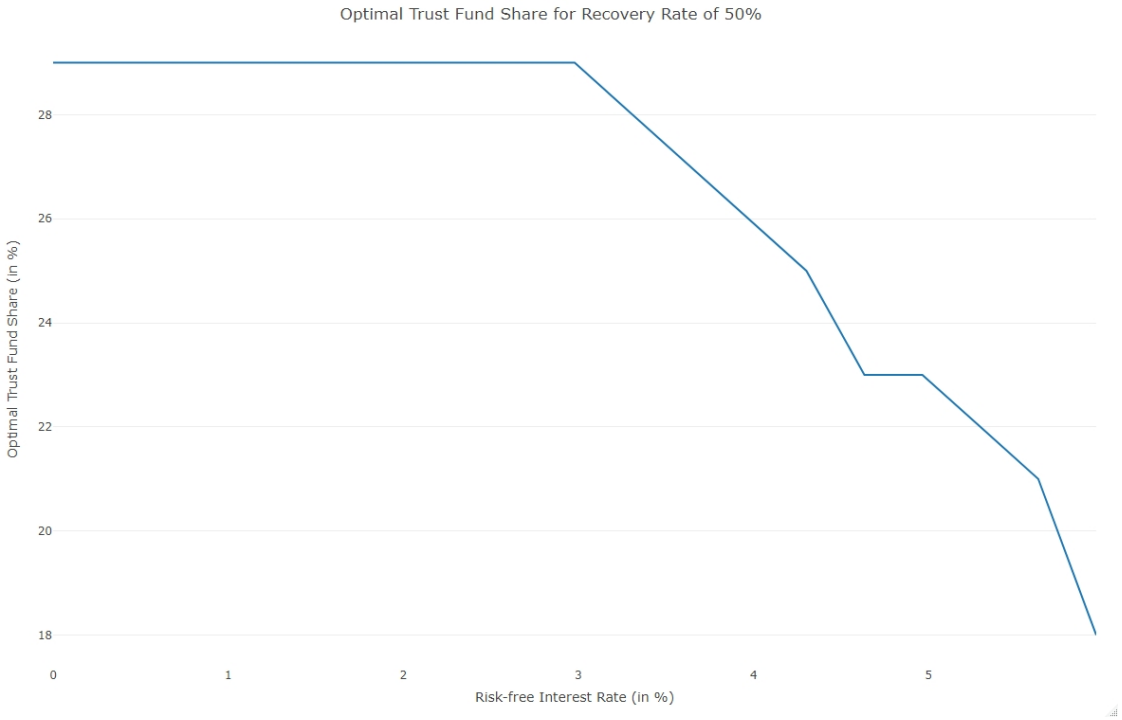

Figure A.8: Sensitivity of the optimal initial trust fund share in respect to the risk-free interest rate with a fixed recovery rate of 50%.

