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Essays on sovereign debt in federations: bailout, default and exit

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Contents

Declaration	V
Acknowledgements	VI
Abstract	VII
List of Figures	IX
List of Tables	X
1 Introduction	1
2 Bailout or bankruptcy: do insolvency laws harden the subnational budget constraint?	6
2.1 Introduction	6
2.2 Related literature	11
2.3 The model	13
2.3.1 The players	14
2.3.2 Timing of the model	17
2.4 Reference cases	18
2.4.1 The hard budget constraint policy	18
2.4.2 The soft budget constraint result	18
2.5 The default decision	20
2.5.1 High exemption level	20
2.5.2 Low exemption level	22
2.6 The federal transfer policy	23
2.7 Regional opportunistic behaviour	28
2.8 The optimal design of bankruptcy procedures	32
2.9 Concluding remarks	36
2.A The soft budget constraint result	39
2.B Proof of Lemma 2.2	40
2.C Proof of Lemma 2.3	42

2.D	Proof of Lemma 2.5	43
2.E	Optimal design of bankruptcy procedures	45
3	A Greek tragedy with a happy ending? Orderly debt restructuring in the EU	47
3.1	Introduction	47
3.2	Background	53
3.2.1	The Eurozone debt crisis	53
3.2.2	Crisis management	56
3.2.3	Orderly debt restructuring: an overview	58
3.3	The benchmark model	60
3.3.1	Model set-up: public debt, liquidity, solvency and default	60
3.3.2	The players	62
3.3.3	Timing of the model	64
3.3.4	Results	65
3.3.5	Debtor country moral hazard	69
3.4	Orderly debt restructuring	72
3.4.1	Modification of players' payoff functions	72
3.4.2	Results	74
3.4.3	Debtor country moral hazard	76
3.5	How effective are insolvency procedures?	78
3.6	Policy implications	85
3.7	Epilogue: a happy ending?	87
4	To be, or not to be: can a 'closer union' save the Euro?	89
4.1	Introduction	89
4.2	Eurozone break-up: background	93
4.2.1	Economic impact	94
4.2.2	Legal and procedural issues	97
4.2.3	The political dimension	98
4.3	The status quo (SQ): "muddling through"	100
4.3.1	Model set-up	100
4.3.2	Periphery's utility after exit	103
4.3.3	Institutional set-up	103
4.3.4	Results	104
4.3.5	EU welfare	107

4.4	The ESM: an orderly default mechanism	108
4.5	Political union (PU): economic governance	111
4.5.1	Institutional set-up	111
4.5.2	Results	112
4.6	Fiscal union (FU)	115
4.6.1	FU with exit clause	115
4.6.2	FU without exit clause	117
4.6.3	A note on Eurobonds	119
4.7	Concluding remarks: can a ‘closer union’ save the Euro?	120
4.A	Status quo	124
4.B	Proof of Proposition 4.2	124
4.C	FU with exit clause	124
4.D	FU without exit clause	125

Bibliography	126
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Declaration

I, Angela Nolte, confirm that this is my own work and the use of all material from other sources has been properly and fully acknowledged. This thesis has not been submitted in whole or in part for any other academic degree or professional qualification.

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Abstract

The thesis analyses the moral hazard problem which arises in political or fiscal federations when member states anticipate being bailed out by the centre in case of financial distress. In particular, I examine whether an orderly default mechanism or deeper fiscal integration within the European Union can alleviate the soft budget constraint phenomenon and provide a solution to the sovereign debt crises engulfing the Eurozone and other parts of the world.

The first essay adapts the standard Stackelberg approach of the bailout literature in order to study the effects of bankruptcy procedures on regional opportunistic behaviour. The insolvency mechanism is shaped by two parameters: the costs of default and the exemption level for public assets. The model lends support to the market discipline hypothesis if all public assets are exempt from seizure. If, by contrast, the exemption level for public assets is low, it is the central government rather than the credit market that discourages overborrowing since the former is incentivised to tax heavily indebted regions. The model's major policy insight is that an insolvency mechanism can lower the federation's welfare if it is not carefully designed.

The second essay sheds light on the incentive effects of the sovereign debt restructuring mechanism which has been drafted by the Eurozone in response to the debt crisis. Employing a global game approach, the model analyses the impact of insolvency procedures on the size of the bailout, the level of effort exerted by the debtor country and EU welfare. Challenging some arguments in the policy literature, the model's major policy implication is that a half-hearted debt restructuring mechanism fails to mitigate the commitment and moral hazard problems embedded in the current EMU framework.

The third essay questions the conventional wisdom that the Euro cannot survive without closer integration, using a simple political economy framework. The model compares the stability and welfare implications of the current "muddling through" scenario, an orderly default mechanism as well as a fiscal and a political union setting. Interestingly, the results suggest that the "muddling through" scenario is not more prone to break-up than the political or the fiscal union. The

model's major policy recommendation is that implementing an orderly default mechanism and inserting an explicit exit clause into the European Treaties might prove more effective in preventing a Eurozone break-up than far-reaching institutional reforms.

List of Figures

2.1	Public Consumption as a Function of Regional Income	16
2.2	Timing of the Model	17
2.3	The Critical Level of Debt	26
2.4	Comparative Statics Analysis for the Exemption Level	33
2.5	A Small Level of Borrowing	42
2.6	A Downwards Deviation by Region i	44
3.1	General Government Gross Debt	54
3.2	10 Year Government Bond Yields	55
3.3	The Benchmark	71
3.4	The Insolvency Law Regime	77
3.5	Comparison of the Two Regimes: Case A	80
3.6	Comparison of the Two Regimes: Case B	82
3.7	Comparison of the Two Regimes: Case C	83
4.1	Relative Unit Labour Costs	95
4.2	Greek Household Deposits	96
4.3	Eurobarometer	99

List of Tables

3.1	Bailout Packages in the Eurozone	56
3.2	Welfare Effects of Insolvency Procedures	79

1 Introduction

*This depends on principles of human nature, that are as infallible as any mathematical calculations. States will contribute or not, according to their circumstances and interests: They will all be inclined to throw off the burthens of government upon their neighbours.*¹

(Alexander Hamilton, 1788)

In the aftermath of the global financial crisis, sovereign debt has emerged as one of the major economic challenges facing countries today, as governments around the world struggle to bring their fiscal houses in order. Central governments' budget plans, however, are frequently undermined by debt accumulation at subnational or local levels. In addition, regional fiscal irresponsibility can pose a serious threat to the federation's macroeconomic stability, with the Eurozone crisis being a prime example of a subnational sovereign debt crisis. In the light of the global trend towards decentralisation, either in the form of devolution of responsibilities to regional governments or evolution to supranational institutions such as the European Union, it is important to understand the link between public debt and fiscal decentralisation (Rodden, 2006). Empirical evidence suggests that regional fiscal indiscipline can be generated by a deficient design of intergovernmental fiscal relations (Ter-Minassian and Craig, 1997; Vigneault, 2007). As seen in the case of Greece, for example, if subnational governments anticipate to be bailed out by the federation, they lack incentives to tackle their problematic finances, resulting in debtor moral hazard. The question of how to discipline subnational borrowers is of interest to policymakers and researchers of fiscal federalism alike.

While the first generation theory of fiscal federalism has stressed the benefits of decentralisation (Oates, 1972), the second generation has highlighted its dark side and started to explore the "dangers of decentralisation" (Prud'homme, 1994), motivated by a series of fiscal crises precipitated by regional opportunistic behaviour (Oates, 2008). A basic element of the second generation approach is the concept of the soft budget constraint, a term that was introduced by Kornai

¹ Speech in the New York Ratifying Convention, 28.6.1788, see Frisch (1985).

(1979). In the context of a federation, it refers to a situation in which subnational governments can look to the central government to rescue them in case of financial distress. Since regions can externalise their costs onto the national taxpayer, they are incentivised to overborrow strategically, thereby “raiding the fiscal commons” (Oates, 2008) and shifting their burden to other member states, as indicated by Hamilton. Rodden et al. (2003) show that soft budget constraints are widespread in many federations. Second generation fiscal federalism is concerned with both the structural roots of the moral hazard problem and potential institutional reforms which can harden the budget constraint.

My research contributes to this field of study by analysing a market-based solution to the moral hazard problem which arises in political or fiscal federations when member states expect a bailout. Drawing on insights from the literature on sovereign debt restructuring, three separate models are developed in order to examine the effects of an orderly default mechanism on the centre’s commitment problem and regional opportunistic behaviour. Proponents of private sector involvement have argued that bankruptcy proceedings can discipline subnational borrowers since creditors demand higher risk premia for heavily indebted member states, thus effectively restricting regional borrowing via the supply side. While this idea has been debated in the policy literature, there are currently very few papers examining the issue within an analytical framework. Moreover, the literature on debt restructuring tends to focus on collective action problems among creditors and thus treats bankruptcy proceedings as co-ordination rather than commitment device. My research takes a different perspective by asking whether an orderly default mechanism can mitigate the inefficiencies generated by the strategic interactions between member states in a federation, thereby potentially increasing welfare and stability within the union. While default is the primary focus in the first two essays, the last essay broadens the analysis and also examines the issue of secession.

The first essay adapts the standard Stackelberg approach of the soft budget constraint literature in order to study the disciplining effects of bankruptcy procedures. The model extends the bailout game in Breuillé et al. (2006) by adding a stage to the game in which regions decide whether to default or not. In order to include bankruptcy procedures into the analytical framework, the modelling approach refers to the legal literature which suggests that subnational insolvency resembles personal bankruptcy. The insolvency mechanism is therefore assumed to be determined by two parameters: the costs of default and the

exemption level for public assets. The latter effectively insures citizens against a reduction in core public services in case of default. While the costs of default are exogenous to the model, the exemption level can be manipulated by policymakers.

Although the model's results support the view that bankruptcy procedures can discourage regional overborrowing, the interactions between the central government, subnational governments and creditors turn out to be more complex than the market discipline hypothesis suggests. Regional borrowers can be restricted by market forces if all public assets are exempt from seizure. If, by contrast, the exemption level for public assets is low, it is the central government rather than the credit market which deters overborrowing since it is incentivised to tax heavily indebted regions. Subnational governments consequently refrain from overborrowing in order to avoid being taxed and pushed into default by the centre. This rather surprising effect of bankruptcy proceedings on the central government's incentives has not been described in the literature so far. The model's major policy insight is that well-designed bankruptcy procedures can enforce hard budget constraints. An orderly default mechanism, however, can also lower the federation's welfare if it is not carefully designed.

By comparison, the second essay puts a stronger emphasis on the creditor co-ordination problem while also considering the strategic interplay between the centre and subnational governments. More precisely, the essay sheds light on the incentive effects of the orderly default mechanism which will be implemented by the Eurozone as part of its permanent crisis management framework. The model builds upon the literature on global games, which treats creditors' roll-over decisions as a collective action problem, and analyses the impact of insolvency procedures on the size of the bailout, the level of effort exerted by the debtor country and EU welfare. The benchmark case adapts Morris and Shin (2006) by dropping their key assumption that the lender of last resort only bails out solvent countries, thus adding a potential commitment problem to the game. Bankruptcy procedures are incorporated into the benchmark by assuming that an insolvency mechanism benefits both debtors and creditors since bondholders do not have to completely write off their investments and countries are granted some debt relief.

The model's major policy implication is that a half-hearted debt restructuring mechanism fails to mitigate the commitment and moral hazard problems plaguing the European Union. Solely an insolvency mechanism which lowers the costs of default significantly for both creditors and debtors can succeed in relieving the European taxpayer, alleviating moral hazard and improving EU welfare.

Interestingly, the model also challenges some arguments in the policy literature. Contrary to the widespread view, the model shows that bankruptcy procedures do not always encourage default and when they do so, debt restructuring is in fact beneficial. Intuitively, the orderly default mechanism corrects the outcome of the benchmark in which too few countries default due to the EU's commitment problem. Bankruptcy procedures consequently force insolvent member states to restructure their debts, thereby improving EU welfare.

The last essay departs from the previous models by extending the analysis to include both default and secession. Inspired by recent calls for "more Europe", the third essay questions the conventional wisdom that the Euro cannot survive without closer integration. Referring to the theory of optimum currency areas by Mundell (1961), Euro critics have argued that a monetary union without a corresponding fiscal union is doomed to fail. Mundell's theory, however, suffers from several shortcomings, one of them being the lack of attention paid to the political economy aspects of monetary unions. The model tries to fill this gap, using a simple political economy framework similar to Dur and Staal (2008) in which core countries determine policies and periphery countries are in the minority. The model compares several institutional settings, namely the current "muddling through" scenario, an orderly default mechanism as well as a fiscal and a political union set-up, and contrasts their implications for the Eurozone's stability and welfare.

The results suggest that it might be too early to write off the Euro since the model finds that the current "muddling through" scenario is not more prone to break-up than the political or the fiscal union. The model's major policy recommendation is that implementing bankruptcy procedures and inserting an explicit exit clause into the European Treaties which allows countries to leave the monetary union might prove more effective in preventing a Eurozone break-up than an institutional overhaul. An orderly default mechanism restricts the periphery's bargaining power and thus alleviates moral hazard as periphery countries are no longer able to externalise their debts onto the core taxpayer. While the finding that an explicit exit clause makes the union more stable seems counterintuitive, this is a well-known result in the fiscal federalism literature. Facilitating Eurozone exit renders the periphery's secession threat credible and gives the minority a voice in the policymaking process, leading to the socially efficient outcome.

In conclusion, my research offers valuable new insights into the effects of

insolvency and exit procedures on regional borrowing in federalist systems. Most importantly, the models show that contrary to claims in the policy literature, bankruptcy procedures are no panacea and the design of the insolvency proceedings crucially determines their success in eradicating soft budget constraints and improving welfare. While an orderly default mechanism tends to discourage moral hazard, ill-designed bankruptcy procedures might indeed lower the federation's welfare. Against the backdrop of the current reform efforts in the European Union and the United States, the thesis provides a closer understanding of the relationship between bailouts, default and exit, thereby potentially influencing policymakers to pass new legislation to prevent regional debt accumulation in the future.

2 Bailout or bankruptcy: do insolvency laws harden the subnational budget constraint?

When it becomes necessary for a state to declare itself bankrupt, in the same manner as when it becomes necessary for an individual to do so, a fair, open, and avowed bankruptcy is always the measure which is both least dishonourable to the debtor, and least hurtful to the creditor.

(Adam Smith, Wealth of Nations, 1776)

2.1 Introduction

Following the defaults by Russia in 1998 and Argentina in 2001, proposals were put forward for the establishment of a sovereign debt restructuring mechanism (SDRM), with a view to facilitate debt negotiations and prevent creditor and debtor moral hazard. Having been abandoned due to a lack of political support, private sector involvement (PSI) has staged a comeback in the wake of the 2008 global financial crisis. In order to stem the sovereign debt crisis engulfing the Eurozone, policymakers in the European Union have drafted rules providing for an orderly default mechanism as part of the European Stability Mechanism (ESM). Similarly, the financial woes of several subnational governments in the United States, such as California, Illinois and New York, have sparked debate in Congress as to whether to extend Chapter 9 of the U.S. Bankruptcy Code, which covers municipal bankruptcy, to federal states (Skeel, 2011; Henes and Hessler, 2011; Gelpern, 2012). With subnational debt spiralling out of control in many federations, bankruptcy procedures are intended to serve as a commitment device for the central government not to bail out fiscally irresponsible regions, thereby hardening the regional budget constraint. While the chances of bankruptcy proceedings being implemented looked very promising initially, lawmakers in the United States were quick to express their opposition to legislation allowing states to go bankrupt and policymakers in the EU have likewise watered down requirements for creditors to participate in bailouts (Bullock, 2011; European Council, 9.12.2011). Insolvency proceedings for subnational entities currently only exist in the United States, South Africa, Hungary, Albania, Romania and

Bulgaria (Liu and Waibel, 2008).

When setting up a regulatory framework for managing subnational borrowing, policymakers tend to favour rule-based solutions, such as legally imposed balanced budget rules or ‘debt brakes’ (European Council, 30.1.2012; Rodden et al., 2003; Ter-Minassian and Craig, 1997). Proponents of private sector involvement, however, have argued that these ex-ante borrowing regulations might prove insufficient to encourage fiscal responsibility unless complemented by an ex-post insolvency mechanism (Liu and Waibel, 2010, 2008; Wissenschaftlicher Beirat, 2005). Bankruptcy proceedings spell out a set of predetermined rules to clarify the consequences of default, thus removing uncertainty and anchoring the expectations of regions, the central government and creditors (Liu, 2010; Blankart and Klaiber, 2006). Since the financial burden of the debt restructuring is exclusively shared between the defaulting region and its creditors, the central government’s no-bailout threat becomes more credible and regions refrain from overborrowing in order to avoid a costly default (Schwarcz, 2011; Wissenschaftlicher Beirat, 2005). Most importantly, bankruptcy laws serve as an incentive for creditors not to lend to high-deficit regions, an argument known as the market discipline hypothesis. The latter postulates a non-linear relationship between bond yields and public debt that eventually results in credit rationing.¹ Subnational borrowing is thus effectively restrained by the supply side as investors punish heavily indebted regions by demanding higher risk premia or by cutting off credit. Empirical evidence from both the United States and Europe lends support to the market discipline hypothesis as an increase in public debt is usually associated with higher interest rates.²

This chapter adapts the standard Stackelberg approach of the soft budget constraint literature in order to study the effects of such an insolvency mechanism on regional opportunistic behaviour. The model extends the bailout game in Breuillé et al. (2006) by adding a stage to the game in which regions have the option of defaulting on their debts. The modelling of the insolvency mechanism draws on the legal literature which suggests that subnational bankruptcy proceedings share more characteristics with personal than with corporate insolvency (Skeel, 2011; White, 2002; McConnell and Picker, 1993).

¹ For an explanation of credit rationing as an equilibrium outcome, see the seminal paper by Stiglitz and Weiss (1981).

² See Bayoumi et al. (1995) for an analysis of municipal bond yields in the U.S. states and Schuknecht et al. (2010, 2008) for interest rate premia paid by central and subnational governments in the EMU and Canada.

Firstly, subnational governments are sovereign entities. As such they perform public functions and cannot be liquidated and dissolved like a firm. Similar to personal bankruptcy, the insolvency mechanism consequently has to be based on the reorganisation principle (Liu, 2010, 2008; Liu and Waibel, 2008; Bolton, 2003; Schwarcz, 2011, 2002). Secondly, the ability of creditors to seize a sovereign's assets is greatly restricted in many countries (Gelpern, 2012; Liu, 2010). Finally, the objective for any insolvency mechanism is to maintain core public services such as police, fire service or drinking water during the debt restructuring process (Liu, 2010, 2008; Wissenschaftlicher Beirat, 2005). Taking these characteristics into account, the chapter refers to concepts from the personal bankruptcy literature in order to incorporate insolvency procedures into the model framework.³ Following White (2005), bankruptcy proceedings in the model are shaped by two parameters: the costs of default and the exemption level for public assets. The latter guarantees that citizens always receive a minimum level of public services in case of default since creditors only have to be repaid from regional revenues exceeding this exemption level.

The model's results show that while bankruptcy procedures can indeed harden the regional budget constraint, the interactions between the central government, subnational governments and creditors are more complex than the market discipline hypothesis suggests. Markets can restrict regional borrowing if all public assets are exempt from seizure. If, by contrast, the exemption level for public assets is sufficiently low so that creditors receive some repayments, it is the central government rather than the credit market that can discipline subnational borrowers. Depending on the model's parameters, it can be optimal for the central government to tax rather than to bail out heavily indebted regions. The key to the central government's behaviour lies in the exemption level which effectively insures regions against a reduction in public services in case of default. Intuitively, letting a high-deficit region default, taxing it and redistributing the proceeds makes citizens in other regions better off while leaving public consumption in the defaulting region, which is protected by the exemption level, unchanged. Regions consequently refrain from overborrowing in order to avoid being taxed by the central government. Interestingly, this rather surprising effect of bankruptcy procedures on the central government's incentives has not been identified in the literature so far.

³ For an overview of theoretical and empirical work, see White (2007). For related models of personal bankruptcy, see Fay et al. (1998), White (2005) and Wang and White (2000).

The model's major policy implication is that an insolvency mechanism can lower the federation's welfare unless carefully designed. Although bankruptcy procedures tend to discourage regional opportunistic behaviour, their design crucially determines their impact on the federation's welfare. Comparing the welfare effects of the bankruptcy regime with a low and a high exemption level, it turns out that the former is preferable as it enables policymakers to set the exemption level such that regions are induced to borrow the socially optimal amount. As a result, well-designed bankruptcy procedures enforce hard budget constraints. In contrast to that, policymakers cannot directly influence regional borrowing in the bankruptcy regime with a high exemption level since the credit limit is determined by the costs of default, which are exogenous to the model. If the model's parameters are such that it is impossible to implement the first best solution, the optimal policy prescription is to set the exemption level equal to zero in order to maximise regions' access to credit. Otherwise, the regional credit constraint might be too tight from a welfare perspective.

The term 'soft budget constraint' (SBC) was coined by Kornai (1979) to describe the behaviour of state-owned enterprises in socialist economies but has since been used in a variety of settings, including fiscal federalism. Following Kornai et al. (2003), a budget constraint is considered to be soft if a supporting organisation, i.e. the central government, comes to the rescue of the budget constraint organisation, i.e. the subnational jurisdiction⁴, and covers the regional deficit. The SBC phenomenon is a problem of time inconsistency as it is optimal for the central government to bail out regions ex post even if it has announced not to provide additional transfers ex ante. As a result, regions are incentivised to overborrow strategically, anticipating that they can externalise their costs onto the national taxpayer. Theoretical models usually attribute the central government's lack of commitment to paternalism or equity concerns, with the central government equalising public consumption or income across the federation. This chapter follows this approach by assuming that the central government maximises a utilitarian welfare function when allocating transfers. Similar to Breuillé et al. (2010) and Akai and Sato (2008), federal resources are assumed to be fixed so that bailouts have to be funded by contributions of other member states. The chapter departs from the existing literature by

⁴ The term subnational is used for all levels of government below the central government. States, provinces, municipalities, cities, towns, public utility companies or school districts represent subnational entities.

explicitly considering bankruptcy procedures, thereby lifting the balanced budget requirement which is typically imposed in these models. While the SBC literature examines various strategic variables ranging from public expenditure to different types of taxation, this chapter focuses on regions' choice of borrowing and is therefore closest to Breuillé et al. (2006) and Goodspeed (2002).

The chapter is also related to previous work on sovereign debt default⁵ and the debate on the sovereign debt restructuring mechanism which was initiated by the IMF more than a decade ago.⁶ In a sense, being an international lender of last resort, the IMF finds itself in a similar dilemma as the central government vis-à-vis its member states. Focusing on the borrower-lender relationship and creditor co-ordination problems, proponents of bankruptcy proceedings claim that the laissez-faire approach to debt restructuring renders the market for sovereign debt inefficient. In a model with two types of debt contracts which differ regarding their ease of renegotiation, Bolton and Jeanne (2007) show that in equilibrium, sovereigns issue an excessive amount of debt which is difficult to restructure. This inefficiency can be alleviated by an insolvency mechanism for sovereigns but solely well-designed bankruptcy procedures are welfare-improving. In Ghosal and Miller (2003), sovereign debt crises arise due to a combination of debtor moral hazard and co-ordination failure by creditors. In the absence of a bankruptcy regime, sovereign bond markets are inefficient as there is excessive disorderly default in equilibrium. The authors therefore recommend introducing bankruptcy procedures which make the sovereign's payoffs seizable ex post. This chapter takes a different perspective by asking whether an orderly default mechanism can mitigate the inefficiencies generated by the strategic interactions between central and subnational governments. The analysis consequently focuses on bankruptcy procedures as a commitment rather than a co-ordination device.

The remainder of the chapter is organised as follows. Section 2.2 reviews the related soft budget constraint literature. The model set-up is described in section 2.3. In order to facilitate comparison with the bankruptcy law regime, section 2.4 establishes the hard budget constraint policy and the soft budget constraint result as reference cases. Section 2.5 examines the region's default

⁵ Panizza et al. (2009) provide a survey of the formal economic literature on sovereign debt and default going back to the seminal papers by Eaton and Gersovitz (1981), Eaton et al. (1986) and Bulow and Rogoff (1989).

⁶ For the IMF's original proposal, see Krueger (2002). The intellectual history of the idea prior to the IMF's initiative is examined in Rogoff and Zettelmeyer (2002). For an economic analysis, see White (2002).

decision under a bankruptcy regime with a high and a low exemption level. The effects of insolvency proceedings on the federal transfer policy and regional strategic behaviour are analysed in sections 2.6 and 2.7 respectively. Section 2.8 discusses the optimal design of bankruptcy procedures and the resulting welfare implications. Concluding remarks are offered in section 2.9.

2.2 Related literature

The theoretical literature has modelled the SBC phenomenon as a sequential game in which regions are Stackelberg leaders and the central government is the Stackelberg follower. In such a dynamic setting, the centre is unable to commit to a no-bailout policy. There is also a closely related body of literature which examines decentralised leadership. Both the SBC and the decentralised leadership literature assume that the centre optimises its transfer policy from an ex-post viewpoint, taking subnational governments' decisions as given. While the SBC literature treats bailouts as exceptional and selective events, decentralised leadership models presuppose a more generalised and systematic ex-post adjustment of federal transfers.

One strand of the literature analyses the relationship between financial support and district size. Echoing the “too big to fail” argument of the banking literature, Wildasin (1997) shows that the centre has an interest in bailing out a subnational government as the latter provides a local public good which benefits the rest of society. Since the breakdown of public service provision in a large jurisdiction generates relatively stronger repercussions for the federation, the central government is more likely to support large regions. His results suggest that decentralisation can harden the budget constraint by reducing district size. In an extension of his model which considers economies of scale, Crivelli and Staal (2008) conclude that district size and the probability for bailouts are negatively correlated. In their model, spillover effects are unrelated to district size, however, whereas bailouts are more costly for large regions. The central government is therefore more likely to intervene if regions are small.

Another strand of the bailout literature focuses on the disciplining effects of tax competition. In a model with vertical and horizontal tax competition, Breuillé et al. (2006) show that the central government always provides a bailout which is funded by an increase in federal taxes on capital. Since the tax rise reduces the common tax base, regions adjust local tax rates and the resulting tax interactions

promote fiscal discipline if regions are not heavily in debt. Similarly, Qian and Roland (1998) demonstrate that fiscal decentralisation can harden the budget constraint of enterprises when subnational governments compete for mobile capital. This competition results in an overinvestment in public infrastructure and an underprovision of the local public good, thus increasing the marginal utility of public good provision and hence the opportunity costs of bailing out firms. Contrary to this, Breuillé and Vigneault (2010) find that regional tax competition does not mitigate the soft budget constraint problem in a three-tier federation comprising a central government, regions and municipalities. This divergence in results can be explained by the fact that the federal transfer scheme internalises the negative externalities which arise with tax competition when regions ignore the effects of their tax policies on other regions, thus eliminating the positive effect of capital competition described by Qian and Roland (1998). If regions compete to attract capital, a net equalisation scheme in which ex-post transfers have to be financed by contributions of other regions is better suited to discouraging regional opportunistic behaviour than a gross equalisation scheme which is funded by federal tax revenues, as shown in Breuillé et al. (2010).

Some authors link the SBC phenomenon to other lines of research. In a political economy approach, Goodspeed (2002) assumes that the central government maximises its re-election probability and thus allocates transfers to equalise marginal political gains across the federation. As an increase in regional borrowing violates this optimal transfer rule, subnational governments can induce the centre to provide additional grants. The bailout lowers the opportunity costs of borrowing but increases tax payments and regions are only incentivised to overborrow if the reduction in opportunity costs outweighs the common pool effect on taxes. Akai and Sato (2008) try to reconcile the divergent results of the decentralised leadership and the bailout literature by showing that the region's choice of the policy instrument critically affects equilibrium outcomes. If subnational governments choose public expenditure, bailouts give rise to negative externalities and a cost-sharing mechanism, resulting in regional overspending. Contrary to that, tax collection efforts are weakened and the public good is underprovided if regions select their tax rates instead. Relating the inability of the centre to make dynamic commitments to the rotten kid literature, Akai and Silva (2009) develop a model in which regions have private information about the costs of public good provision ex ante but the central government finds out the true costs ex post. They demonstrate that soft budget constraints can be

eradicated if the centre can redistribute income between regions ex ante and ex post as regions are incentivised to report their true costs.

Finally, some papers question the widely held belief in the policy literature that a hard budget constraint is always desirable. Besfamille and Lockwood (2008) demonstrate that a hard budget constraint can be inefficient and that under certain conditions, the central government prefers a bailout even if it can precommit at zero cost. In their model, regions invest in projects and rely on the central government to refinance investments which turn out bad. In the case of a no-bailout policy, meaning that bad projects are always terminated, regions are incentivised not to initiate an investment even if it is efficient to do so or to exert excessive effort in order to lower the probability that the project is bad. Similarly, in a model with regional tax competition, Köthenbürger (2004) finds that the centre's inability to precommit might prove welfare superior. While ex-post federal intervention generates an inefficient interstate revenue-sharing mechanism as additional tax revenues are split amongst all member states, it also neutralises horizontal fiscal externalities arising from tax competition so that the overall welfare effect is ambiguous. In Köthenbürger (2008), the centre imposes a distortive tax on labour while regions engage in capital tax competition. Compared to the Nash outcome, federal precommitment enhances welfare but exacerbates the distortions in public good consumption. In contrast to that, both welfare and efficiency may improve under decentralised leadership if capital mobility is high since the central government allocates additional transfers to regions which raise their taxes, thus offsetting regions' incentives to lower tax rates in a race to the bottom. Caplan et al. (2000) likewise show that decentralised leadership leads to a Pareto efficient outcome. Their result is model-specific, however, and depends on the assumption that the local public good is pure in nature.

2.3 The model

The framework is a simple intertemporal model with two periods. The federation is characterised by a two-level hierarchy and comprises a central government and $n \geq 2$ identical subnational governments which have borrowing autonomy. Each region consists of a representative citizen who cannot relocate to other regions.

2.3.1 The players

The consumer: The representative citizen living in region i derives utility from the consumption of regional public goods (G_{i1}, G_{i2}) in the first and second period respectively:

$$U_i(G_{i1}, G_{i2}) = v(G_{i1}) + z(G_{i2}), \quad (2.1)$$

where $v(\cdot)$ and $z(\cdot)$ are strictly increasing, twice differentiable and concave.⁷

The subnational government (SNG): The subnational government attempts to maximise the utility of the citizen located in its region. The SNG has some room for budgetary manoeuvre since it is able to borrow on international credit markets. It is, however, subject to bankruptcy procedures in case of default. In the first period, the SNG provides a regional public good G_{i1} , which is financed through an exogenous federal transfer T_1 and borrowing B_i :

$$G_{i1} = T_1 + B_i. \quad (2.2)$$

In the second period, the SNG's overall revenues, denoted by R_i , consist of federal transfers T_{i2} and regional revenues Y , which result from taxing the household's income, so that $R_i = T_{i2} + Y$. The SNG uses its overall revenues to provide a local public good in the second period. In contrast to Breuillé et al. (2006), the SNG also has the option of defaulting on its debt repayments. It can choose to either repay the outstanding debt including interest rates in full or to default on its loans. The budget constraint for the second period, depending on whether the SNG defaults, is given by:

$$\text{No default (ND):} \quad G_{i2}^{ND} = T_{i2} + Y - (1 + r)B_i \quad (2.3a)$$

$$\text{Default (D):} \quad G_{i2}^D = \min\{\max\{0, T_{i2} + Y - c_d\}, E - c_d\}, \quad (2.3b)$$

where G_{i2}^{ND} and G_{i2}^D denote public consumption in the no-default and default scenario respectively. For simplicity, regions only choose their level of borrowing, B_i , to smooth public consumption over time and taxation is not a decision

⁷ In Breuillé et al. (2006), citizens also choose their level of savings and private consumption so as to maximise their intertemporal utility. Following the set-up in Breuillé et al. (2007), which assumes that the utility function is linear in c_{i2} , consumption in period 1 is solely determined by the return on savings and fixed independently of anything else. As the solution to the consumer's problem does not influence the outcome of the bailout game, it is neglected in the subsequent analysis and the utility function is simplified by excluding private consumption.

variable.⁸ If the SNG does not default, public good provision amounts to regional income net of principal and interest repayments $(1 + r)B_i$.

The bankruptcy procedure is effectively shaped by two parameters: the costs of default and the exemption level for public assets. Irrespective of the amount of regional revenues, defaulting entails costs such as the costs of filing the petition, the loss of reputation and access to future borrowing as well as lawyers' fees. This is captured by the parameter c_d which can be thought of as a negative utility item. As previously discussed, SNGs are sovereign entities and cannot be liquidated so that sovereign bankruptcy differs from corporate bankruptcy which provides for either the liquidation or the reorganisation of a company under Chapter 7 or Chapter 11 of the U.S. Bankruptcy Code respectively. Moreover, the objective of any sovereign insolvency mechanism must be to ensure the provision of core public services such as police, fire service or drinking water in the case of default. This is taken into account by introducing an exemption level for public assets, denoted by E , and assuming that creditors are only repaid from revenues exceeding this exemption level. This implies that for $R_i < E$, the SNG only bears the costs of default and creditors receive nothing. In this case, public consumption in the second period corresponds to $T_{i2} + Y - c_d$ and it is assumed that G_{i2}^D cannot be negative. If revenues are larger than the exemption level ($R_i \geq E$), by contrast, SNGs have to use any income above E to repay creditors and public good provision consequently amounts to $E - c_d$.

Figure 2.1 illustrates the gist of equations (2.3a) and (2.3b) and shows the level of public good consumption under both scenarios as a function of the regional revenues $R_i = T_{i2} + Y$. Note that the endogenous variable B_i is held fixed and $r = 0$. In the left panel of Figure 2.1, it is assumed that both public debt and the costs of default are positive and that $c_d > B_i$. In this case, public good consumption is always higher in the no-default scenario unless regional revenues are extremely low. This is no longer true, however, if public debt rises and eventually becomes larger than the costs of default, resulting in a downward shift of the G_{i2}^{ND} curve as in the right panel of Figure 2.1. This simple comparison implies that, holding the costs of default fixed, the SNG is more likely to default

⁸ There has been a debate in the legal literature as to whether bankruptcy courts can issue a writ of mandamus, thus forcing an SNG to impose new taxes for debt repayment. In practice, regions have often successfully avoided such an enforced tax increase (Gelper, 2012; Liu and Waibel, 2010). Moreover, raising taxes to repay creditors might prove inefficient since residents evade higher taxes by relocating to other regions (Skeel, 2011). In order to abstract away from these issues, regional revenues are assumed to be fixed.

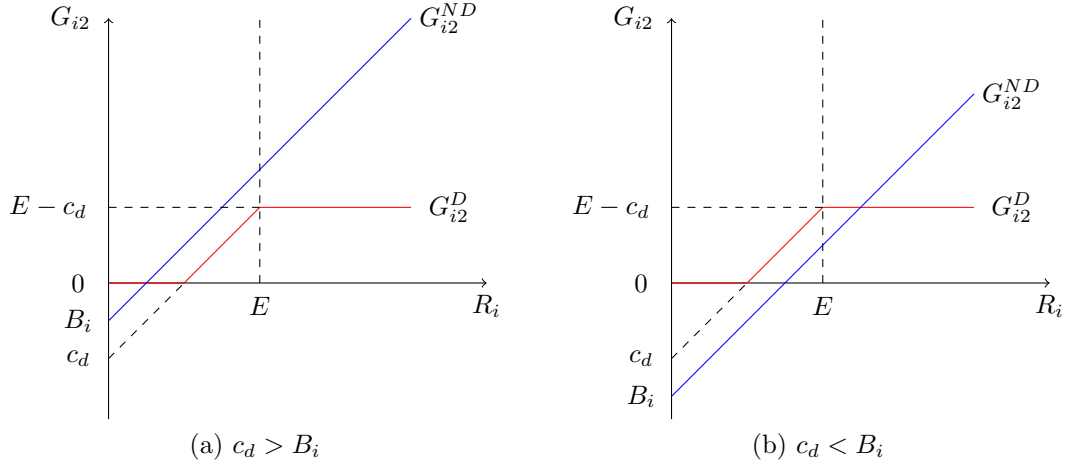


Figure 2.1: G_{i2} as a function of R_i

for higher levels of debt as the range of revenues for which default leads to higher public good consumption increases.

The creditors: SNGs can issue bonds on international credit markets in order to finance public expenditure in the first period. Creditors are assumed to be risk neutral and competitive. They lend to SNGs as long as they make zero profits. There are no information asymmetries and lenders have perfect knowledge.