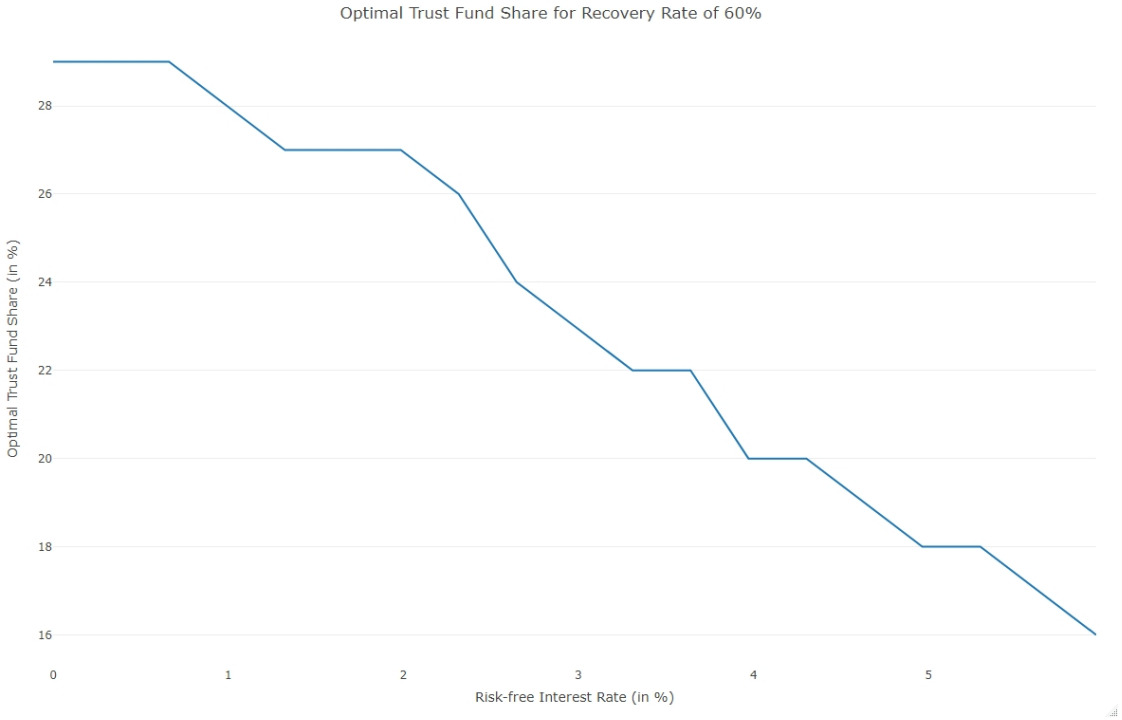

Figure A.9: Sensitivity of the optimal initial trust fund share in respect to the risk-free interest rate with a fixed recovery rate of 60%.

EMU-wide introduction

Now we assume an introduction of SCPF in the Monetary Union where every member country is participating in August 2018, a time of low-interest rates and yields at the sovereign bond markets. The resulting structure from the Monte-Carlo simulation can be seen in table A.2. This structure stays the same independent from the distribution scheme and will be used throughout. It only changes when the data or considered countries change. The main part in the structure is built of the AAA tranche. Here, the advantages of the trust fund and correlation effects can be seen. With the end of July ratings, we have three countries with an AAA rating which are representing 36.27% of the GDP of the whole EMU. In this structure, the AAA-part is above 76%, more than double the volume. Also, the lowest-rated tranche receives an A+ rating whereas the lowest rating in the EMU is at B.

Tranche	Thickness	Rating	Interest Rate
Tranche I	76.39%	AAA	0.33%
Tranche II	4.27%	AA+	0.42%
Tranche III	13.81%	AA	0.62%
Tranche IV	2.24%	AA-	0.76%
Tranche V	3.29%	A+	0.94%

Table A.2: The structure for an introduction of SCPF for the whole EMU. The first column displays the thickness of the tranche, the second the rating, and the third shows the interest rate that is paid by every tranche to the capital market.

We want to have a closer look at the two distribution schemes where the extra costs and the initial funding are subtracted from the trust fund before distribution and the remaining capital is distributed with even or relative distribution. We again assume an issuing of 10% of the GDP with structured Eurobonds. This delivers a total volume of 1,240.81 billion Euro and an AAA-rated nominal of 947.85 billion Euro. For comparison, the total nominal volume of AAA-rated debt in the EMU is 2,540.9 billion Euro for end of June 2018. The results of the Monte-Carlo simulation and the distribution methods can be seen in table A.3. In column 2 the portion of every country of the whole nominal can be seen, column 3 displays the nominal net gain after subtraction of the extra costs in billion Euro. The next columns are

showing the gain in relation to the nominal in total and per year. In parenthesis are the results for the even distribution.

Country	Stake	Nom. net gain	Rel. net gain	Gain rel. to nom. p.a.
Belgium	3.95%	1.65 (2.91)	3.40% (5.99%)	0.34% (0.58%)
Germany	29.26%	5.23 (21.61)	1.44% (5.96%)	0.14% (0.58%)
Estonia	0.24%	0.10 (0.16)	3.91% (6.07%)	0.39% (0.59%)
Ireland	2.66%	1.41 (1.98)	4.28% (6.00%)	0.42% (0.59%)
Greece	1.61%	5.12 (1.19)	25.94% (6.02%)	2.33% (0.59%)
Spain	10.40%	10.06 (7.85)	7.78% (6.07%)	0.75% (0.59%)
France	20.47%	8.52 (15.25)	3.35% (6.00%)	0.33% (0.59%)
Italy	15.39%	35.57 (11.80)	18.64% (6.19%)	1.72% (0.60%)
Cyprus	0.16%	0.27 (0.13)	12.69% (6.14%)	1.20% (0.60%)
Latvia	0.24%	0.12 (0.18)	4.02% (6.07%)	0.40% (0.59%)
Lithuania	0.40%	0.29 (0.28)	6.19% (6.09%)	0.60% (0.59%)
Luxembourg	0.48%	0.13 (0.38)	2.16% (5.97%)	0.21% (0.58%)
Malta	0.08%	0.10 (0.08)	7.94% (6.16%)	0.77% (0.60%)
Netherlands	6.53%	1.70 (4.86)	2.08% (5.97%)	0.21% (0.58%)
Austria	3.30%	1.07 (2.45)	2.60% (5.98%)	0.26% (0.58%)
Portugal	1.69%	2.22 (1.31)	10.33% (6.12%)	0.99% (0.60%)
Slovenia	0.40%	0.23 (0.29)	4.87% (6.11%)	0.48% (0.60%)
Finland	2.01%	0.61 (1.48)	2.44% (5.98%)	0.24% (0.58%)
Slovakia	0.73%	0.37 (0.57)	3.96% (6.08%)	0.39% (0.59%)

Table A.3: The results for an introduction of SCPF in the whole EMU. The first column displays the stake every country has at the nominal volume, the second the nominal net gain, the third shows the nominal net gain in relation to the debt, and the last column the yearly savings from the third column. In parenthesis are the results for the even distribution.

In a relative distribution scheme, there are some advantages for lower-rated countries. On the other hand, this changes when the distribution scheme is changed to an even distribution. For better comparison, we use as a reference Germany, France, and Italy. Now the nominal net gain rises from 5.23 to 21.61 (8.52 to 15.25) for Germany (France) which is equivalent to an increase of 4.52 (2.65) percentage points relative to nominal. The gain for Italy falls from 35.57 to 11.80 billion Euro. This decline is equivalent to a decrease of 12.45 percentage points. On the other hand, the yearly interest savings for Italy are 1.72% in the relative distribution. This is equivalent to a reduction of the effective interest rate from 3.239% to 1.519%. In the even distribution scheme, the savings are only 0.60%, but they are growing for the high rated Germany from 0.14% to 0.58% p.a. This would turn the effective

interest rate for Germany from 0.331% into -0.249%, a negative interest rate. This effect is a result of the different interest rates that are paid by the SPV and by the countries. The SPV has to pay 0.404% to the investors whereas the countries are on average paying 1.129% to the SPV. A part of the difference is used to pay the additional costs resulting from the higher nominal volume. The remaining cash is transferred into the trust fund where it is interest-paying with the risk-free interest rate. All countries can have gains in an environment of low-interest rates.

In the next step, we want to show that the ABS-structure is stable for other dates of introduction. We start by focussing on the end of 2012, a peak of the European sovereign debt crisis. Naturally, the default probabilities of nearly all countries are higher and the risk-free interest rate is higher at 1.305% compared to 0.331% in 2018. We use the same assumptions as before with 10% of GDP issuing and 10% initial trust fund volume. Due to different values of the default probability the structure changes. This can be seen in table A.4.

Tranche	Thickness	Rating	Interest Rate
Tranche I	56.98%	AAA	1.31%
Tranche II	4.88%	AA+	1.35%
Tranche III	14.54%	AA	1.46%
Tranche IV	9.18%	AA-	1.53%
Tranche V	6.18%	A+	1.63%
Tranche VI	1.75%	A	1.73%
Tranche VII	3.49%	A-	1.90%
Tranche VIII	2.99%	BBB+	2.20%

Table A.4: The structure for an introduction of SCPF for the whole EMU in 2012. The first column displays the thickness of the tranche, the second the rating, and the third shows the interest rate that is paid by every tranche to the capital market.

In comparison to the results for 2018, we can see that the number of tranches grows from five to eight with a sharp drop in the thickness of the AAA tranche. This can be explained by higher CDS-spreads and finally higher default probabilities. The interest rate of every tranche grows due to a higher risk-free and individual interest rate.

Noticeable is that the thickness of smaller tranches is growing compared to the evaluation for 2018. In 2018 a huge part of the nominal volume is concentrated in

the AAA and AA tranches with approximately 97%. Now the AAA and AA tranche only represent nearly 86%, a decline of eleven percentage points. The gains for every country with the two distribution schemes can be seen in table A.5.