The central government (CG): The central government is concerned about the welfare of the entire federation and maximises a utilitarian utility function $\sum_{i=1}^n U_i$. The CG levies a lump sum tax Γ on households to finance federal transfers in the second period:

$$\sum_{i=1}^n T_{i2} = n\Gamma. \quad (2.4)$$

It is assumed that Γ is fixed so that the CG cannot raise any additional tax revenues for bailout purposes ($d\Gamma = 0$). As a result, a bailout to region i has to be financed by a reduction in transfers to other regions $j \neq i$.⁹ Moreover, the CG is able to tax an SNG by choosing $T_{i2} < 0$, meaning that it can get hold of regional revenues Y , and T_{i2} must satisfy $T_{i2} \geq -Y$.

⁹ This transfer mechanism in which the overall pool of federal resources is fixed is also known as net equalisation scheme, see Breuillé et al. (2010).

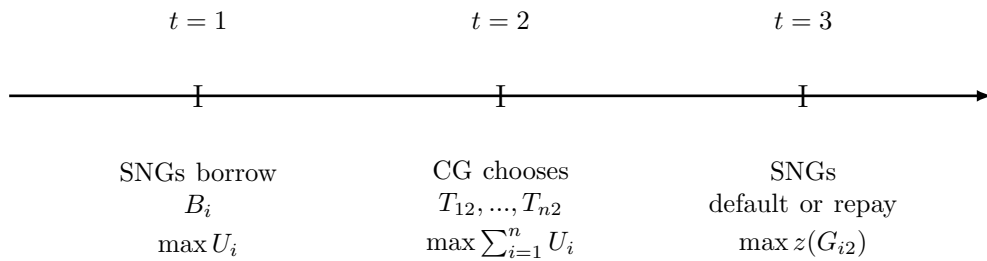


Figure 2.2: Sequence of Actions

2.3.2 Timing of the model

SNGs move first by choosing their level of borrowing, B_i , in order to maximise the intertemporal utility of the representative citizen. When doing so, SNGs act as Nash competitors with regard to each other, meaning that they take other regions' borrowing choices as given. Once SNGs have determined their level of debt, the CG sets regional transfers (T_{12}, \dots, T_{n2}) so as to maximise the overall welfare of the federation, anticipating regions' subsequent default decisions. Finally, the SNGs decide whether to repay their loans, this time maximising the utility of the representative citizen in the second period. Figure 2.2 summarises the sequence of events. The model is solved by backward induction to identify subgame perfect equilibria.

Similar to Breuillé et al. (2006), SNGs can perfectly foresee the CG's transfer policy. They consequently take the CG's reaction function, which describes the adjustment of the federal transfer policy following an increase in region i 's borrowing, into account when making their initial borrowing decision in period 1. The CG's reaction function therefore proves crucial in that it can either encourage or deter regional opportunistic behaviour. If the CG rewards additional borrowing with an increase in regional transfers, SNGs are incentivised to overborrow strategically and the budget constraint is soft. If, by contrast, the CG punishes regions for high levels of debt by reducing transfers, overborrowing can be restricted. Unlike in Breuillé et al. (2006), the interactions between SNGs and CG are more complex since the federal transfer policy does not only affect the SNG's initial borrowing decision but is also linked to its default decision in the second period.

2.4 Reference cases

Before examining the effects of insolvency procedures on regional opportunistic behaviour, two reference cases are established in order to facilitate comparison with the bankruptcy law regime.

2.4.1 The hard budget constraint policy

Following the definition by Kornai et al. (2003), a budget constraint is considered to be hard if the CG does not step in to bail out SNGs, meaning that T_{i2} is fixed. As SNGs are identical which makes it possible to abstract away from any redistributive issues, transfers to each region amount to Γ ($T_{i2} = \Gamma \forall i$). Taking this into account, the SNG maximises U_i with respect to B_i subject to (2.2) and (2.3a), yielding the following FOC:

$$\frac{\frac{dv}{dG}(G_{i1})}{\frac{dz}{dG}(G_{i2})} = 1 + r, \quad (2.5)$$

which determines the socially optimal level of borrowing B_i^{FB} . Under a hard budget constraint policy, the opportunity costs of borrowing correspond to the marginal costs of debt repayment ($1 + r$). The same result is obtained when assuming that all policy decisions are centralised and welfare is maximised by a benevolent social planner. In the model, the hard budget constraint policy is therefore equivalent to the first best outcome. To simplify the analysis, r is set equal to zero in sections 2.6 to 2.8. The SNG consequently chooses borrowing so as to equalise marginal utilities of public good consumption in the first and second period: $\frac{dv}{dG}(G_{i1}) = \frac{dz}{dG}(G_{i2})$.

2.4.2 The soft budget constraint result

The existing soft budget constraint literature reviewed in section 2.2 ignores the option of default and usually assumes that regional debt is always repaid and that regional budgets have to be balanced at the end of the second period. In the bailout game based on Breuillé et al. (2006), the sequence of actions is identical to the one described in Figure 2.2, except for the stage in which SNGs decide whether to repay their loans. As the SNGs cannot default, the federal transfer scheme is considered first. The CG maximises the utilitarian utility function $\sum_{i=1}^n U_i$ with respect to regional transfers (T_{12}, \dots, T_{n2}) subject to (2.2), (2.3a),

and (2.4), leading to the following FOCs:

$$\frac{dz}{dG}(G_{i2}) = \frac{dz}{dG}(G_{j2}) \quad \forall i, j \quad \Rightarrow \quad G_{i2} = G_{j2} \quad \forall i, j. \quad (2.6)$$

The CG's optimal transfer policy consequently aims to equalise the marginal utilities of public good consumption across the federation. As regions are identical, federal transfers are set such that every SNG consumes the same amount of the public good in period 2.

The CG's response to a change in regional borrowing determines whether the regional budget constraint is hard or soft. Intuitively, if T_{i2} is held constant, an increase in borrowing by region i reduces the level of the local public good in period 2, thereby increasing the marginal utility. As this violates the optimal transfer rule, the CG increases transfers to region i until marginal utilities are equalised in all regions.¹⁰ For example, if region i borrows one extra pound, public good consumption in the second period falls by $(1 + r)$. In order to restore its optimal transfer policy, the CG reimburses region i for these additional costs of debt repayment. As federal revenues are fixed, however, the costs of the transfer are split amongst all n regions, including region i .

In the absence of bankruptcy procedures, the CG thus always bails out an SNG if the latter increases its borrowing. In period 1, the SNG maximises the utility of the representative household with respect to B_i subject to (2.2), (2.3a), (2.4) and the CG's reaction function, resulting in the following FOC:

$$\frac{\frac{dv}{dG}(G_{i1})}{\frac{dz}{dG}(G_{i2})} = \frac{1 + r}{n}, \quad (2.7)$$

which determines the level of borrowing under a soft budget constraint policy, denoted by B_i^* . Compared to the first best given by (2.5), the opportunity costs of borrowing are now lower as regions only bear a fraction of their debt servicing costs. Since the SNG can externalise part of its debt repayments onto the rest of the federation, it is incentivised to overborrow strategically. This is the well-known soft budget constraint result which is derived by Breuillé et al. (2006). As $n \rightarrow \infty$, the common pool problem gets more severe since the SNG can shift an ever increasing amount of its costs onto other regions.

¹⁰See Appendix for a detailed calculation of the CG's reaction function.

2.5 The default decision

In the following, an insolvency mechanism, as described in equation (2.3b), is introduced into the model framework, allowing regions to default in the second period. The SNG's choice whether to repay its loan is considered first. SNGs default if doing so increases their utility in the second period, i.e. if

$$z(G_{i2}^D) > z(G_{i2}^{ND}) \quad \Leftrightarrow \quad G_{i2}^D > G_{i2}^{ND}, \quad (2.8)$$

which boils down to a comparison of the level of the public good in the second period. In general, the default decision can be described as a yes/no decision and can be written as a binary variable:

$$D_i = \begin{cases} 0 & \text{if } B_i < \tilde{B}_i & \text{Repay} \\ 1 & \text{if } B_i > \tilde{B}_i & \text{Default,} \end{cases}$$

where \tilde{B}_i is some threshold which will be determined in the following. The subsequent analysis distinguishes between two bankruptcy regimes, depending on the exemption level, each of which is analysed in turn.

2.5.1 High exemption level: $R_i < E$

In a first step, it is assumed that the exemption level is very high so that $R_i < E$. This implies that in case of default, SNGs only have to bear the costs of default and can keep all their assets. SNGs consequently default if the costs of repayment are larger than the costs of default. Rearranging gives the following default condition:

$$B_i > \frac{c_d}{1+r} \equiv \bar{B}_i. \quad (2.9)$$

The federal transfer policy has no impact on the default decision which is independent of T_{i2} and based on a simple cost comparison. As a result, the CG cannot prevent regional default by adjusting its transfer scheme. The orderly default mechanism affects neither the CG's optimal transfer policy nor its best response to an increase in regional borrowing. The results of Breuillé et al. (2006) regarding the CG's policy therefore carry over to the case with a high exemption level and the reasoning is the same as in section 2.4.2. The CG bails out a region since it tries to equalise the marginal utilities of public good consumption across the federation. If an SNG increases its borrowing, public good consumption in

period 2 falls, thereby raising marginal utility and violating the optimal transfer rule given by (2.6). In order to restore equality, the borrowing region receives additional transfers. This implies that borrowing an extra pound is relatively cheap as the region only has to repay a fraction of the costs ($\frac{1+r}{n}$). Regions are consequently incentivised to overborrow strategically. Contrary to Breuillé et al. (2006), SNGs might be disciplined by the credit market as \overline{B}_i can be interpreted as a credit constraint. This is equivalent to $r \rightarrow \infty$ at \overline{B}_i and can be understood as credit rationing. If there are no information asymmetries and c_d and r are common knowledge, creditors can perfectly foresee the default condition and consequently never lend a larger amount than \overline{B}_i to SNGs in the first place. As a result, default does not occur in equilibrium unless creditors make a mistake.

Depending on the extent of the credit rationing, the outcome of the bailout game therefore differs from the results in Breuillé et al. (2006) and three cases can be distinguished. If the credit limit lies in between the first best and the SBC equilibrium ($B_i^{FB} < \overline{B}_i < B_i^*$), the credit constraint is binding. Due to the CG's lack of commitment, SNGs are incentivised to borrow up to B_i^* but creditors only lend \overline{B}_i . As a result, moral hazard is alleviated since overborrowing is restricted. Here the credit constraint is welfare-improving since it brings regional borrowing closer to its first best level. If, by contrast, the credit constraint is very tight and lower than the first best ($\overline{B}_i < B_i^{FB} < B_i^*$), regions are not even able to borrow up to the socially optimal level B_i^{FB} . In the extreme case in which the costs of default are zero, SNGs always choose default. Creditors are therefore unwilling to lend to SNGs and the latter have no intertemporal flexibility at all. Although credit rationing mitigates the SBC problem, it also implies a welfare loss. If the credit constraint is very loose ($B_i^{FB} < B_i^* < \overline{B}_i$), the typical SBC result holds as in Breuillé et al. (2006). SNGs' optimal choice of borrowing is given by B_i^* since regions are bailed out by the CG and overborrow strategically. As regions have no interest in borrowing up to \overline{B}_i , the credit limit is not binding.

The model thus lends support to the market discipline hypothesis. This result is summarised in the following proposition:

Proposition 2.1. *Bankruptcy laws with a high exemption level for public assets do not serve as a commitment device for the CG. Nevertheless, regional borrowing is reduced if the credit constraint imposed by the market is binding ($\overline{B}_i < B_i^*$). Otherwise, regions overborrow strategically as in Breuillé et al. (2006). The market restrictions on regional debt do not necessarily improve the federation's welfare.*

Proof. This follows directly from (2.9) and the previous discussion. \square

2.5.2 Low exemption level: $R_i \geq E$

In practice, the exemption level E is likely to be more moderate, trying to balance debtors' and creditors' interests. If E is sufficiently low so that $R_i \geq E$, SNGs can keep some but not all of their public assets. Again, SNGs default if doing so is economically advantageous by increasing second period utility, leading to the following default condition:

$$B_i > \frac{T_{i2} + Y - E + c_d}{1 + r} \equiv \underline{B}_i. \quad (2.10)$$

Similar to the previous case with a high exemption level, \underline{B}_i can be interpreted as a credit constraint imposed by the market. Unlike in the regime with a high E , the critical level of debt above which the SNG defaults depends on an endogenous variable, T_{i2} . As a result, the CG's transfer policy has an impact on the SNG's repayment choice, as stated in the following lemma:

Lemma 2.1. *For sufficiently low exemption levels ($R_i \geq E$), the CG is able to influence the SNG's default decision. Since*

$$\frac{dB_i}{dT_{i2}} = \frac{1}{1 + r} > 0, \quad (2.11)$$

extending federal transfers can prevent regional default by increasing the critical level of debt.

If, by mistake, creditors lend one pound too much so that SNGs decide not to repay their loans, the CG can prevent regional default by increasing transfers by $dT_{i2} = (1 + r)$. Whether the CG actually makes use of this strategic advantage and is interested in preventing default is examined in the subsequent section.

For very low exemption levels ($E \rightarrow c_d$), almost all public assets can be seized by creditors. It is assumed, however, that $G_{i2} < 0$ is impossible. The default condition becomes:

$$B_i > \frac{T_{i2} + Y}{1 + r} \quad \text{if} \quad E \rightarrow c_d. \quad (2.12)$$

In this case, SNGs borrow against their revenues and default if revenues fall short of outstanding debt obligations.

Comparing the credit constraints for high and low exemption levels, it turns out that the critical level of debt is more restrictive for a high exemption level:

$$\underline{B}_i = \frac{T_{i2} + Y - E}{1 + r} + \overline{B}_i, \quad (2.13)$$

with the first term being positive since $R_i > E$. This seems intuitive because creditors have no collateral and cannot seize any assets in the regime with a high exemption level. As creditors are likely to incur larger losses in this case, they are not willing to lend a huge amount. Note that the critical level of debt, \underline{B}_i , decreases in the exemption level E . The more assets SNGs are able to keep in case of default, the more careful creditors become when lending to regions as they anticipate larger losses. Equation (2.13) is therefore consistent with the market discipline hypothesis and offers an important insight for policymakers. Implementing insolvency proceedings with a high exemption level might lower welfare as regions face stricter borrowing constraints, thus limiting their ability to smooth public consumption over time.

2.6 The federal transfer policy ($R_i \geq E$)

Anticipating the default condition, the CG chooses transfers (T_{12}, \dots, T_{n2}) so as to maximise the welfare of the federation $\sum_{i=1}^n U_i$ subject to (2.2), (2.3a), (2.3b) and (2.4). Compared to the bailout game without default by Breuillé et al. (2006), an additional condition appears in the CG's maximisation problem in the form of equation (2.3b), thereby widening the range of available policy options. Firstly, the CG can correctly foresee whether, given the level of federal transfers, the SNG will choose to repay its debt in the subsequent period. As shown in Lemma 2.1, the CG can prevent default by adjusting its transfer scheme. Secondly, the CG also has an interest in 'punishing' regions which do not comply with their debt obligations. The key to the CG's behaviour lies in the exemption level E . The latter effectively constitutes an insurance mechanism, enabling citizens to consume a minimum amount of public services in case of default. For example, if an SNG defaults in the second period, the CG's best reply is to reduce the revenues of the defaulting SNG down to the exemption level E . While the representative citizen in the defaulting region is not worse off, taxpayers' money no longer accrues to creditors and can be redistributed to non-defaulting regions, thereby increasing the welfare of the federation. Interestingly, even if none of the

regions default, the sheer existence of bankruptcy procedures affects the CG's strategic behaviour as it can credibly threaten to punish heavily indebted SNGs by reducing their transfers.

For certain parameters of the model, the CG's best reply to an increase in regional borrowing thus differs from the bailout game without default since the CG might be incentivised to reduce transfers rather than to provide bailouts. This idea is summarised in the following lemma:

Lemma 2.2. *The CG's reaction function:* *For a sufficiently low level of debt, the CG bails out region i if the latter increases its borrowing in the first period. This bailout is financed by reductions in transfers of other regions. If the SNG raises its debt above a critical level $\hat{B}_i(B_{-i})$, the CG lets it default, reduces region i 's overall revenues down to the exemption level E and redistributes the proceeds to the rest of the federation.¹¹*

$$T_{i2} = \begin{cases} \frac{n(\Gamma + Y) - \sum_j B_j}{n} - Y + B_i = \Gamma - \frac{\sum_j B_j}{n} + B_i & \text{if } B_i \leq \hat{B}_i \\ E - Y & \text{if } B_i > \hat{B}_i. \end{cases} \quad (2.14)$$

Proof. See Appendix. □

For a sufficiently low level of debt ($B_i \leq \hat{B}_i$), the result by Breuillé et al. (2006) extends to the bailout game with default. The slope of the CG's best response function is derived by differentiating the first line of (2.14), leading to:

$$\frac{dT_{i2}}{dB_i} = 1 - \frac{1}{n} > 0,$$

which is identical to the reaction function in Breuillé et al. (2006). The intuition is the same as in section 2.4.2. If region i borrows an extra pound, its public good consumption in period 2 is lowered, thereby increasing marginal utility. As the CG's optimal transfer rule is no longer satisfied, the CG bails out region i to restore the equality of marginal utilities across the federation. Since the CG has no additional tax raising power, the costs of the bailout are split amongst all n regions so that region i has to bear a fraction of the costs ($\frac{1}{n}$). The transfers to

¹¹ Where B_{-i} is given by $B_{-i} \equiv (B_1, \dots, B_{i-1}, B_{i+1}, \dots, B_n)$ and r and c_d are set equal to zero in the following. (2.14) is only valid if no other regions are left to default. Otherwise, the debt of a defaulting region can be removed from the summation and the denominator will be reduced by the number of defaulting regions.

regions $j \neq i$ are adjusted as follows:

$$\frac{dT_{j2}}{dB_i} = -\frac{1}{n} < 0.$$

This line of reasoning no longer applies for a sufficiently high level of debt ($B_i > \hat{B}_i$). For simplicity, assume $E = 0$ and $\Gamma = 0$. Given everyone else's B_j , suppose region i borrows a large amount in the first period, leading to a very low consumption of the public good in period 2. In Breuillé et al. (2006), this effect is offset since the CG spreads the debt across all the regions. If the level of borrowing is sufficiently high, however, bailing out region i will eventually become so costly for the CG that it is better to let region i default and completely tax away its revenues. Otherwise, region i 's bailout would tie up the entire resources of the federation (nY) so that the other regions also get zero consumption in the second period. If the CG lets region i default, public consumption in that region is given by $E = 0$ as citizens are protected by the exemption level. Although marginal utility at this point is very large, region i 's utility loss amounts to a finite number which gets closer to zero the closer is the bailout consumption to zero. Redistributing region i 's revenues Y to the other $n - 1$ regions more than compensates this utility loss, thereby increasing the welfare of the federation.