Country	Stake	Nom. net gain	Rel. net gain	Gain rel. to nom. p.a.
Belgium	3.93%	3.28 (5.20)	7.62% (12.09%)	0.74% (1.15%)
Germany	28.00%	13.92 (37.00)	4.54% (12.07%)	0.45% (1.15%)
Estonia	0.18%	0.18 (0.24)	9.23% (12.14%)	0.89% (1.15%)
Ireland	1.83%	3.86 (2.40)	19.81% (12.31%)	1.82% (1.17%)
Greece	1.92%	14.14 (2.41)	66.54% (11.32%)	5.23% (1.08%)
Spain	10.61%	27.49 (14.37)	23.80% (12.44%)	2.16% (1.18%)
France	21.23%	17.24 (28.10)	7.43% (12.12%)	0.72% (1.15%)
Italy	16.38%	35.22 (22.30)	19.65% (12.44%)	1.81% (1.18%)
Cyprus	0.18%	0.67 (0.24)	30.71% (11.27%)	2.71% (1.07%)
Latvia	0.18%	0.32 (0.30)	13.10% (12.24%)	1.24% (1.16%)
Lithuania	0.37%	0.62 (0.45)	16.76% (12.17%)	1.56% (1.16%)
Luxembourg	0.46%	0.25 (0.59)	5.03% (12.08%)	0.49% (1.15%)
Malta	0.09%	0.12 (0.10)	15.45% (12.06%)	1.45% (1.15%)
Netherlands	6.59%	3.79 (8.65)	5.29% (12.07%)	0.52% (1.15%)
Austria	3.20%	2.25 (4.27)	6.3% (12.06%)	0.62% (1.15%)
Portugal	1.74%	6.29 (2.27)	33.61% (12.13%)	2.94% (1.15%)
Slovenia	0.37%	0.90 (0.50)	22.43% (12.42%)	2.04% (1.18%)
Finland	2.01%	1.19 (2.68)	5.37% (12.05%)	0.52% (1.15%)
Slovakia	0.73%	1.32 (0.98)	16.37% (12.17%)	1.52% (1.16%)

Table A.5: The results for an introduction of structured Eurobonds in the whole EMU in 2012. The first column displays the stake every country has at the nominal volume, the second the nominal net gain, the third shows the nominal net gain in relation to the debt, and the last column the yearly savings from the third column. In parenthesis are the results for the even distribution.

At first, we ascertain that the gains remain positive for every country. The stakes change but the differences are negligible. The gains are larger in the relative distribution than in the first case. This can be explained by the higher level of the risk-free interest rate and more uniform interest spreads that have to be paid by the countries. As a result, higher-rated countries like Germany have received higher net gains. Nonetheless countries with problems in the sovereign debt crisis, e.g. Greece and Portugal, also have greater gains than in the first case. This can be seen in the relative net gain which is about 66.54% for Greece and 33.61% for Portugal compared to 25.94% (10.33%) for Greece (Portugal) in 2018. The effective interest rate for Portugal is reduced by 2.94% per year. As before the gains are shifting when

we use the even distribution. Higher rated countries now face higher net gains and the interest rate reduction per year is 1.15%. This will reduce the interest burden for Germany from 1.305% to 0.155%.

Now we want to evaluate the third scenario with an introduction at the end of 2008 when the financial crisis was at its peak. As before the default probabilities of the countries are changing and the ABS have a new structure. This can be seen in table A.6.

Tranche	Thickness	Rating	Interest Rate
Tranche I	47.05%	AAA	2.25%
Tranche II	6.03%	AA+	2.38%
Tranche III	8.55%	AA	2.69%
Tranche IV	15.40%	AA-	2.91%
Tranche V	7.51%	A+	3.21%
Tranche VI	6.87%	A	3.49%
Tranche VII	8.59%	A-	4.03%

Table A.6: The structure for an introduction of SCPF for the whole EMU in 2008. The first column displays the thickness of the tranche, the second the rating, and the third shows the interest rate that is paid by every tranche to the capital market.

We now have seven tranches and all are rated A- or better, which is equivalent to an investment-grade rating for every tranche. The nominal debt is 1,070.67 billion Euro. We also have a strong rise in the risk-free interest rate up to 2.25% and the different tranches also have higher interest rate burdens. The risk-free interest rate is now chosen as the yield of the 10 year US-bond because it is lower than the German yield and displays a lower risk. Besides, the default probability of the participating countries cannot be calculated with the CDS-spreads for every country due to the market turmoils in the financial crisis. In these cases, we again use an approach of Sturzenegger and Zettelmeyer (2010) who calculate the default probability with the yield spread of every country over the risk-less yield. The results of the Monte-Carlo simulation can be seen in table A.7.