The argument that reducing transfers to region i makes the federation as a whole better off certainly holds for $B_i > \underline{B}_i$. As the SNG defaults in this case, region i 's revenues would partly accrue to creditors and thus be lost for the federation. The fact that the CG is also incentivised to lower transfers to heavily indebted regions which do not default can be explained by the implicit insurance provided by the exemption of certain public assets. Suppose that E is positive and that region i borrows up to its credit limit \underline{B}_i . Public consumption is then given by $G_{i2}^{ND} = G_{i2}^D = E$, meaning that region i is indifferent between defaulting or not defaulting. If the CG lets such an SNG default and reduces its overall revenues down to E , the SNG is not worse off due to the indifference property. The proceeds can be spread across the other regions, thereby increasing the welfare of the federation. The exemption level consequently represents a form of insurance and prevents region i 's citizens from suffering a utility loss. This insurance mechanism, however, comes at the expense of the creditors. As region i 's revenues are now equal to E , creditors receive nothing and have to bear the costs of region i 's default. Due to the insolvency mechanism, the CG can get hold of additional resources while leaving public good consumption in region

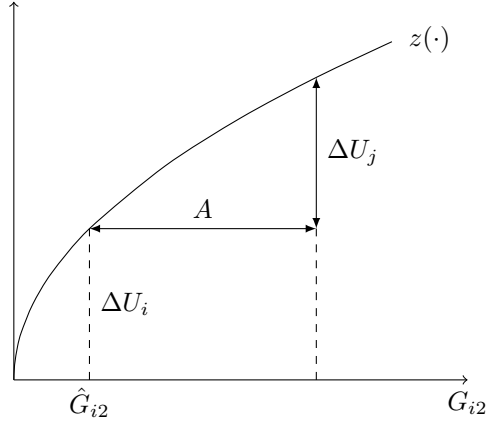


Figure 2.3: The Critical Level of Debt \hat{B}_i

i unaffected, thus limiting the resulting inequality between regions. A similar argument can be established if regional borrowing is below the credit limit but sufficiently high. The mechanics of this model therefore differ from the bailout game without default where a reduction in transfers to region i always lowers G_{i2} by the exact same amount. Since the insurance effect disappears for $R_i < E$, the maximum possible reduction which the CG can impose is given by $E - Y$.

To sum up the CG's best response, region i receives additional transfers, i.e. a bailout, if $B_i \leq \hat{B}_i$ while it experiences a reduction in transfers for $B_i > \hat{B}_i$. More precisely, if regional revenues are above the exemption level ($Y > E$), the federal transfer is negative ($T_{i2} < 0$) so that the CG effectively taxes region i .

Finally, the critical threshold \hat{B}_i is determined as follows:

Remark 2.1. *The critical level of debt $\hat{B}_i(B_{-i})$ is such that it is just worth taxing region i , i.e. reducing region i 's public consumption to E , and redistributing the proceeds to the other $n - 1$ regions. In this case, the CG is indifferent between bailing out or taxing region i .*

Figure 2.3 illustrates this point for $n = 2$, $E = 0$, $c_d = 0$, $r = 0$ and $\Gamma = 0$. The CG redistributes $A \equiv Y + \frac{1}{2}(\hat{B}_i - B_j)$ to region j . $\hat{G}_{i2} = Y - \frac{\hat{B}_i + B_j}{2}$ denotes the level of public consumption corresponding to $\hat{B}_i(B_j)$. \hat{G}_{i2} consequently represents the common public good consumption if neither region defaults. If G_{i2} is such that redistributing does not increase the utility of the federation ($-\Delta U_i \geq \Delta U_j$), the CG has no interest in taxing region i . In Figure 2.3, the critical level of

$\hat{B}_i(B_j)$ satisfies

$$z\left(Y - \frac{\hat{B}_i + B_j}{2}\right) - z(0) = z(2Y - B_j) - z\left(Y - \frac{\hat{B}_i + B_j}{2}\right).$$

Assuming that only one region defaults and generalising the example in Figure 2.3, the critical threshold $\hat{B}_i(B_{-i})$ is implicitly defined by:

$$\begin{aligned} & z\left(Y + \Gamma - \frac{\sum_j B_j}{n}\right) - z(E - c_d) \\ = & (n-1) \left[z\left(Y + \frac{n\Gamma + Y - E - \sum_{j \neq i} B_j}{n-1}\right) - z\left(Y + \Gamma - \frac{\sum_j B_j}{n}\right) \right]. \end{aligned}$$

The concrete level of \hat{B}_i consequently hinges on the parameters of the model, in particular on the concrete form of $z(\cdot)$, the amount of revenues available for redistribution and the number of regions n . The higher region i 's revenues relative to the exemption level, the more the CG can redistribute to other SNGs which makes the reallocation of resources more profitable. As n increases, each SNG gets a smaller fraction of region i 's revenues. At the same time, these revenues are spread across more regions, thereby implying a larger overall utility gain for the federation since the force of diminishing marginal utility is lower when n is large.

In the following, attention is confined to symmetric equilibria, meaning that all regions borrow the same amount B . For expositional ease, let \bar{R} be the level of regional revenues if the CG allocated the same amount of federal resources to each region, that is $\bar{R} = \Gamma + Y$. In the symmetric case, the critical threshold of debt above which it is desirable for the CG to tax some regions turns out to be positive but strictly lower than the credit limit \underline{B} , leading to the following lemma:

Lemma 2.3. *The CG's reaction function in the symmetric case: If all regions borrow the same amount B , the critical threshold $\hat{B}(B, \dots, B)$ at which the CG is indifferent between taxing and bailing out regions must lie between zero and the credit limit $\underline{B} = \bar{R} - E$.*

Proof. See Appendix. □

The implications of the CG's behaviour for regions' choice of borrowing are analysed in the subsequent section.

2.7 Regional opportunistic behaviour ($\bar{R} \geq E$)

In the first period, the SNG maximises the intertemporal utility of the citizen located in its region, U_i , with respect to B_i subject to (2.2), (2.3a), (2.3b), (2.4) and the CG's reaction function (2.14). In comparison to the bailout game by Breuillé et al. (2006), the SNG now faces two additional restrictions when choosing its level of borrowing. Firstly, the CG's best reply to an increase in regional borrowing has changed as a result of the bankruptcy procedures. As shown in the previous section, the CG either bails out or taxes region i if the latter increases its borrowing, depending on the parameters of the model. Secondly, as regional debt is issued on international bond markets, the bankruptcy proceedings as captured by condition (2.3b) might restrict the region's access to borrowing. Since creditors can perfectly foresee the region's default condition (2.10), they never lend more than $\underline{B} = \bar{R} - E$ to SNGs in the first place. Similar to the scenario with a high exemption level, credit rationing might therefore occur if the region's preferred level of borrowing is above this credit limit.

Since the analysis is restricted to symmetric equilibria, all SNGs choose the same level of debt and no region has an incentive to deviate unilaterally. For simplicity, it is assumed that $r = 0$ and $c_d = 0$. In this case, SNGs can borrow against the surplus of \bar{R} over E . For $E = 0$, no public assets are exempt from seizure and regions can borrow against their revenues.

Suppose first that the parameters are such that similar to the model without default, the CG bails out region i . The resulting putative overborrowing equilibrium can be defined as follows:

Definition 2.1. *Overborrowing equilibrium (OE):* *Assuming an interior solution, the following conditions must be satisfied in the overborrowing equilibrium, denoted by B^* and $G^* = T_{i2} + Y - B^*$:*

$$\frac{\frac{\partial v}{\partial G_{i1}}}{\frac{\partial z}{\partial G_{i2}}} = \frac{1}{n} \quad \forall i \quad (2.15a)$$

$$T_{i2} = \Gamma \quad \forall i. \quad (2.15b)$$

Recalling Lemma 2.2, regional opportunistic behaviour is rewarded with a bailout for certain parameters of the model. If the CG's best reply is described by the first line of (2.14), each SNG has an incentive to increase borrowing above the first best since it can externalise its costs onto other regions. In equilibrium,

all regions thus overborrow strategically in order to receive additional transfers. In this case, deviating and borrowing less would not be profitable for a single SNG since it would have to fund other regions' excessive debts. As the CG does not have the means to bail out all regions in equilibrium, however, SNGs do not get any additional transfers. The attempt to increase public consumption in period 1 at a low opportunity cost of period 2 consumption is therefore ultimately self-defeating. The region's budget constraint is soft but the CG still allocates $T_{i2} = \Gamma$ to all SNGs in equilibrium.

As shown in Proposition 2.1, bankruptcy laws with a high exemption level can compensate for the CG's lack of commitment and curb regional overborrowing as creditors impose a credit constraint on SNGs, thus lending support to the market discipline hypothesis. Although investors anticipate the default condition (2.10) and could similarly ration credit in the bankruptcy regime with a low exemption level, it turns out that the credit limit does not determine equilibrium borrowing in this case, leading to the following lemma:

Lemma 2.4. *If the exemption level is low ($\bar{R} \geq E$), the credit limit \underline{B} is not binding and public consumption is strictly larger than E .*

Proof. If all SNGs borrowed the maximum amount available \underline{B} , taxation of some regions is desirable for the CG, as shown in Lemma 2.3. Since creditors anticipate that the CG would let some SNGs default if they borrowed up to their credit limit, they never lend \underline{B} in the first place. The credit limit \underline{B} can therefore not constitute an equilibrium. \square

Unlike in the bankruptcy regime with a high exemption level, the maximum amount which regions can borrow in equilibrium when $\bar{R} \geq E$ is not determined by the default condition and the resulting credit limit \underline{B} . Strictly speaking, the market discipline hypothesis therefore does not hold for low exemption levels. Rather than being restricted by market forces, SNGs' choice of borrowing hinges on the CG's strategic behaviour, as captured by the reaction function. For certain ranges of parameters, regions consequently overborrow in equilibrium, expecting to receive a bailout by the CG, and $B^* < \underline{B}$. This implies that regions do not default in the overborrowing equilibrium.

In this case, the outcome of the bailout game is the same as in the model without default by Breuillé et al. (2006) as regions overborrow strategically and regional budget constraints are soft. It is important to note, however, that their model only offers a partial solution as it focuses on the interaction of the CG and

one single SNG. If one region is incentivised to trigger a federal bailout, other SNGs might follow suit. The characterisation of the Nash equilibrium would then require the simultaneous determination of regional best replies in the presence of soft budget constraints. In contrast to Breuillé et al. (2006), this chapter shows that while each SNG has an incentive to overborrow, this strategy results in a higher level of regional debt but leaves federal transfers unchanged.

Under certain conditions, the overborrowing solution does not represent the Nash equilibrium of the game, however, as stated by the following lemma:

Lemma 2.5. *If the putative overborrowing equilibrium has $B^* > \hat{B}_i(B^*, \dots, B^*)$, then*

(a) B^* is not an equilibrium.

(b) B^{**} is the unique equilibrium where $B^{**} = \hat{B}_i(B^{**}, \dots, B^{**})$.

Proof. (a) directly follows from Lemma 2.2. (b) see Appendix. □

If $B^* > \hat{B}_i(B^*, \dots, B^*)$, the equilibrium can be defined as follows:

Definition 2.2. Bankruptcy law equilibrium (BLE): *In the bankruptcy law equilibrium, denoted by \hat{B} and $\hat{G}_{i2} = T_2 + Y - \hat{B}$, consumption \hat{G}_{i2} and transfers T_{i2} must satisfy the following conditions:*

$$z(\Gamma + Y - \hat{B}_i) - z(E) = (n-1) \left[z\left(\frac{n(Y + \Gamma) - E}{n-1} - \hat{B}_j\right) - z(\Gamma + Y - \hat{B}_j) \right] \quad \forall i, j \quad (2.16a)$$

$$T_{i2} = \Gamma \quad \forall i. \quad (2.16b)$$

In the bankruptcy law equilibrium, SNGs therefore only borrow up to \hat{B} in order to avoid being taxed by the CG. As a result, regions effectively face a borrowing constraint which is imposed by the CG itself rather than by the credit market. While SNGs might still incur levels of debt which are higher than the first best amount, the extent of the overborrowing can be reduced and the regional budget constraint is hardened. Interestingly, bankruptcy laws can thus mitigate the SBC phenomenon for certain parameters but for reasons other than those highlighted by the proponents of the market discipline hypothesis. In contrast to the regime with a high exemption level, the credit limit \underline{B} is irrelevant when E is low, as shown in Lemma 2.4. The disciplining effect of bankruptcy procedures

with a low exemption level consequently stems from the CG's taxing threat which discourages SNGs from overborrowing. Bankruptcy procedures therefore serve as a commitment device or, more precisely, as a deterrent since they directly affect the CG's incentives and its reaction to an increase in regional borrowing. In equilibrium, no region is effectively taxed but each SNG receives a federal transfer of $T_{i2} = \Gamma$.

Anticipating the CG's behaviour, \hat{B} is also the maximum amount that creditors would be prepared to lend as any additional lending would lead to taxation and hence default. Note, however, that even if, by mistake, investors extended lending beyond \hat{B} , the SNGs would have no incentive to increase borrowing due to the CG's taxing threat. In a sense, \hat{B} can be interpreted as a self-imposed constraint which does not depend on any market restrictions. Surprisingly, this borrowing constraint is even stricter than the one derived from the default condition (2.10), as stated in the following lemma:

Lemma 2.6. *The maximum amount which regions can borrow in the bankruptcy law equilibrium, \hat{B} , is lower than the credit limit \underline{B} .*

Proof. This follows directly from Lemma 2.4 and the previous discussion. \square

This implies that SNGs do not default in the bankruptcy law equilibrium, leading to the following result:

Result 2.1. *Default never occurs in equilibrium. Given the parameters, a unique symmetric pure strategy Nash equilibrium always exists.*

The main insights of this section are summarised in the following proposition:

Proposition 2.2. *Bankruptcy procedures with a low exemption level for public assets ($\bar{R} \geq E$) can harden the subnational budget constraint and serve as a commitment device for the CG. For a certain range of parameters, the CG taxes an SNG if the latter increases its debt, thereby effectively imposing a borrowing constraint on regions. Otherwise, the overborrowing result derived by Breuillé et al. (2006) holds. The credit limit \underline{B} is never binding so that the credit market does not directly discipline regional borrowers.*

Comparing Propositions 2.1 and 2.2, it turns out that the exemption level E is crucial in determining how bankruptcy procedures translate into enhanced fiscal responsibility. Whereas creditors might restrict access to regional borrowing

in the regime with a high exemption level, the CG itself can encourage fiscal discipline via its taxing threat in the bankruptcy scenario with a low E . The following section therefore looks at the optimal design of bankruptcy procedures and examines whether a high or a low exemption level is better suited to improving the welfare of the federation.

2.8 The optimal design of bankruptcy procedures

In the model, the bankruptcy proceedings are essentially shaped by two parameters: the costs of default c_d and the exemption level E . While the costs of default are assumed to be exogenous, the exemption level E can be understood as a policy parameter which can be chosen by policymakers prior to the first stage of the game, as described in Figure 2.2. This section therefore examines whether bankruptcy procedures can be designed in such a way that the regional budget constraint is hard and borrowing is at its socially optimal level B^{FB} .

If policymakers choose a very high exemption level ($E > \bar{R}$), a region's access to credit can be restricted by the market, as shown in Proposition 2.1. While regional overborrowing might be curbed as creditors are unwilling to extend lending beyond the credit limit \bar{B} , the welfare effects of this regime are ambiguous. If the costs of default are very low, for example, the credit constraint might be too tight and welfare is lowered. Moreover, policymakers cannot directly control regional borrowing in this regime as a region's access to credit is solely determined by the costs of default, which policymakers cannot influence. As a result, policymakers are in general unable to directly implement the socially optimal amount of borrowing. The regional budget constraint is hard and public debt coincides with the first best if the costs of default are such that $\bar{B} = c_d = B^{FB}$. As the credit limit \bar{B} is increasing in the costs of default, insolvency proceedings with a high exemption level can improve or lower welfare, depending on the exact size of the costs and the level of B^{FB} . For $\bar{B} > B^* > B^{FB}$, the overborrowing equilibrium prevails so that bankruptcy procedures leave welfare unchanged.

If the exemption level is set such that $E < \bar{R}$, by contrast, regions face a self-imposed borrowing constraint since they will be taxed if they borrow more than \hat{B} . Interestingly, this borrowing constraint depends on the policy parameter E . Policymakers might consequently be able to manipulate E , thereby discouraging regions from borrowing above the first best. In order to assess the effect of a change in E on the borrowing constraint \hat{B} and hence welfare,

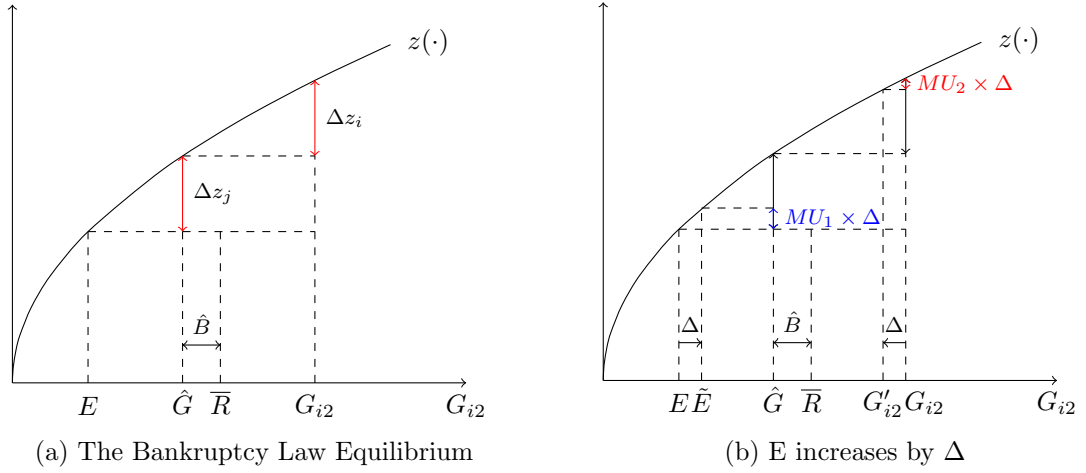


Figure 2.4: Comparative Statics Analysis for E

a heuristic approach is used.¹² The left panel of Figure 2.4 illustrates the bankruptcy law equilibrium for $n = 2$ and a given exemption level E . If the CG taxes region j and redistributes the proceeds $\bar{R} - E$ to the other region, consumption in region j will fall to E whereas region i will consume at G_{i2} which equals $\bar{R} - \hat{B} + \bar{R} - E$. Since the vertical distances Δz_i and Δz_j are equal, the federation's welfare remains unchanged and the CG is hence indifferent between taxing and bailing out regions. In the bankruptcy law equilibrium, public consumption therefore amounts to \hat{G} in each region and the corresponding critical level of debt $\hat{B}(\hat{B})$ is given by the difference between \bar{R} and \hat{G} , as indicated in the graph.

Now assume that the exemption level rises by Δ to \tilde{E} while \hat{G} and \hat{B} are held fixed. The effects of an increase in E are depicted in the right panel of Figure 2.4. If region j is taxed, its consumption will be given by \tilde{E} whereas region i will consume at G'_{i2} . The costs of taxing region j are now lower since the resulting utility loss in region j decreases by $MU_1 \times \Delta$, where MU_1 denotes the marginal utility evaluated at E . At the same time, there are fewer resources available for redistribution so that the transfer to region i drops by Δ . Region i 's utility gain consequently decreases by the small amount of $MU_2 \times \Delta$, where MU_2 is the marginal utility evaluated at G'_{i2} . Since $MU_1 > MU_2$ due to diminishing marginal utility, taxing region j now increases the federation's welfare since the loss to region j is smaller than the gain to region i . Ceteris paribus, the CG is therefore more likely to tax if the exemption level increases.

¹²This would also follow from analysing equations (2.16a) or (2.17) directly.

So far \hat{B} has been held fixed. In order to restore the bankruptcy law equilibrium where $\Delta z_i = \Delta z_j$, public consumption needs to be adjusted: as \hat{G} increases and \hat{B} falls, the cost to the taxed rises relatively more than the benefit to the non-taxed region, thus weakening the CG's incentive to tax and offsetting the effect of the change in E .¹³ The comparative statics analysis for E therefore suggests an inverse relationship between \hat{B} and E . Regions are consequently less restrained in their borrowing choice for lower levels of E and the amount of credit available to regions under this regime is maximised for $E = 0$. Depending on consumers' preferences for public consumption, however, even the maximum possible amount which regions can borrow in the bankruptcy law equilibrium might be too small from a welfare perspective. This seems to be the case if citizens value public consumption in period 1 relatively highly, i.e. B^{FB} is large, and there is only a small number of regions. Moreover, subnational governments have no access to credit in the limit case where the exemption level is equal to regional income and creditors hence cannot seize any assets. These arguments all generalise for the case with $n \geq 2$ regions. The major points of the comparative statics analysis for E are summarised in the following lemma:

Lemma 2.7. *The relationship between the critical level of debt and the exemption level can be characterised as follows:*

- (a) *The borrowing constraint \hat{B} is a decreasing function of E , i.e. $\frac{d\hat{B}}{dE} < 0$.*
- (b) *The maximum possible amount of borrowing in the bankruptcy law equilibrium can be smaller or larger than the first best: $\hat{B}|_{E=0} \begin{matrix} \geq \\ < \end{matrix} B^{FB}$.*
- (c) *In the limit case where the exemption level is equal to total revenues, regions cannot borrow at all: $\hat{B}|_{E=\bar{R}} = 0$.*

Proof. (a) follows directly from the previous discussion and Figure 2.4. (b) Example 2 in the Appendix illustrates a case where $\hat{B}|_{E=0} < B^{FB}$, using a specific utility function. (c) Set $\bar{R} = E$ in equation (2.17).¹⁴ \square

Lemma 2.7 implies that the welfare effects of a bankruptcy regime with a low exemption level are ambiguous and depend on E . Note that bankruptcy

¹³A similar point has been made in the proof for Lemma 2.5.

¹⁴For $c_d > 0$, the borrowing constraint \hat{B} converges to c_d in this case. To see this, set $\bar{R} = E$ in equation (2.17). Note that the latter becomes $nz(\bar{R} - \hat{B}) - z(E - c_d) = (n-1)z\left(\frac{n\bar{R} - (n-1)\hat{B} - E}{n-1}\right)$ if c_d is positive.

procedures have no impact on welfare if $\hat{B} > B^*$. Under certain conditions, however, it might be possible to establish a hard budget constraint policy. Recall that in the symmetric equilibrium, equation (2.16a), which implicitly determines the borrowing constraint \hat{B} , becomes:

$$nz(\bar{R} - \hat{B}) - z(E) = (n - 1)z\left(\frac{n\bar{R} - (n - 1)\hat{B} - E}{n - 1}\right). \quad (2.17)$$

If policymakers aim to implement a hard budget constraint, they can choose the exemption level such that the critical threshold \hat{B} is identical to the first best amount of borrowing. Formally, this means setting \hat{B} equal to B^{FB} and solving equation (2.17) for the optimal exemption level, denoted by E^{opt} . If a solution exists and $0 \leq E^{opt} \leq \bar{R}$, there is an optimal exemption level for which bankruptcy procedures result in the first best level of regional debt and therefore eradicate the SBC phenomenon.¹⁵

For those parameters of the model for which the first best solution cannot be implemented since $\hat{B}|_{E=0} < B^{FB}$, the optimal policy consists in setting the exemption level equal to zero in order to maximise regions' access to credit. Alternatively, as $E = 0$ seems somewhat extreme since no regional assets are exempt from seizure, some minimum politically feasible exemption level should be chosen. When doing so, the federation's welfare can be increased compared to the overborrowing equilibrium. This might not be true, however, if the bankruptcy mechanism is ill-designed. If policymakers choose an exemption level which is too high in order to accommodate voters, for example, the federation can even be worse off than under a soft budget constraint policy.¹⁶ Bankruptcy procedures can also be welfare-lowering if policymakers are unable to commit to the optimal E for reasons such as political lobbying. Setting a very low exemption level appears unproblematic in the current deterministic set-up in which default does not actually occur in equilibrium. In a richer model with a stochastic element, however, bankruptcy would sometimes be triggered. In this case, a very low exemption level could generate a political backlash as it can be perceived as protecting creditors at the expense of citizens.

In conclusion, bankruptcy proceedings do not always improve welfare in comparison to the SBC equilibrium as their welfare effects depend on their

¹⁵ Example 1 in the Appendix illustrates such a case for a specific utility function.

¹⁶ Example 2 in the Appendix presents a case in which bankruptcy procedures with an inappropriate exemption level lower welfare compared to the overborrowing equilibrium.

concrete design, as captured by the exemption level. This result is in line with previous research which has highlighted the importance of the exemption level as a policy variable (Wissenschaftlicher Beirat, 2005).

2.9 Concluding remarks

With national and subnational debt spiralling out of control in the aftermath of the 2008 global financial crisis, proposals have been put forward for an orderly default mechanism in order to mitigate moral hazard and harden regional budget constraints. Drawing on the market discipline hypothesis, proponents of private sector involvement have argued that insolvency laws incentivise creditors to price public debt and default risk efficiently, thus restraining fiscally irresponsible sovereigns who have to pay higher risk premia on their loans. While this chapter supports the view that bankruptcy procedures can restrict overborrowing in a federation, it turns out that the interactions between central government, subnational governments and creditors are more complex than the market discipline hypothesis suggests. Moreover, the design of the insolvency mechanism, which is determined by the costs of default and the exemption level for public assets, is crucial in shaping fiscal policy.

If the exemption level for public assets is very high so that regions are too poor to repay their creditors, credit markets can indeed discipline regional borrowers. The regional budget constraint is hardened if the credit limit imposed by the market is binding. If, by contrast, the exemption level is sufficiently low, which means that creditors receive some repayments in case of default, it is the central government rather than the credit market that restricts regional borrowing. In this case, regions might refrain from overborrowing since they risk being taxed and pushed into default by the central government otherwise. The key to the central government's behaviour lies in the exemption level which effectively serves as an insurance mechanism. Intuitively, if a region borrows up to its credit limit, public good consumption is the same as in the default scenario. By letting this region default, taxing it and redistributing the proceeds, the central government can make the rest of the federation better off while leaving the utility of the citizen in the defaulting region, who is protected by the exemption level and can still consume essential public services, unchanged. Bankruptcy procedures can therefore serve as a commitment device for the central government as the latter is incentivised to tax rather than to bail out high-deficit regions. Interestingly,

this effect of bankruptcy proceedings on the central government's behaviour has not been identified in the literature so far.

The model also offers some important insights into the optimal design of bankruptcy procedures. The model's major policy implication is that bankruptcy proceedings can be welfare-lowering if they are not carefully designed. Comparing the bankruptcy regime with a low and a high exemption level, it turns out that the former is preferable as it enables policymakers to manipulate the exemption level in a desirable way. For a certain range of parameters, policymakers can set the exemption level such that the borrowing constraint coincides with the first best level of debt, thus eradicating the SBC phenomenon and leading to the socially optimal outcome. Well-designed bankruptcy laws thus result in hard budget constraints. For those parameters of the model for which it is impossible to implement the first best solution, the optimal policy prescription is to choose some minimum politically feasible exemption level. Setting a very low exemption level maximises the amount of credit available to regions, thus allowing subnational governments greater intertemporal flexibility. If policymakers choose an exemption level which is too high from a welfare perspective, by contrast, the federation can even be worse off than under a soft budget constraint policy.

The model's key findings have been derived under the assumption that while being unable to stick to a pre-announced transfer policy, the central government can commit to a legal insolvency procedure and its associated exemption level. The argument underlying this assumption is that a bankruptcy mechanism, which is enshrined in law, is not subject to the ad hoc political pressures which often characterise bailout decisions. This would certainly be true in the case where the bankruptcy procedures were formulated within a supranational legal framework and overseen by an independent international bankruptcy court. If the insolvency mechanism is implemented at national level, however, it might be more prone to commitment issues, unless amendments to the bankruptcy law required a supermajority. The assumption of full commitment to a bankruptcy regime seems therefore appropriate for federations with strong legal institutions. If the central government is unable to commit to bankruptcy laws, by contrast, the disciplining effects of insolvency procedures will disappear and the model will yield the standard soft budget constraint result.

A common concern raised by critics of sovereign bankruptcy procedures is that the default of a subnational entity has repercussions on other member states since the latter are likely to see their bond yields increase and/or their credit ratings

drop (White, 2002). In other words, default, even if it is orderly, might lead to financial contagion or so-called creditworthiness spillover effects. For example, opponents of the Greek debt restructuring deal have warned of negative effects on other heavily indebted periphery countries such as Portugal. Rather than serving as a commitment device, bankruptcy procedures might therefore provide the central government with an additional bailout motive, thereby softening the regional budget constraint further. While the model currently does not take this into account, it can be extended to incorporate the contagion argument by including negative spillover effects into the federation's welfare function. When doing so, the central government's taxing threat is weakened since the benefits of letting a region default and redistributing its revenues are now smaller due to the additional welfare costs. As default becomes more costly for the federation, the borrowing constraint \hat{B} is less restrictive. As a result, overborrowing is more likely to occur in this set-up than in the model without contagion.

It is important to note, however, that empirical evidence on financial contagion is mixed. Using Canadian provincial data, Landon and Smith (2000) find that an increase in the debt of regions other than Ontario negatively affects the creditworthiness of the other provinces but the size of this negative effect is relatively small. Kaminski et al. (2003) examine recent financial events such as devaluations and defaults and conclude that immediate financial contagion only occurs in some cases. They argue that for contagion to be triggered, three key elements have to be present, which they dub the 'unholy trinity'. Contagion episodes tend to be associated with a large influx of capital, a high degree of surprise and a leveraged common creditor. For example, Argentina's default in 2001 had only limited immediate consequences as it was widely anticipated due to a string of five credit downgrades in the preceding year. It could be argued that Greece found itself in a similar situation since a Greek default had been on the cards for almost two years and hardly came as a surprise to investors. As the relevance and the size of potential spillover effects are debatable, the model therefore provides a good starting point for analysing the incentive effects of bankruptcy procedures, especially if creditworthiness spillovers are expected to be relatively subdued.

2.A The soft budget constraint result (without default)

The CG solves the following maximisation problem:¹⁷

$$\begin{aligned} & \max_{T_{12}, \dots, T_{n2}} \sum_{i=1}^n U_i \\ & \text{s.t. (2.2), (2.3a), and (2.4).} \end{aligned}$$

The optimal transfer policy is determined by the following $(n - 1)$ first order conditions:

$$\frac{dz}{dG_{i2}} = \frac{dz}{dG_{j2}} \quad \forall i, j \quad \Rightarrow \quad G_{i2} = G_{j2} \quad \forall i, j.$$

In order to derive the CG's reaction function, the FOC, $G_{i2} - G_{j2} = 0$, is differentiated with respect to T_{i2} , $T_{j2} \forall j \neq i$ and B_i :

$$\begin{aligned} & \frac{\partial}{\partial T_{i2}} (G_{i2} - G_{j2}) dT_{i2} + \frac{\partial}{\partial T_{j2}} (G_{i2} - G_{j2}) dT_{j2} + \underbrace{\sum_{l \neq j \neq i} \frac{\partial}{\partial T_{l2}} (G_{i2} - G_{j2}) dT_{l2}}_{=0} \\ & + \frac{\partial}{\partial B_i} (G_{i2} - G_{j2}) dB_i = 0 \quad \forall j \neq i, \end{aligned}$$

which simplifies to

$$dT_{i2} - dT_{j2} - (1 + r)dB_i = 0 \quad \forall j \neq i.$$

Summing these $(n - 1)$ equations across $j \forall j \neq i$ gives:

$$\begin{aligned} & (n - 1)dT_{i2} - \sum_{j \neq i} dT_{j2} - (n - 1)(1 + r)dB_i = 0 \\ \Leftrightarrow & dT_{i2} = (1 + r)dB_i + \frac{1}{n - 1} \sum_{j \neq i} dT_{j2}. \end{aligned}$$

Differentiation of the CG's budget constraint $\sum_{i=1}^n T_{i2} = 0$ yields:

$$\sum_{i=1}^n dT_{i2} = 0 \quad \Leftrightarrow \quad \sum_{j \neq i} dT_{j2} = -dT_{i2}.$$

¹⁷The proof follows Breuillé et al. (2007). Note that the model has been slightly modified.

The CG's reaction function is obtained by inserting this relation into the equation above:

$$\begin{aligned} dT_{i2} &= (1+r)dB_i - \frac{1}{n-1}dT_{i2} \\ \frac{dT_{i2}}{dB_i} &= \frac{n-1}{n}(1+r) = (1+r) - \frac{1}{n}(1+r). \end{aligned}$$

In the first stage of the game, the SNG maximises the utility of the household located in its region, anticipating the CG's reaction function:

$$\begin{aligned} &\max_{B_i} U_i \\ &\text{s.t. (2.2), (2.3a), (2.4), and } \frac{dT_{i2}}{dB_i}. \end{aligned}$$

The optimal level of B_i satisfies the following condition:

$$\begin{aligned} &\frac{\partial v}{\partial G_{i1}} + \frac{\partial z}{\partial G_{i2}} \left(\frac{dT_{i2}}{dB_i} - (1+r) \right) = 0 \\ \Leftrightarrow &\frac{\partial v}{\partial G_{i1}} + \frac{\partial z}{\partial G_{i2}} \left((1+r) - \frac{1}{n}(1+r) - (1+r) \right) = 0. \end{aligned}$$

The opportunity costs of borrowing are thus given by:

$$\frac{\frac{\partial v}{\partial G_{i1}}}{\frac{\partial z}{\partial G_{i2}}} = \frac{1}{n}(1+r).$$

2.B Proof of Lemma 2.2: The CG's reaction function

Recall that the reaction function T_{i2} is a function of (B_1, \dots, B_n) . All other variables are fixed. Recall that $r = 0$ and for simplicity assume that $c_d = 0$.

In a first step, it is established that the CG's best response consists in either bailing out or taxing region i . Suppose that federal transfers are such that neither region i nor region j defaults which implies that $B_i \leq R_i - E = \underline{B}_i$. Public consumption consequently amounts to $G_{i2} = R_i - B_i \geq E$ and likewise $G_{j2} \geq E$. If $G_{i2} \neq G_{j2}$, say $G_{i2} < G_{j2}$, the CG can increase $\sum_{i=1}^n U_i$ by transferring one pound from j to i which contradicts optimality. This means that the CG equalises public good consumption for any i, j which do not default so that $G_{i2} = G_{j2}$.

Next suppose that transfers are such that region i defaults but some other region j repays its debt. Then it must be that $T_{i2} = E - Y$ so that the CG reduces

overall regional revenues down to the exemption level E . If this lump sum tax imposed on region i is smaller than the maximum possible amount ($T_{i2} < E - Y$), then increasing the lump sum tax and transferring the proceeds to j must increase $\sum_{i=1}^n U_i$ since citizens in region i are not worse off but utility in regions $j \neq i$ is increased. If an SNG defaults, the CG hence taxes the maximum possible amount.

In a second step, it is shown that there is a critical threshold $\hat{B}_i(B_{-i})$ at which the CG is indifferent between taxing and bailing out region i . Assume that the other regions $j \neq i$ each borrow an arbitrary amount B_j .

- i. Holding every other region's B_j fixed, suppose that transfers are such that region i defaults (i.e. $T_{i2} = E - Y$) at B'_i . Then consider $B''_i > B'_i$. Suppose that it is optimal not to let region i default in this case. The utility $\sum_{i=1}^n U_i$ which can be reached by doing this must be lower than what could be achieved by not letting region i default with B'_i . Since region i 's creditors receive less with B'_i , more resources are available to everyone else so that each region has an additional amount of $\frac{B''_i - B'_i}{n}$ for public consumption. By contrast, the utility which can be reached by letting i default for B''_i is the same as with B'_i as welfare amounts to $u_i(E) + \sum_{j \neq i} u_j\left(\frac{n(\Gamma+Y) - E - \sum_{j \neq i} B_j}{n-1}\right)$ in both cases. Thus, given that it is optimal to let region i default with B'_i , it is impossible that it is optimal to not let i default with B''_i . This argument establishes a contradiction.
- ii. Now suppose that region i does not default at B'_i and consider $B'''_i < B'_i$. Suppose that it is optimal to let region i default in this case. As previously shown, the utility which can be achieved by letting region i default with B'_i is identical to the utility which is reached when letting region i default with B'''_i . The utility, however, which can be reached by letting i not default with B'''_i is higher than what can be achieved by not letting region i default with B'_i . Since there are relatively more resources available with B'''_i , public good consumption is increased by $\frac{B'_i - B'''_i}{n}$. Thus, as it is optimal to not let region i default with B'_i , it is impossible that it is optimal to let i default with B'''_i . This argument establishes a contradiction.