Compared to the first two scenarios (introduction in 2012 and 2018) the average effect is between the two scenarios. It is noticeable that the minimum gain is 6.22% for Germany in a relative distribution scheme which is higher than in the two cases

Country	Stake	Nom. net gain	Rel. net gain	Gain rel. to nom. p.a.
Belgium	3.64%	3.31 (3.21)	8.42% (8.16%)	0.81% (0.79%)
Germany	26.62%	17.72 (23.00)	6.22% (8.08%)	0.61% (0.78%)
Estonia	0.19%	0.21 (0.15)	11.28% (7.90%)	1.07% (0.76%)
Ireland	1.96%	2.18 (1.74)	10.45% (8.34%)	1.00% (0.80%)
Greece	2.52%	3.38 (2.22)	12.56% (8.26%)	1.19% (0.80%)
Spain	11.58%	10.65 (10.19)	8.59% (8.22%)	0.83% (0.79%)
France	20.74%	16.42 (17.95)	7.41% (8.09%)	0.72% (0.78%)
Italy	16.91%	18.66 (15.13)	10.29% (8.34%)	0.98% (0.81%)
Cyprus	0.18%	0.23 (0.18)	10.89% (8.29%)	1.04% (0.80%)
Latvia	0.28%	0.43 (0.22)	16.04% (8.06%)	1.50% (0.78%)
Lithuania	0.37%	0.50 (0.30)	13.63% (8.15%)	1.29% (0.79%)
Luxembourg	0.37%	0.46 (0.35)	10.74% (8.14%)	1.03% (0.79%)
Malta	0.09%	0.08 (0.06)	11.45% (8.22%)	1.09% (0.79%)
Netherlands	6.63%	5.66 (5.88)	7.97% (8.29%)	0.77% (0.80%)
Austria	3.08%	2.87 (2.72)	8.78% (8.33%)	0.85% (0.80%)
Portugal	1.87%	1.78 (1.63)	8.97% (8.19%)	0.86% (0.79%)
Slovenia	0.37%	0.52 (0.35)	12.38% (8.18%)	1.17% (0.79%)
Finland	2.06%	1.75 (1.74)	8.14% (8.08%)	0.79% (0.78%)
Slovakia	0.65%	0.81 (0.61)	10.98% (8.29%)	1.05% (0.80%)

Table A.7: The results for an introduction of structured Eurobonds in the whole EMU in 2008. The first column displays the stake every country has at the nominal volume, the second the nominal net gain, the third shows the nominal net gain in relation to the debt, and the last column the yearly savings from the third column. In parenthesis are the results for the even distribution.

before. On the other hand, the greatest gain is 16.04% for Latvia compared to 25.94% and 66.54% for Greece in 2018 and 2012, respectively. The gains are better distributed, independent of the chosen distribution method. It can be seen that all countries gain above 6% in a relative distribution. These large average gains are a result of well-distributed credit spreads and similar default probabilities of the participating countries. The capital inflows from the countries to the SPV which are only determined by government bond yields reach 3.66%. On the other hand, the capital outflows from the SPV, which are determined by CDS-spreads, to the capital market are 2.71%.

We draw a crucial conclusion. The trust in structured Eurobonds or the assigned issuer risk determine the effectivity and stability of the approach. Introducing Eurobonds by a supranational organization like the ESM, ECB or a newly formed institution would eliminate the market risk. Thus, interest rates paid by the SPV

to the capital market would be determined by sovereigns that have the same rating and significantly reduce the structures interest outflow.

Country subsets

In the last chapter, we have required that every country of the EMU participates in the SCPF programme. Since some countries may disagree to participate, due to country-specific jurisdiction or other reservations, we have a look at a country subset to work out their possible advantages of this programme. We focus on four different scenarios. We start by evaluating the advantages or disadvantages if a single country drops out. In the first scenario, we establish Eurobonds without Italy. This shall contribute to the discussion about the current uncertainty about Italian debt and government deficit. Also, the growth in Italy has been down in the last years. Thus, government deficit can be a crucial factor for non-participating. In the second scenario, we analyze the EMU without Germany. The main purpose of this construction is to see whether Germany can draw direct financial advantages from participation. It is inspired by the resistance of German authorities against common Eurobonds. For better comparison, we only evaluate the scenario of 2018.

We start with a scenario where all countries are participating, besides Italy. This is close to the case that was discussed in the previous chapter. Since a country with a lower rating and higher default probability is not in the issuance scheme, we can expect a better overall rating in the structure than in the case with all EMU countries. This is supported by the results of the Monte-Carlo simulation. The resulting structure can be seen in table A.8. When we compare this with the structure in table A.2, we can see that the thickness of the tranches with a rating of AA or better. In addition, the AA- and A+ tranche drop. As a result, we receive a better average rating. On the other hand, the complete volume drops from 1,240.8 billion Euro to 1,050 billion Euro with an absolute decline from 947.9 billion Euro to 823.1 billion Euro in the AAA-tranche from the whole EMU to this scenario.

We can see in the results, which are displayed in table A.9, that the gains for

Tranche	Thickness	Rating	Interest Rate
Tranche I	78.39%	AAA	0.33%
Tranche II	5.14%	AA+	0.42%
Tranche III	16.47%	AA	0.62%

Table A.8: The structure for an introduction of SCPF for EMU countries ex Italy.

all countries are declining although the overall rating is better. Nevertheless, every country has a nominal net gain. In this case, we focus on the impact on Germany and Greece as they are representing a high and low rated country and we compare it with the results from the whole EMU scenario from table A.3. The nominal net gain for Germany drops from 5.23 (21.61) billion Euro to 4.35 (10.81) billion Euro in a relative (even) distribution. This is a reduction of nearly 11 billion Euro or 50% of the nominal gain in the even distribution. The interest rate reduction decreases from 0.14% (0.58%) in the whole EMU scenario to 0.12% (0.29%) for a relative (even) distribution in this scenario.

The same effect can be seen for the gains of Greece. They are also reduced from 5.12 (1.19) billion Euro to 4.03 (0.59) billion Euro in the relative (even) distribution scheme, which is a drop of 20% (50%). The interest rate savings per year are also reduced from 2.33% (0.59%) to 1.88% (0.30%).

The decline of the gains can be explained by different reasons. The main reason is that the average interest rate paid by the SPV does not significantly decrease due to the absence of Italy. The total interest paid is lower since the total volume is lower but the capital inflows from Italy are missing which is roughly 40% of total interest inflows. The average interest rate paid by the SPV in the whole EMU scenario is 0.404%, which is nearly AA+. In the now viewed scenario, we have an average interest rate of 0.383%. So, the payments from the SPV to the capital market are only slightly lower. On the other hand, the capital inflows from all countries are significantly lower. If no country defaults, the average interest rate paid by the countries is 1.123% which is equivalent to capital inflows into the SPV of 14.82 billion Euro per year in the whole EMU scenario. In the scenario without Italy the average interest rate of the countries is only 0.745% representing 8.64 billion Euro.

Country	Stake	Nom. net gain	Rel. net gain	Gain rel. to nom. p.a.
Belgium	4.67%	1.34 (1.47)	2.76% (3.02%)	0.27% (0.30%)
Germany	34.57%	4.35 (10.81)	1.20% (2.98%)	0.12% (0.29%)
Estonia	0.29%	0.08 (0.08)	3.17% (3.09%)	0.31% (0.31%)
Ireland	3.14%	1.14 (1.00)	3.46% (3.04%)	0.34% (0.30%)
Greece	1.90%	4.03 (0.59)	20.41% (3.01%)	1.88% (0.30%)
Spain	12.29%	8.07 (4.01)	6.24% (3.10%)	0.61% (0.31%)
France	24.19%	6.93 (7.69)	2.73% (3.03%)	0.27% (0.30%)
Cyprus	0.19%	0.21 (0.07)	9.98% (3.09%)	0.96% (0.31%)
Latvia	0.29%	0.10 (0.09)	3.25% (3.08%)	0.32% (0.30%)
Lithuania	0.48%	0.23 (0.14)	4.97% (3.10%)	0.49% (0.31%)
Luxembourg	0.57%	0.11 (0.18)	1.77% (2.97%)	0.18% (0.29%)
Malta	0.10%	0.08 (0.04)	6.32% (3.08%)	0.62% (0.30%)
Netherlands	7.71%	1.39 (2.44)	1.71% (2.99%)	0.17% (0.30%)
Austria	3.90%	0.87 (1.23)	2.12% (3.00%)	0.21% (0.30%)
Portugal	2.00%	1.76 (0.66)	8.21% (3.10%)	0.79% (0.31%)
Slovenia	0.48%	0.19 (0.15)	3.91% (3.10%)	0.38% (0.31%)
Finland	2.38%	0.49 (0.74)	1.99% (3.00%)	0.20% (0.30%)
Slovakia	0.86%	0.30 (0.29)	3.21% (3.09%)	0.32% (0.31%)

Table A.9: The results for an introduction of structured Eurobonds in the whole EMU ex Italy. In parenthesis are the results for the even distribution.