Finally, assume that all other regions do not default and borrow B . If region i borrows less than the other regions ($B_i < B$), the CG has no incentive to tax region i and the transfer rule by Breuillé et al. (2006) applies. If region i borrows

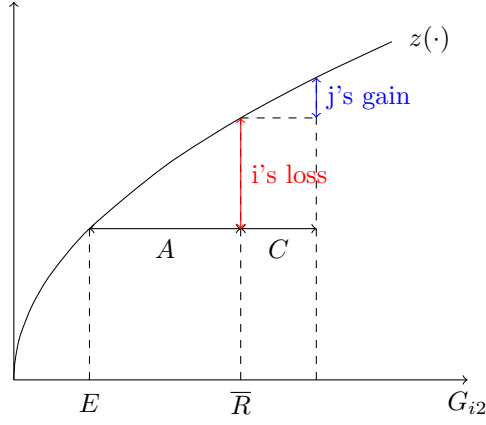


Figure 2.5: A Small Level of Borrowing ($B = \varepsilon$)

more than the other SNGs, it will be taxed by the CG at some point. In this case, $\hat{B}_i(B, \dots, B)$ is greater than or equal to B .

2.C Proof of Lemma 2.3: The CG's reaction function in the symmetric case

Suppose that all SNGs borrow the same amount. In order to show that the critical threshold $\hat{B}(B, \dots, B)$ in the symmetric case must lie between zero and the credit limit $\underline{B} = \bar{R} - E$, suppose first that each region borrows the same very small amount ε . This situation is depicted in Figure 2.5. If the CG taxed region i down to the exemption level E , region i 's utility would fall from $z(\bar{R} - \varepsilon)$ to $z(E)$, as shown in Figure 2.5. The proceeds A are redistributed to the other $(n - 1)$ regions so that each of them receives an additional transfer of $C \equiv \frac{\bar{R} - E}{n - 1}$. Regions $j \neq i$ consequently end up with a public good consumption of $G_{j2} = \bar{R} + \frac{\bar{R} - E}{n - 1} - \varepsilon$ instead of $\bar{R} - \varepsilon$ and the utility gain of such an SNG is illustrated in Figure 2.5. Note that the gain in total resources available to the CG is just ε , i.e. the amount that region i defaults on. Due to the concavity of the utility function, there is a discrete drop in $\sum_{i=1}^n U_i$ at $\varepsilon \approx 0$ as the gain in total resources ε is insufficient to compensate for the resulting inequality of public good provision. Thus, provided ε is small enough, there is a drop in $\sum_{i=1}^n U_i$ so that the CG prefers to keep all SNGs equal instead of taxing them, and the first line of (2.14) applies. It follows that $\hat{B}(\varepsilon, \dots, \varepsilon) > \varepsilon$.

Suppose now that each region borrows up to the credit limit $\underline{B} = \bar{R} - E$, meaning that regions are indifferent between defaulting and not defaulting. If

the CG taxed region i down to the exemption level E , the latter would not be worse off due to the indifference property. The additional resources can be transferred to the other $(n - 1)$ regions, thus increasing $\sum_{i=1}^n U_i$. In this case, taxation of some SNGs must be desirable. A similar argument can be established for any B which is sufficiently close to the credit limit \underline{B} since the discrete drop in U_i is limited while the CG's total resources increase by the amount of borrowing that region i defaults on.

By continuity, there must be an intermediate value of borrowing strictly between zero and $\underline{B} = \bar{R} - E$ for which the CG is indifferent between taxing and bailing out regions. This value is defined as $\hat{B}(B, \dots, B)$.

2.D Proof of Lemma 2.5

Claim (b) is true since an SNG has no incentive to deviate, holding the strategies of the other regions constant. If region i borrows more than \hat{B}_i , it will be taxed and ends up with public consumption of $G_{i2} = E$ which is worse, thus making an upwards deviation unprofitable. A downwards deviation by region i could be profitable if it triggered the taxation of some other region. It turns out, however, that a downwards deviation by i weakens the CG's incentive to tax regions $j \neq i$. Region i would consequently have no incentive to undercut other regions' borrowing in order to get hold of their revenues.

In order to show that this is true, a heuristic approach is used. Assume that $n = 2$ and both regions initially borrow the same amount B and consume G_2 , as shown in the left panel of Figure 2.6. If the CG taxes region j and redistributes the proceeds to region i , consumption in region j will fall to E while consumption in region i will increase to G_{i2} . The fall in utility in region j exceeds the utility gain in region i ($\Delta z_j > \Delta z_i$) so that the CG has no incentive to tax any of the regions if both borrow the same amount B .

Now consider a downwards deviation and assume that region i reduces its debt by Δ . This situation is depicted in the right panel of Figure 2.6. If the CG refrains from taxing anyone, the reduction in the federation's total debt benefits all regions, with public consumption for each region rising by $\frac{\Delta}{2}$ to G'_2 . If the CG taxes region j and reallocates its revenues, by contrast, region j will consume E whereas region i 's consumption will be given by G'_{i2} . Since region i no longer has to share the benefit of lowering its debt with region j if the latter is taxed, consumption in region i increases by Δ . In order to assess whether the CG

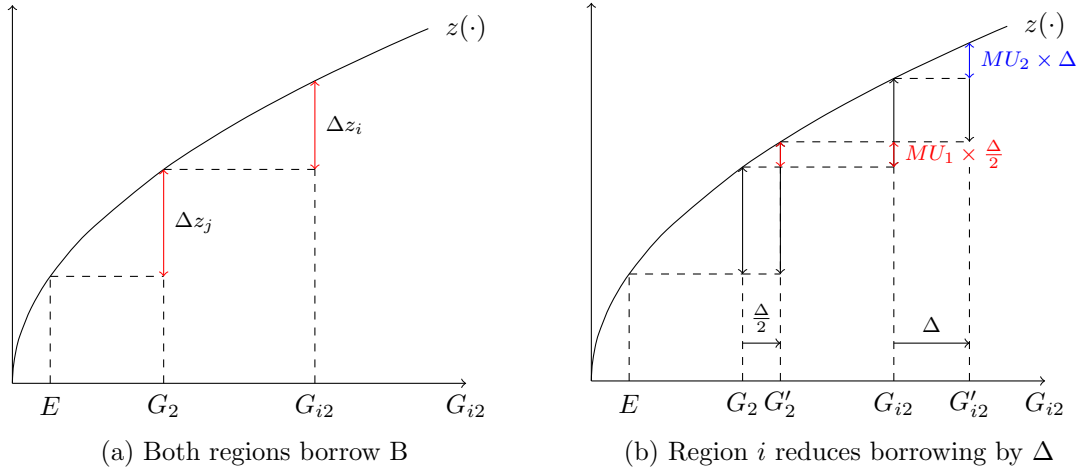


Figure 2.6: A Downwards Deviation by Region i

is more or less likely to tax than in the initial scenario, solely the changes in region i 's utility gain and region j 's utility loss need to be compared. As shown in the right panel of Figure 2.6, the change in region i 's utility gain is given by $X = MU_2 \times \Delta - MU_1 \times \frac{\Delta}{2}$, where MU_1 and MU_2 denote the marginal utilities evaluated at G_2 and G_{i2} respectively. Region j 's utility loss increases by $Z = MU_1 \times \frac{\Delta}{2}$. The CG is less likely to tax region j if $X - Z < 0$. This condition always holds since

$$MU_2 \times \Delta - MU_1 \times \frac{\Delta}{2} - MU_1 \times \frac{\Delta}{2} = (MU_2 - MU_1) \times \Delta,$$

which is smaller than 0 as $MU_2 < MU_1$, due to diminishing marginal utilities. This argument can easily be generalised for n regions.

It follows that if region i borrows less, the CG taxes neither region i nor regions $j \neq i$ but instead equalises marginal utilities and the reaction function is given by the first line in equation (2.14). Since in this case G^* , as given in definition 2.1, is optimal, going above $\hat{G}_{i2} = \bar{R} - \hat{B}$ is even further away from G^* and therefore not a profitable deviation. By the same argument, any $B < B^{**}$ cannot be an equilibrium.

2.E Optimal design of bankruptcy procedures

Assume that the utility function takes the form $z(G_{i2}) = \sqrt{G_{i2}}$. Equation (2.17) becomes:

$$n\sqrt{\bar{R} - B} - \sqrt{E} = (n - 1)\sqrt{\frac{n\bar{R} - (n - 1)B - E}{n - 1}}. \quad (2.18)$$

Solving for E leads to:

$$E_{1,2} = \frac{-Bn + n^2\bar{R} \pm 2\sqrt{B^2n^3 - B^2n^4 - Bn^3\bar{R} + Bn^4\bar{R}}}{n^2}.$$

Example 1: Assume that $v(G_{i1}) = \sqrt{G_{i1}}$ so that citizens would like to consume equal amounts of G_{i1} and G_{i2} in the first best equilibrium. Moreover, assume that $n = 5$, $T_1 = 10$ and $\bar{R} = 40$ which implies that $B^{FB} = 15$. Plugging these values into the equation above, the optimal exemption level E amounts to:

$$E_1 = 37 - 20\sqrt{3} = 2.36 \quad \text{and} \quad E_2 = 37 + 20\sqrt{3} = 71.74.$$

E_2 is not a solution since it is larger than the regional revenues \bar{R} . Recall that in the bankruptcy regime with a high exemption level ($\bar{R} < E$), solely the market can restrict regional borrowing and the borrowing constraint depends on the cost of default c_d . If policymakers choose E_1 as exemption level, by contrast, the regional budget constraint is hard and regional borrowing amounts to the first best level $B^{FB} = 15 = \hat{B}$.

Example 2: Assume that $v(G_{i1}) = 2\sqrt{G_{i1}}$ which implies that citizens put a relatively higher value on public consumption in period 1. Moreover, assume that $n = 2$, $T_1 = 10$ and $\bar{R} = 40$ which implies that $B^{FB} = 30$. Plugging these values into (2.18), the equation simplifies to:

$$2\sqrt{10} - \sqrt{E} = \sqrt{50 - E}.$$

This equation has no real solution so that $E = \{ \}$. In this case, it is impossible to implement the first best level of borrowing by choosing an adequate exemption level.

Even if the exemption level is set to its lowest possible value, SNGs are not able to borrow up to the first best amount. For $E = 0$ and the values given above,

equation (2.18) becomes:

$$2\sqrt{40 - B} = \sqrt{80 - B}.$$

Solving for B , the critical level of debt amounts to $\hat{B} = 26.67$ which is smaller than B^{FB} . In order to examine whether bankruptcy procedures are still welfare-improving in this case, the federation's welfare is compared for the first best equilibrium, the overborrowing equilibrium and the bankruptcy law equilibrium. The welfare function is given by:

$$W = 2\left(v(G_{i1}) + z(G_{i2})\right) = 2\left(2\sqrt{G_{i1}} + \sqrt{G_{i2}}\right).$$

In the first best equilibrium, the opportunity costs of borrowing are given by equation (2.5). Using the specific functions, (2.5) becomes $G_{i1} = 4G_{i2}$ so that $G_{i1}^{FB} = 40$ and $G_{i2}^{FB} = 10$. Welfare amounts to $W^{FB} = 31.62$. In the overborrowing equilibrium, opportunity costs amount to $\frac{1}{2}$ and equation (2.7) is given by $G_{i1} = 16G_{i2}$ so that $G_{i1}^{OE} = 47.06$ and $G_{i2}^{OE} = 2.94$. Welfare is lower than in the first best equilibrium and amounts to $W^{OE} = 30.87$. Finally, consider the bankruptcy law equilibrium. For $\hat{B}|_{E=0} = 26.67$, public good consumption is given by $\hat{G}_{i1} = 36.67$ and $\hat{G}_{i2} = 13.33$, leading to a welfare of $W|_{E=0} = 31.53$. While the first best cannot be implemented, bankruptcy procedures with $E = 0$ enhance welfare compared to the SBC equilibrium. Note that this is not necessarily true for higher exemption levels. For $\hat{B}|_{E=10} = 10.39$, for example, welfare is given by $W|_{E=10} = 28.95$. Since welfare is even lower than in the overborrowing equilibrium, the federation is worse off under bankruptcy procedures.

3 A Greek tragedy with a happy ending? Orderly debt restructuring in the EU

*Scheitert der Euro, dann scheitert nicht nur das Geld. Dann scheitert mehr. Dann scheitert Europa, dann scheitert die Idee der europäischen Einigung.*¹
(Angela Merkel, 13.5.2010)

3.1 Introduction

The sovereign debt crisis in the Eurozone, which has so far culminated in the bailouts of Greece, Ireland and Portugal and the creation of a temporary €750bn rescue fund, has revealed that the monetary and fiscal policy framework of the European Monetary Union (EMU) is insufficient for disciplining profligate governments. During the height of market turmoil, European policymakers reacted to the crisis in an ad hoc way by circumventing the so-called no-bailout clause² and by setting up the European Financial Stability Facility (EFSF). Negating the EU's no-bailout policy, the rescue package has exacerbated moral hazard by providing an implicit insurance to both creditors and debtors at the expense of the European taxpayer. As a result, bondholders are encouraged to take on too much risk and countries lack incentives to tackle their problematic finances. In order to mitigate the commitment problem inherent in the current framework and to ensure orderly crisis management in the future, Eurozone leaders have recently signed the treaty establishing a permanent crisis mechanism, dubbed the European Stability Mechanism (ESM). Among other things, the ESM envisages the possibility of orderly debt restructuring, or, more precisely, "a case by case participation of private sector creditors" (Eurogroup, 28.11.2010).

The proposal has sparked debate amongst economists and policymakers as to whether the ESM and in particular private sector involvement will resolve the

¹ If the Euro fails, [...] so will Europe, so will the idea of European integration (my translation). Speech at the *Charlemagne Prize* ceremony in Aachen.

² Article 125 of the TFEU: "The Union shall not be liable for or assume the commitments of central governments, regional, local or other public authorities, other bodies governed by public law, or public undertakings of any Member State, without prejudice to mutual financial guarantees for the joint execution of a specific project."

debt crisis. Those in favour of an orderly debt restructuring mechanism, such as Otmar Issing, argue that “default must be a credible threat” (Issing, 2010) so that bondholders take into account default risks. As a result, markets will restrict overborrowing since creditors demand higher risk premia for heavily indebted countries. Opponents, however, are less optimistic and claim that insolvency procedures simply encourage default. The former ECB president Jean-Claude Trichet has predicted that the mechanism will drive up the borrowing costs of debt-laden nations, thereby making them insolvent. Finally, De Grauwe (2010b) asserts that the “sovereign debt default mechanism will destabilise the eurozone and ensure its demise.”

This chapter contributes to the policy discussion by providing a formal model which sheds light on the incentive effects of the orderly debt restructuring mechanism which is bound to be implemented in the EMU. Employing a global game approach, the model analyses the impact of insolvency procedures on the size of the bailout, the level of effort exerted by the debtor country and EU welfare. The benchmark case extends Morris and Shin (2006), who examine the moral hazard implications of IMF bailouts, in order to model the EU-specific setting. Consequently, their assumption that the IMF only provides financial assistance to solvent countries is dropped. Instead, it is assumed that the EU has to reconcile the interests of all member states and thus maximises the welfare of the federation. In this set-up, it is possible for insolvent countries to receive financial assistance if this benefits the EU as a whole. Moreover, during the height of the crisis, policymakers justified the bailouts by creating the impression that the stability of the entire Eurozone was at stake. This argument is taken into account by assuming that averting default entails an additional benefit which can be thought of as macroeconomic stability. Finally, the model by Morris and Shin (2006), which is primarily concerned with the effect of bailouts on the country’s adjustment effort in the absence of any conditionality or private sector involvement (‘bail-in’), is adapted to study the impact of an orderly default mechanism. Insolvency procedures are incorporated into the benchmark by assuming that both debtors and creditors are better off in the case of default since orderly debt restructuring lowers the costs of default on both sides (Gianviti et al., 2010). While creditors suffer haircuts, they can also retrieve a fixed fraction of their investment even if the country defaults; at the same time, debtor countries receive debt relief in the case of default.

Interestingly, the results challenge some claims made in the policy literature.

Firstly, contrary to the widespread view as stated by Sinn and Carstensen (2010), for example, orderly debt restructuring does not necessarily discourage debtor moral hazard since the model shows that countries exert more or less adjustment effort, depending on the economic fundamentals. Secondly, insolvency laws do not always encourage default as some commentators have suggested (Münchau, 2010) and if they do so, there are no detrimental effects. Focusing on the particular range of extremely weak fundamentals for which default is encouraged in comparison to the benchmark, it turns out that EU welfare in fact increases under the sovereign debt restructuring mechanism even though the country defaults. Intuitively, encouraging default for very weak fundamentals, which means that the country is potentially insolvent, may prevent the debtor from exerting ultimately wasteful effort and the EU from providing an expensive bailout. The sovereign debt restructuring mechanism thus corrects the outcome of the benchmark where the EU might support insolvent member states and too few countries default as a result. Thirdly, although being described as a panacea by some authors such as Gianviti et al. (2010), insolvency procedures are not always welfare-improving for all ranges of fundamentals. Depending on the model's parameters, EU welfare can be lower in the insolvency law regime if the country's economy is characterised by weak or intermediate fundamentals. Finally, the claim made by policymakers that orderly default relieves the European taxpayer by restricting the size of the bailout holds for all but one range of economic fundamentals.