This is a decline of 6 billion Euro per year which is not transferred to the trust fund. We can conclude that Italy would face approximately 40% of the interest burden in the whole EMU scenario under the current circumstances. A minor issue is that the trust fund has a lower initial volume and due to this the compound interest effect is lower.

The combination of these two factors results in lower gains. In the whole EMU scenario we have a total net gain of approximately 75 billion Euro which drops to 32 billion Euro without Italy. We conclude that a common issuance with all countries is preferable and high rated countries can have higher gains if they work together with lower-rated countries.

Now, we focus on the case without Germany, the country with the lowest default probability. The effect is contrary to the one we have calculated for the issuance without Italy. The structure is getting worse with seven tranches ranging from AAA to A-. The main volume is concentrated in the AAA tranche with 63% and

the whole volume is 878.21 billion Euro.[22] The average interest rate paid by the structure is 0.47%, a small increase from 0.40% paid in the whole EMU scenario. The main reason for the positive effect on the structure and afterward on the gains can be found in the average interest rate paid by the countries to the SPV. This is now at 1.46% compared with 1.13% in the whole EMU scenario. Due to the high inflows versus relatively low outflows, a high volume is stored in the trust fund and defaults can be better compensated.

This leads to the counterintuitive conclusion that participation of Germany may be disadvantageous in a low-interest rate, relatively stable environment. The main reason is that although almost the entire German share increases the volume of the AAA tranche, the interest paid by Germany is still much less than the structure pays on average. The net effect of German participation thus is negative. Also, the marginal effects of diversification and tranching are decreasing with the number of countries. Thus, the positive effects induced by Germany are diminished by the large group. For political reasons and the market's perception of the structures credibility, an inclusion of Germany is mandatory.[23]

We also evaluated two other subsets. These are the so-called PIIGS countries and EU6. They confirm the results we have seen so far.

In the next step, we have a closer look at the PIIGS countries introducing Eurobonds in 2018 and at the peak of the sovereign debt crisis in 2012. We start with the results for 2018.

The resulting structure can be seen in table A.10. Two interesting issues shall be mentioned. Although no involved country has an AAA rating, a tranche with this rating remains in the structure. Besides this, it is only 19 percentage points smaller than the one containing all EMU-countries. Second, the number of tranches increases to eight with the second greatest thickness besides the AAA tranche concentrated in the lowest-rated tranche. The nominal total volume in this subset is 394.17 billion Euro.

[22]The results can be presented by the authors upon request.
[23]Exact values can be delivered upon request.

Tranche	Thickness	Rating	Interest Rate
Tranche I	57.18%	AAA	0.33%
Tranche II	2.35%	AA+	0.42%
Tranche III	4.97%	AA	0.62%
Tranche IV	4.36%	AA-	0.76%
Tranche V	6.98%	A+	0.94%
Tranche VI	5.99%	A	1.09%
Tranche VII	7.01%	A-	1.31%
Tranche VIII	11.18%	BBB+	1.49%

Table A.10: The structure for an introduction of SCPF for PIIGS countries in 2018.

The results for an even and relative distribution can be seen in table A.11. The results for all countries are getting better compared to a system where all countries of the EMU are involved. In this selection, Spain and Italy are representing more than 80% of the nominal volume.

Country	Stake	Nom. net gain	Rel. net gain	Savings rel. to nom. p.a.
Ireland	8.37%	1.50 (4.89)	4.57% (14.86%)	0.45% (1.40%)
Greece	5.07%	5.61 (2.92)	28.41% (14.78%)	2.53% (1.39%)
Spain	32.73%	10.86 (19.30)	8.40% (14.93%)	0.81% (1.40%)
Italy	48.46%	38.88 (28.93)	20.38% (15.17%)	1.87% (1.42%)
Portugal	5.33%	2.41 (3.22)	11.22% (15.02%)	1.07% (1.41%)

Table A.11: The results for an introduction of SCPF through government debt crisis countries in 2018. In parenthesis are the results for the even distribution.

Now, we focus on 2012 as the introduction year. This leads to the following structure displayed in table A.12.

Tranche	Thickness	Rating	Interest Rate
Tranche I	43.92%	AAA	1.31%
Tranche II	5.35%	AA+	1.35%
Tranche III	5.14%	AA	1.46%
Tranche IV	0.14%	AA-	1.53%
Tranche V	5.21%	A+	1.63%
Tranche VI	4.66%	A	1.73%
Tranche VII	5.56%	A-	1.90%
Tranche VIII	14.84%	BBB+	2.20%
Tranche IX	15.19%	BBB	2.51%

Table A.12: The structure for an introduction of SCPF for PIIGS countries in 2012.

The nominal volume drops to 354.25 billion Euro and we can see that the thick-

ness of the AAA-tranche declines from 57.18% to 43.92% in this scenario. Also, it is noticeable that the lowest-rated tranche is the second thickest. In addition, nearly 30% of the whole nominal is concentrated in the two lowest-rated tranches with a rating of BBB+ and BBB.

The results can be seen in table A.13. For every distribution method, the relative gain is above 24% and the savings per year in relation to the nominal are consistently above 2%. The impact of the different distribution schemes is the same as above. In an even scheme the countries with higher extra costs, here Greece and Italy, are having a higher gain than others. Contrary to this, we see in a relative distribution scheme that countries with lower extra costs are having a higher relative gain.

Country	Stake	Nom. net gain	Rel. net gain	Gain rel. to nom. p.a.
Ireland	5.65%	4.82 (5.99)	24.73% (30.70%)	2.23% (2.71%)
Greece	5.93%	17.54 (5.95)	82.57% (28.00%)	6.20% (2.50%)
Spain	32.75%	34.34 (35.65)	29.72% (30.86%)	2.64% (2.73%)
Italy	50.53%	43.98 (55.31)	24.54% (30.86%)	2.22% (2.73%)
Portugal	5.36%	7.84 (5.62)	41.90% (30.05%)	3.56% (2.66%)

Table A.13: The results for an introduction of SCPF through government debt crisis countries in 2012. In parenthesis are the results for the even distribution.

Now, we observe the effect of an issuance by the founding members of the European Union, the European Economic Community. These are Belgium, France, Italy, Luxembourg, Netherlands, and Germany. As before the structure, represented by the thickness of the tranches, is changing with a higher weighting of the high rated ones and the nominal volume is now 943.74 billion Euro. The structure for an introduction in 2018 can be seen in table A.14. The whole structure is rated AA- or better. This will result in lower interest costs than in the cases before.

Tranche	Thickness	Rating	Interest Rate
Tranche I	80.97%	AAA	0.33%
Tranche II	3.10%	AA+	0.42%
Tranche III	15.54%	AA	0.62%
Tranche IV	0.39%	AA-	0.76%

Table A.14: The structure for an introduction of SCPF for founding members.

The gains for every country are displayed in table A.15. Germany, France, and Italy have the main stake of nominal debt, representing more than 85%. The results are similar to the results when all countries of the Monetary Union are participating in the programme. Again, every country has a positive effect from enrolling at the Eurobond programme and does not fall beyond a 2% gain in relation to nominal volume, except for Germany. This can be a hint that it is possible to introduce SCPF as a test only in some countries at the beginning and widen the circle afterwards without lowering the gains. On the contrary, the gains will rise if more countries are participating.

Country	Stake	Nom. net gain	Rel. net gain	Gain rel. to nom. p.a.
Belgium	5.19%	1.63 (2.67)	3.35% (5.50%)	0.33% (0.54%)
Germany	38.46%	5.08 (19.83)	1.40% (5.47%)	0.14% (0.53%)
France	26.91%	8.39 (14.01)	3.30% (5.51%)	0.33% (0.54%)
Italy	20.24%	35.33 (10.92)	18.52% (5.73%)	1.71% (0.56%)
Luxembourg	0.64%	0.13 (0.37)	2.11% (5.46%)	0.21% (0.53%)
Netherlands	8.58%	1.66 (4.47)	2.04% (5.48%)	0.20% (0.54%)

Table A.15: The results for an introduction of SCPF through founding members.

The results are showing that even during the sovereign debt crisis the most problematic countries could have gained and gains would have been higher than in the whole EMU scenario. They would have more advantages when starting without the higher-rated countries. This is supported by the results we have seen in a scenario where all countries besides Germany are participating. The gains for high rated countries are driven by lower-rated countries whereas the stability is preserved by the higher-rated ones.