The results do not imply, however, that the EU's approach to include private creditors in future bailouts should be rejected. The model suggests, rather, that insolvency procedures need to be carefully designed to bring about the positive effects ascribed to them. The choice of the parameters which determine the mechanism is thus crucial to the success of insolvency laws. The model's major policy implication is that a half-hearted orderly debt restructuring mechanism fails to alleviate the commitment and moral hazard problems inherent in the current EMU framework. Only a 'strong' mechanism which lowers the costs of default significantly for both creditors and debtors, meaning that haircuts are relatively subdued and the amount of debt forgiven is sufficiently large, simultaneously mitigates the EU's commitment problem, discourages moral hazard and enhances EU welfare. From a political economy perspective, an insolvency law regime which provides for a relatively small amount of debt relief might also appear sensible. Depending on the model's parameters, insolvency

procedures are welfare-improving in this case but the effort exerted by the country is lower. Still, policymakers might endorse this design as the public in the respective debtor country is more likely to support austerity measures if the latter are less painful.

The model builds upon the literature on global games³ which treats creditors' roll-over decisions as a collective action problem. In these models, rational behaviour does not only depend on creditors' beliefs about the country's economic fundamentals but also on their higher-order beliefs, i.e. the creditors' beliefs about other creditors' beliefs, creditors' beliefs about other creditors' beliefs about other creditors' beliefs, and so on (Morris and Shin, 2003). As a result, bondholders might decline to roll over their claims, fearing premature foreclosure by other creditors, although the debtor country is in fact solvent. In the model, default is consequently triggered by co-ordination failure or a liquidity crunch. Moreover, from a game theoretic perspective, global games offer certain advantages since they remedy the multiplicity of equilibria which characterises the traditional bank run literature. In Diamond and Dybvig (1983), for example, two equilibria exist: a 'good' one in which confidence is maintained and risk is shared optimally and a 'bad one' in which all agents panic and rush to the bank to withdraw their deposits. By assuming that payoffs are not common knowledge but observed with a small amount of noise, global games reduce or eliminate multiple equilibria so that policy recommendations become possible. Global games have therefore been used in applied work on creditor co-ordination failures, speculative attacks or financial crises.⁴ By adding noise to the Diamond and Dybvig framework, for example, Goldstein and Pauzner (2005) show that the model has a unique equilibrium, in which a run occurs if the economic fundamentals are below some critical threshold, and compute the probability of panic-based bank runs.

The global game methodology offers an alternative to the common view that sovereign debt crises are self-fulfilling, caused by an unexplained shift in creditors' beliefs which is unrelated to economic fundamentals. Global games relax the assumption that fundamentals are common knowledge, thus preventing creditors' actions and beliefs to be perfectly co-ordinated in a way that generates

³ In their seminal paper, Carlsson and van Damme (1993) define a global game as "an incomplete information game where the actual payoff structure is determined by a random draw from a given class of games and where each player makes a noisy observation of the selected game".

⁴ This chapter is closest in spirit to the framework first developed by Morris and Shin (2004), which was taken up by Carlson and Hale (2005) and Dreisbach and Kindermann (2009), for example. Morris and Shin (2003) and Heinemann (2005) provide an overview of both the global game methodology and applications.

multiple equilibria (Morris and Shin, 2001). For a unique equilibrium to exist, however, private signals must be sufficiently accurate as compared to public signals, and public information tends to be destabilising. This feature of the model has attracted most criticism since market prices are thought to serve as a co-ordination device and represent strong public signals, thus undermining the logic of the global game approach (Atkeson in Morris and Shin, 2001). This is why some authors favour a multiple equilibria explanation of the Eurozone crisis. De Grauwe and Ji (2012) argue that monetary unions are more vulnerable to self-fulfilling crises as they cannot revert to the money printing press like stand-alone countries. In order to test their theory, they attempt to identify periods during which movements in bond spreads are unrelated to their underlying fundamentals. Their evidence is mixed, however, showing that bond spreads in Spain were mostly driven by market sentiments whereas the surge in Greek yields is mainly due to deteriorating fundamentals.⁵ While their interpretation might prove to be correct, there are also good reasons for applying a global game approach. With ‘prices’ or bond yields being identical for all Eurozone member states prior to 2008 and interest rates becoming increasingly volatile during the course of the crisis, it can be argued that prices have not accurately revealed the Eurozone’s true state and that “mispricing of risks” (De Grauwe and Ji, 2012) has been widespread in Eurozone bond markets. If prices fail to provide consistent signals, global games might offer a better way to model the Eurozone crisis since they, unlike other models, reconcile fundamental and panic-driven views.

The chapter is closely related to the global game literature on the lender of last resort (LOLR). Both Morris and Shin (2006) and Corsetti et al. (2006) assume that the IMF seeks to lend to illiquid, but solvent, countries. Despite using different modelling strategies, i.e. Morris and Shin (2006) have players move sequentially, while Corsetti et al. (2006) model a simultaneous game with the IMF as a large player, both papers find that IMF bailouts do not always induce moral hazard. Similarly, Rochet and Vives (2004), who focus on the role of a domestic LOLR in solving banking crises, assume that assistance is provided to solvent banks facing a liquidity crunch. They show that LOLR policy in addition to liquidity and solvency regulation can alleviate the creditor co-ordination problem. Applying their model to an international context, they

⁵ It would be interesting to see whether their results on Portugal and Ireland, where half of the variation in spreads is due to market sentiments and half due to fundamentals, still hold when including more recent data which points towards a recovery of these spreads.

argue in favour of a sovereign debt restructuring mechanism which complements international financial aid and which helps insolvent countries which are not too far away from the solvency threshold. This model departs from these approaches by dropping the key assumption that the lender of last resort can credibly commit to bail out solvent countries in order to better fit the European setting. Since the EU might support countries which are potentially insolvent, a commitment problem is added to the Morris and Shin framework. As a result, bailouts occur more often and the moral hazard problem is more severe since the range of fundamentals for which the EU intervenes increases in comparison to their model. Countries are consequently less likely to default compared to their set-up.

Several proposals regarding the design of the European sovereign debt restructuring mechanism have been put forward. Gros and Mayer (2010) suggest creating a European Monetary Fund which can organise an orderly default as a measure of last resort. Gianviti et al. (2010) propose the creation of a European Crisis Resolution Mechanism (ECRM) which makes the provision of financial aid conditional on a restructuring agreement between creditors and debtors. Similarly, Sinn and Carstensen (2010) argue that haircuts must precede any financial assistance by the EU to ensure bond spreads are maintained and serve as a disciplining device. The European Economic Advisory Group (EEAG) recommends a three-stage procedure based on different degrees of financial distress, namely illiquidity, pending insolvency and actual insolvency. While liquidity problems are remedied by providing short-term financial aid without private sector involvement, pending insolvency envisages haircuts to the amount of 20 to 50 per cent of the bond's nominal value as well as issuance of replacement bonds which are partly guaranteed by the ESM. In the case of actual insolvency, the country has to declare a debt moratorium for its total outstanding debt (EEAG, 2011). While the chapter follows this growing literature to some extent by assuming that bailouts presuppose an orderly debt restructuring mechanism, the modelling approach is quite general and thus robust to different specifications of the mechanism. The disciplining effect of bond spreads is not considered in the model, however, since the initial debt situation is taken as given, in common with Morris and Shin (2006) and the related global game literature. For the same reason, creditor moral hazard is not an issue in the model. The chapter also draws on previous debates on sovereign insolvency procedures.⁶

⁶ See for example Krueger (2002), White (2002), Roubini (2002), Thomas (2004) and Rogoff and Zettelmeyer (2002).

The remainder of the chapter is organised as follows. Section 3.2 provides a brief overview of the Eurozone debt crisis and orderly debt restructuring. Section 3.3 presents the model set-up and the results for the benchmark scenario. Section 3.4 modifies the benchmark model to incorporate the proposed debt restructuring mechanism. In section 3.5, the results of the benchmark are compared to the insolvency law regime. The resulting policy implications and concluding remarks are presented in sections 3.6 and 3.7.

3.2 Background

3.2.1 The Eurozone debt crisis

In the aftermath of the global financial crisis of 2007/2008, sovereign debt has taken centre stage in the Eurozone, especially in the bloc's periphery. This evolution is not surprising since, historically, financial crises have often been succeeded by a higher occurrence of sovereign default (Reinhart and Rogoff, 2009). As shown in Figure 3.1, some countries such as Italy and Greece have exhibited public debt levels of more than 90 per cent of GDP even before the financial crisis hit, despite the provisions in the Stability and Growth Pact which restrict the debt-to-GDP ratio to 60 per cent. By contrast, formerly fiscally sound countries such as Ireland or Spain have experienced a deterioration of their public finances as a result of the financial crisis.

Concerns about the sustainability of public finances in the Eurozone's periphery have been reflected in the widening of bond yields since mid-2008, as illustrated in Figure 3.2. European governments initially benefitted from the introduction of the single currency since exchange rate risks were eliminated and countries subsequently paid similar interest rates, albeit differing in their fundamentals (Sinn, 2010; Buiter and Rahbari, 2010). Some authors have suggested that this initial convergence of Eurozone bond yields might have been driven by creditors believing in an implicit bailout guarantee, despite the existence of the no-bailout clause. Rejecting this argument, Buiter and Sibert (2005) claim that interest rates did not adequately reflect default risks as a result of the operational practices of the European Central Bank. By treating all sovereign debt instruments issued by member states equally in its collateralised open market operations, the ECB signalled that all Eurozone debt was equivalent, thus potentially suppressing interest rate differentials. Since the use of low-quality sovereign debt as collateral

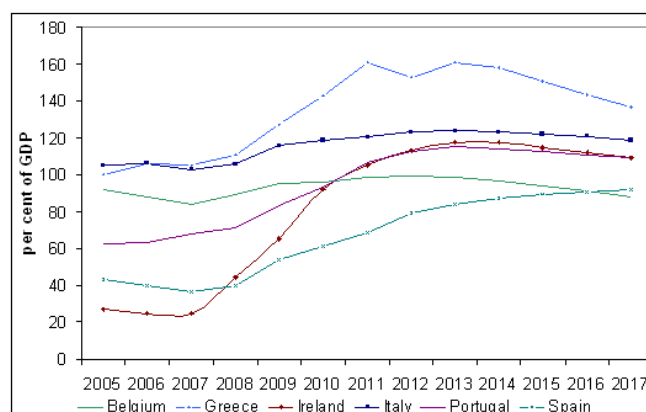


Figure 3.1: General Government Gross Debt (Source: IMF, WEO)

was effectively subsidised thereby boosting demand for this type of debt and driving down bond yields, the ECB's rules on collateral might have created an implicit transfer mechanism which has resulted in moral hazard.

With pressures on public finances increasing due to bank bailouts and fiscal stimulus packages, bondholders, however, started to fear the potential default of governments in the Eurozone's periphery, thus demanding higher risk premia. As a result, the three bailout candidates, Greece, Ireland and Portugal, suffered a steep rise in bond yields between 2010 and mid-2011. While the creation of the bailout fund in May 2010 provided short relief for the fiscally distressed countries by lowering interest rates significantly, bond yields started to rise again soon after, even reaching higher levels than in May 2010. Remarkably, the increase in Greek, Irish and Portuguese interest rates in October 2010 coincided with the EU's announcement that private bondholders would have to shoulder losses in the future. Starting from mid-2011, Irish bond yields have decoupled from those of the other bailout recipients, however, reflecting the country's progress in implementing austerity measures. By comparison, Greek interest rates spiked to 40 per cent in early 2012 but are now trading just above 20 per cent following Greece's debt restructuring in March 2012. Attention has recently turned to Spain and Italy whose bond spreads over German bunds have widened since summer 2011, causing concerns that these countries might be next in line for a bailout.

While the fiscal troubles experienced in Greece, Ireland and Portugal are rooted in the financial crisis, the economic problems are largely country-specific. The Greek economy has long been suffering from a competitiveness problem which has aggravated its budgetary problems arising from high age-related spending, poor tax administration and a large public sector (Buiter and Rahbari, 2010). Its fiscal

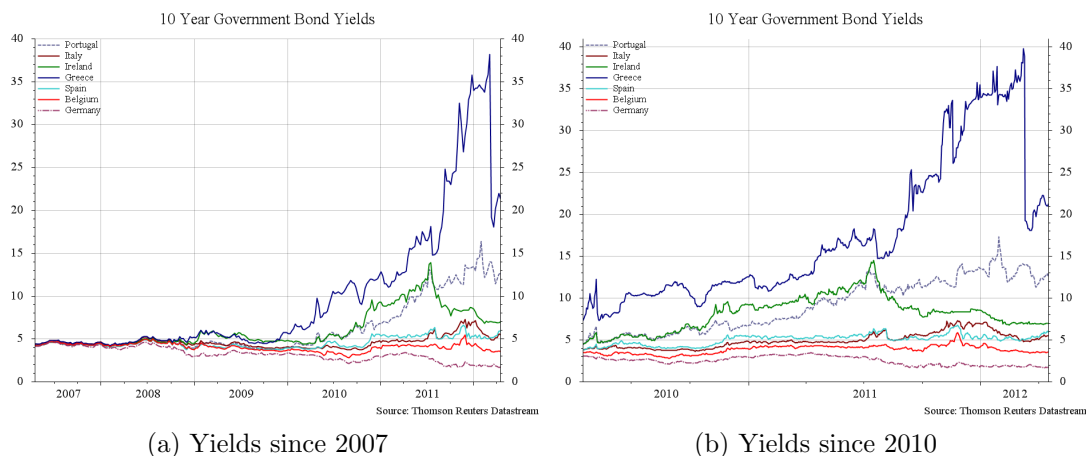


Figure 3.2: 10 Year Government Bond Yields (Source: Thomson Reuters)

position turned out to be more severe than previously thought when, following the general election in October 2009, the general government deficit was revised upwards from initially 6 to 12.5 per cent of GDP (Buiter et al., 2011).⁷ Unable to refinance itself on the capital markets, Greece received a bailout of €110bn on 9 May 2010, with €80bn provided by the EU and €30bn by the IMF. Being caught in a downward spiral of lower growth and higher debt, and struggling to implement the conditions imposed by its lenders, Greece had to seek further assistance from the EU in 2011. This time, however, European leaders made private sector participation a prerequisite for extending financial aid. Following the agreement between Greece and its creditors on the debt exchange, Greece was officially granted a second bailout amounting to €172.7bn on 21 February 2012 (European Commission, 2012; Eurogroup, 21.2.2012).

By contrast, the former ‘Celtic tiger’ has been under financial strain because of the support extended by the Irish government to its ailing banking sector, both through guarantees of bank debt and large bank bailouts. Ireland was the first country to tap the bailout fund and was granted €85bn on 28 November 2010. While largely avoiding the real estate boom and the turbulences in the banking sector, Portugal’s economy has been facing structural problems such as labour market rigidities and low levels of human capital, leading to a sharp loss of competitiveness and persistently sluggish growth.⁸ Following a political crisis which was triggered by the government’s failure to pass further austerity

⁷ The most recent revision published by Eurostat estimates a figure of 15.8 per cent.

⁸ Portugal’s high-school dropout rate is amongst the highest in the OECD (Forelle, 2011).

	Ireland	Portugal	Greece
Total	85	78	172.7
Composition of package			
EFSF	17.7	26	144.7
EFSM	22.5	26	-
IMF	22.5	26	28
Bilateral	4.8	-	-
Own contribution	17.5	-	-

Table 3.1: EFSF-based Bailout Packages (in EUR billions)

measures and which resulted in the prime minister's resignation, Lisbon reached an agreement with the IMF and the EU on a €78bn bailout on 17 May 2011. Table 3.1 provides an overview of the rescue packages to date.⁹

3.2.2 Crisis management

In response to the market turmoil in early May 2010, EU countries agreed a comprehensive rescue package on 9/10 May which is based on Article 122(2) of the TFEU and consists of three parts: the European Financial Stability Facility (EFSF), the European Financial Stability Mechanism (EFSM) and financial assistance provided by the IMF (European Council, 9.5.2010). The EFSF is a special-purpose vehicle which was created as a limited liability company under Luxembourg law. The facility has been intended as a temporary solution and is thus able to set up new programmes until 30 June 2013 (EFSF Framework Agreement). Initially, the EFSF was only meant to issue bonds, notes or other debt instruments on the market backed by intergovernmental guarantees of €440bn provided by Euro Area member states. Its scope of activity was significantly expanded in March and July 2011, however, allowing for intervention in primary and secondary bond markets, assistance on the basis of a precautionary programme and recapitalisation of financial institutions (European Council, 21.7.2011). In order to provide the bailout fund with an effective lending capacity of €440bn, the guarantee ceiling was later increased to €780bn (European Council, 11.3.2011, 24.6.2011). In November 2011, Eurozone leaders decided to boost the EFSF's firepower even further using leverage.

The creation of the bailout fund was complemented by the ECB's decision on

⁹ The table excludes the first Greek bailout, the *Greek Loan Facility*, which was not provided within the EFSF framework. Note that the figures for Greece's second bailout include €37bn remaining from the first package.

10 May 2010 to purchase government securities in the secondary market for the first time in its history. The ECB created the Securities Markets Programme (SMP) in order “to address the malfunctioning of securities markets and restore an appropriate monetary policy transmission mechanism” (ECB, 10.5.2010). As purchases under the SMP are sterilised, the monetary base remains unchanged so that no inflationary pressures arise. As of 13.4.2012, the ECB’s holdings of periphery sovereign debt amount to €214bn. Purchases under the SMP have fallen significantly in 2012, however, as the ECB now uses long-term refinancing operations (LTROs) instead in order to provide banks with cheap loans, thereby encouraging them to invest in high-yield peripheral bonds.

In order to prevent future sovereign debt crises, Eurozone leaders signed the *ESM Treaty* on 2 February 2012, thus establishing a permanent crisis resolution mechanism. To this end, the European Council decided to amend Article 136 of the TFEU in March 2011. The paragraph to be added reads as follows (European Council, 17.12.2010, 25.3.2011):

The Member States whose currency is the euro may establish a stability mechanism to be activated if indispensable to safeguard the stability of the euro area as a whole. The granting of any required financial assistance under the mechanism will be made subject to strict conditionality.

The ESM will take the form of an international financial institution and assume the tasks of the EFSF and the EFSM in 2012 (European Council, 9.12.2011). Its overall lending capacity of €500bn will require €80bn in paid-in capital and €620bn in callable capital and guarantees to ensure the highest credit rating. Being activated a year earlier than previously planned, the ESM will run parallel with the EFSF for 12 months. In March 2012, Eurozone finance ministers agreed to temporarily boost the combined EFSF/ESM lending capacity to €700bn (Eurogroup, 30.3.2012). The ESM will be linked to the Fiscal Compact since member states will be required to have ratified the latter in order to benefit from the mechanism as of March 2013. Loans provided by the ESM will be senior to those of private bondholders but junior to IMF credits.

The ESM is designed to relieve the European taxpayer by forcing private bondholders to shoulder some of the losses of future bailouts. From 1.1.2013, all new bonds issued within the Euro Area will therefore carry standardised and identical collective action clauses (CACs) which enable a qualified majority of bondholders to bind all bondholders of the same issuance to the terms of a restructuring agreement. The requirements regarding private sector involvement

(PSI) have been watered down, however, compared to the initial proposal dated October 2010 and the first draft text of the treaty. Policymakers have repeatedly stressed that the Greek case is unique and exceptional, potentially signalling that other member states would not be forced to restructure their debts. This is also reflected by the fact that the provision regarding PSI has been moved from an operative article in the first version of the treaty to a recital in the recently signed treaty (European Council, Factsheet, 2.2.2012). The passage now states that in “accordance with IMF practice, in exceptional cases an adequate and proportionate form of private sector involvement shall be considered”, which suggests less automaticity than originally envisioned.

3.2.3 Orderly debt restructuring: an overview

History has shown that sovereign defaults are not extraordinary events (Reinhart and Rogoff, 2009). Among the Eurozone members, for example, Austria, Greece, Germany, Portugal, Italy and Spain have defaulted at least once since 1824 (Sturzenegger and Zettelmeyer, 2007). In the model, the term ‘default’ refers to “every form of non-compliance with the original terms of the debt contract, including repudiation, standstill, moratorium, restructuring, rescheduling of interest or principal repayment” (Buiters and Rahbari, 2010). Remarkably, default becomes an even more pressing issue in the context of a monetary union since countries can no longer revert to inflation, leaving default as an attractive option to substantially reduce their burden of debt (Gianviti et al., 2010). While the Paris Club and the London Club negotiate debt restructuring agreements for official bilateral debt and syndicated bank loans respectively, there are currently no provisions for the case where debt is held by bondholders. Due to the ever increasing role of sovereign debt bond markets, the IMF tried to close this loophole almost a decade ago with its proposal of a sovereign debt restructuring mechanism.

The purpose of such a mechanism is to “facilitate the orderly, predictable, and rapid restructuring of unsustainable sovereign debt, while protecting assets values and creditors’ rights” (Krueger, 2002). Orderly and promptly debt restructuring lowers the costs of defaulting significantly, thus leaving “more on the table for creditors and debtors” (Gianviti et al., 2010). The mechanism attempts to solve two classic co-ordination problems which have been identified in the context of sovereign defaults, namely the creditor grab race and the holdout problem

(Gianviti et al., 2010; Thomas, 2004). Even before default occurs, a grab race might arise when creditors rush to the exit by selling off their bonds, thereby driving down bond prices and causing other creditors to follow suit. The holdout problem refers to a situation where, ex post, a minority of creditors refuses to accept the restructuring agreement, hoping to be bought out in full by the other bondholders. Moreover, as seen in the case of Argentina which defaulted in 2001, lengthy and disorderly debt restructuring can take a high toll on the country's economy. Insolvency procedures, by contrast, can minimise the costs of disruption to the economy (Thomas, 2004). From the creditors' perspective, orderly debt restructuring is also less harmful than a lengthy process since bondholders can at least retrieve some of their investment without costly litigation or delays. Finally, insolvency procedures stabilise expectations of financial market participants, thereby preventing costly speculation (Hüther, 2010; Sinn and Carstensen, 2010).

The sovereign debt literature distinguishes between the contractual approach which embodies procedures to deal with insolvency in debt contracts, and the statutory approach which spells out procedures in domestic or international law, thus binding the parties (Gianviti et al., 2010). Both approaches, however, suffer from shortcomings. While the contractual solution in the form of collective action clauses, for example, is seen to be more market-friendly and easier to implement than its counterpart, it only applies to individual bond classes. The statutory regime, by contrast, enables aggregation across all creditors' claims and prevents the transition problem which occurs when some bonds carry CACs and others do not (Roubini, 2002; Gianviti et al., 2010). Roubini (2010), however, points out that there might be an easier way to solve the underlying co-ordination problem in debt restructuring, namely using unilateral bond exchange offers which allow investors to swap their bonds for new ones with different payment features.

While the IMF proposal failed to gain support, the implementation of a European debt restructuring mechanism looks more promising since the EU already has a common legal framework which interferes with national sovereignty (Gianviti et al., 2010). By including CACs in bonds from 2013, the current proposal takes a less statutory and more contractual approach. Following the literature, the model assumes that orderly default reduces the costs of default for both sides. This assumption is very general so that it does not matter which mechanism will finally be adopted by the Eurozone.

3.3 The benchmark model

3.3.1 Model set-up: public debt, liquidity, solvency and default

Creditors' roll-over decisions are modelled as a collective action problem, using a global game framework. In the model, default is triggered by short-term creditors failing to co-ordinate and is thus precipitated by a liquidity crunch. As a result, a bondholder might decline to roll over her claim, fearing premature foreclosure by other creditors, although the debtor country is effectively solvent. The relationship between liquidity, solvency and default is discussed in the following.

Public debt: The debtor country issues both long-term and short-term sovereign debt. It has to pay interest L on its outstanding long-term loans. Moreover, the amount S of the country's short-term debt, which matures instantly, has to be refinanced. If short-term creditors decline to roll over their claims, the country must fund this gap and repay these maturing loans. As a result, the immediate funding requirement of the country is given by:

$$L + \ell S, \tag{3.1}$$

where ℓ denotes the proportion of short-term creditors who decline to roll over. It is assumed that the government debt S is held by a continuum of short-term creditors.

Liquidity: The country's liquid assets, denoted by θ , reflect its ability to service its debt, where θ is the realisation of a normally distributed random variable with mean y and precision α :

$$\theta \sim N\left(y \equiv \phi + e; \frac{1}{\alpha}\right).$$

The mean of the distribution is determined by the underlying strength of the economy as well as by the country's economic policies which aim at increasing its ability to repay its creditors. Whereas ϕ represents the soundness of the underlying economic fundamentals regardless of any measures taken by the country's government, e can be interpreted as political adjustment effort. The latter can take the form of austerity measures comparable to those which have been implemented by countries across Europe to tackle their problematic public finances. Austerity, however, is painful for the countries so that effort is costly.

Solvency: A country is considered to be solvent, or *fundamentally sound* in

the terminology of Morris and Shin (2006), if the available cash θ suffices to cover the interest payment L on outstanding long-term debt:

$$L \leq \theta. \tag{3.2}$$

Countries with high amounts of cash, i.e. $\theta > L + S$, are not in danger of defaulting. For intermediate levels of θ , namely $L < \theta < L + S$, the co-ordination problem of short-term creditors might trigger default. If all creditors roll over ($\ell = 0$), the country has to repay interest on long-term debt L only. For positive ℓ , by contrast, the country also has to fund maturing short-term debt S . If the amount of creditors who foreclose is sufficiently high, the country might not be able to fund the gap and consequently defaults. In the following, the debt payments L and S are normalised so that

$$L = 0 \quad \text{and} \quad L + S = 1.$$

ϕ , e and θ are normalised accordingly. Note that this implies that a country is considered to be solvent if $\theta \geq 0$.

Bailouts and default: If a supranational institution such as the European Union can credibly commit to its no-bailout policy, the debtor country defaults if θ is too small to repay the fraction ℓ of creditors who foreclose. If the EU bails out a member country in case of financial distress, by contrast, the latter defaults if its overall resources consisting of domestic funds θ and the bailout, denoted by m , do not suffice to meet the funding gap which arises as a result of short-term creditors refusing to roll over their claims. Consequently, using the normalisation above, the country defaults if, and only if

$$\theta + m < \ell. \tag{3.3}$$

In the model, default is thus linked to a potential liquidity crunch, with long-term creditors playing no active role. As solvency problems do not trigger default, attention is confined to the actions of the short-term creditors.

3.3.2 The players

3.3.2.1 The creditors

Creditors can choose between rolling over their claims or investing in a safe asset whose gross return is equal to 1. The payoff of a creditor who decides to roll over, however, is uncertain. If the country does not default on its debt, the creditor receives a return of $R > 1$. The difference $R - 1$ can therefore be interpreted as a risk premium. In case of default, creditors have to write off their debt completely and thus receive a payoff of zero. To summarise, the payoff to rolling over is given by:

$$w(\theta, m, \ell) \equiv \begin{cases} R & \text{if } \theta + m \geq \ell & \text{No default} \\ 0 & \text{if } \theta + m < \ell & \text{Default.} \end{cases} \quad (3.4)$$

Note that the a priori probability of default is $\text{Prob}(\theta + m < \ell)$ and that creditors consider rolling over their claims if $\text{Prob}(\theta + m > \ell)R \geq 1$.

In the global game framework of the model, creditors also observe private noisy signals about θ . Creditor i 's signal is given by:

$$x_i = \theta + \varepsilon_i, \quad \varepsilon_i \sim N\left(0; \frac{1}{\beta}\right), \quad (3.5)$$

where ε_i is a normally distributed random variable with mean 0 and precision β . For $i \neq j$, the noise terms ε_i and ε_j are independent.

3.3.2.2 The debtor country

The debtor country chooses e so as to maximise its payoff. The decision whether to implement austerity measures involves a trade-off. On the one hand, exerting effort to tackle the country's public finances might stave off default so that the country's output, given by Y_d , is positive. Defaulting, by contrast, entails an output loss and the country's output is normalised to zero in this case. In a sense, this output loss reflects the costs of defaulting. On the other hand, austerity measures are associated with painful economic adjustment and thus come with a cost, denoted by $c(e)$. The latter is an increasing convex function which means that the marginal costs are increasing in e . For simplicity, $c(e) = e^2$ will be assumed throughout the chapter. In the model, effort can be understood as a costly way of shifting resources to the government. Public sector spending cuts, for example, free up resources, thereby making it easier for the government to

service its debt. While austerity measures improve the country's ability to repay its creditors and might thus avert a debt crisis, exerting effort does not boost overall output in the no-default state.¹⁰ To sum up, the country's payoff is given by:

$$u_d(\theta, m, \ell) = \begin{cases} Y_d - c(e) & \text{No default} \\ -c(e) & \text{Default.} \end{cases} \quad (3.6)$$

3.3.2.3 The European Union (EU)

The modelling of the EU's payoff function differs from the approach taken in Morris and Shin (2006). In their framework, the IMF can credibly commit to providing assistance if the country is fundamentally sound, i.e. if $\theta \geq 0$. This policy is credible as the IMF is ultimately interested in being repaid in the long run. The EU, by contrast, is a federation and has to reconcile the interests of all member states. As a result, the assumption that the EU only intervenes at intermediate levels of θ is dropped. Instead, drawing on the literature of fiscal federalism, the EU maximises the welfare of the entire federation and thus takes into account both the welfare of the debtor country (u_d) and the welfare of the rest of the federation (Y_f). Throughout the crisis, policymakers have been concerned about the risk of contagion triggered by a country's default as European banks are still heavily exposed to peripheral debt. While the model does not explicitly distinguish between debt held by creditors abroad and within the EU, the idea that the default of a member state generates negative spillover effects on other countries is taken into account by assuming that averting a crisis benefits the federation. This benefit, denoted by u_s , enters the EU's payoff function and can be thought of as macroeconomic stability. In a sense, u_s thus reflects the extent to which the country's debt is held by EU nationals, banks or insurance companies. Since the EU budget is relatively small compared to the size of the union¹¹, the bailout has to be funded by the other member countries, i.e. the European taxpayers, in effect implementing a horizontal reallocation mechanism. As a result, the welfare of the rest of the federation (Y_f) is lowered by the amount of the bailout m .

Following Morris and Shin (2006), it is assumed that m is not recovered by

¹⁰Morris and Shin (2006) show that the qualitative results do not change if exerting effort improves the country's fundamentals and generates additional benefits irrespective of crisis prevention.

¹¹In 2012, the EU budget amounts to €147.2 billion or 1.12 per cent of the EU's GNI. See also Oates (2002) on the EU's budgetary powers.

the EU even in the case of no default which implies that m represents a cash payment from the EU to the debtor country rather than a loan or a guarantee. While the assumption that the cash transfer m is never recovered drives the results of the model, it can be justified on economic and modelling grounds. If the bailout was completely repaid and hence costless in the case of no default, i.e. $m = 0$ in the first line of (3.7), the EU would always bail out member states as EU welfare would always be higher in the no-default scenario. In such a set-up, bailouts would be potentially infinite and the bailout decision would be unrelated to the country's economic fundamentals. In reality, however, taxpayers are unlikely to support unlimited bailouts so that the size of the financial support is restricted. Assuming that bailouts generate a positive cost in the no-default case puts an upper bound on the size of the bailout.¹² There is also a purely economic argument for this assumption as loans to debtors under the EFSF/ESM have been repeatedly amended, either by extending maturities or by lowering interest rates, suggesting that bailouts are costly even if they are officially 'repaid'. Finally, as pointed out by Buiter and Sibert (2005), the ECB's treatment of collateral used in its open market operations represents an empirical example of a transfer to a non-defaulting debtor country.

If the debtor country does not default, EU welfare amounts to the sum of the benefit from preserving macroeconomic stability and the welfare of both the debtor country and the rest of the federation. In case of default, u_s is normalised to zero. The EU's welfare function is thus given by:

$$W(\theta, m, \ell) = \begin{cases} Y_d - c(e) + Y_f - m + u_s & \text{No default} \\ -c(e) + Y_f - m & \text{Default.} \end{cases} \quad (3.7)$$

In the following, the welfare of the federation in the case of no default and default are denoted by W^{ND} and W^D respectively.

3.3.3 Timing of the model

The sequence of moves and the information available at each point of the game can be summarised as follows:

¹²For simplicity, it is assumed here that the costs of the bailout are the same no matter whether the country defaults or not. The main results of the analysis would also go through if the costs differed under the default and no-default scenarios, e.g. if the cost in the no-default case were a fraction of the cost in the default scenario ($\frac{m}{n}$ compared to m).

1. Nature draws the fundamentals ϕ capturing the economic strength of the debtor country. The fundamentals are common knowledge among all players.¹³
2. Based on its knowledge of the fundamentals, the debtor country chooses its effort e . Once chosen, the expected ability of the country to service its debt, $y = \phi + e$, is common knowledge among all.
3. Based on the country's expected ability to service its debt, the EU chooses whether and to what extent to provide financial assistance to the debtor country. The size of the bailout m is common knowledge among all.
4. Nature draws θ from a normal density with mean y and precision α . None of the players observes the true realisation of θ .
5. In addition to the publicly known variables ϕ , e and m , each short-term creditor i receives a noisy signal x_i . Based on this information, each short-term creditor decides whether to roll over her claim or not.
6. Default occurs if, and only if, the country does not have sufficient funds to pay the proportion ℓ of short-term creditors who decline to roll over, i.e. if $\theta + m < \ell$.

3.3.4 Results

3.3.4.1 Roll-over decision and θ^*

The creditors' subgame, which begins with Nature's draw of θ , is solved employing the global game methodology developed by Morris and Shin (2006, 2004).

Switching strategies: A strategy is a function specifying an action, i.e. rolling over or not, for each possible private signal x_i . Attention is confined to equilibria in switching strategies, meaning that a short-term creditor rolls over her claim whenever her estimate of the country's liquid assets θ exceeds some given threshold level. Assuming that only creditor i observes her signal while β is common knowledge, the posterior distribution of θ is normal with mean ξ_i and precision $\alpha + \beta$:

$$\theta|x_i \sim N\left(\xi_i \equiv \frac{\alpha y + \beta x_i}{\alpha + \beta}; \frac{1}{\alpha + \beta}\right).$$

¹³Note that in the model with insolvency procedures presented in section 3.4, the orderly debt restructuring mechanism is chosen prior to stage 1.

Creditors who use switching strategies have a switching point ξ for their switching strategies and roll over their claim if, and only if, the private signal x exceeds the following threshold:

$$x(\xi, y) \equiv \frac{\alpha + \beta}{\beta} \xi - \frac{\alpha}{\beta} y. \quad (3.8)$$

Critical value θ^* :¹⁴ The equilibrium can be described by the critical threshold level θ^* above which the country avoids default since a sufficient number of creditors decide to roll over their claims. The country is on the brink of default when its overall resources just suffice to meet the funding gap, i.e. when $\theta + m = \ell$. The proportion of creditors who foreclose (ℓ) is tantamount to the mass of creditors who have observed a signal below the marginal signal x . As the creditors' signals are independent, ℓ equals the probability that a single player receives a signal below x so that $\ell = \Phi(\sqrt{\beta}(x - \theta^*))$, where $\Phi(\cdot)$ represents the cumulative distribution function for the standard normal. The first equation which determines θ^* is thus given by:

$$\begin{aligned} \theta^* + m &= \ell \\ \theta^* + m &= \Phi(\sqrt{\beta}(x - \theta^*)) \\ \theta^* + m &= \Phi\left(\frac{\alpha}{\sqrt{\beta}}(\xi - y) + \sqrt{\beta}(\xi - \theta^*)\right). \end{aligned} \quad (3.9)$$

The fact that a creditor is indifferent between investing in a safe asset and rolling over at the switching point ξ is used in order to derive the second equation that determines θ^* . The country does not default whenever $\theta \geq \theta^*$. Recall that the conditional density over θ is normal with mean ξ and precision $\alpha + \beta$ so that the probability that the country avoids default is given by $1 - \Phi(\sqrt{\alpha + \beta}(\theta^* - \xi))$. The indifference condition consequently amounts to:

$$1 = (1 - \Phi(\sqrt{\alpha + \beta}(\theta^* - \xi)))R,$$

which implies

$$\theta^* - \xi = \frac{\Phi^{-1}\left(1 - \frac{1}{R}\right)}{\sqrt{\alpha + \beta}}. \quad (3.10)$$

¹⁴This proof follows Morris and Shin (2006).

Equations (3.9) and (3.10) are used in order to solve for the two unknowns θ^* and ξ . Solving for θ^* gives:

$$\theta^* + m = \Phi \left(\frac{\alpha}{\sqrt{\beta}} \left(\theta^* - y + \frac{\sqrt{\alpha + \beta}}{\alpha} \Phi^{-1} \left(\frac{1}{R} \right) \right) \right). \quad (3.11)$$

This expression which implicitly defines the critical θ^* is the intersection of a straight line of slope 1 with intercept m and a cumulative normal distribution with mean $y - \frac{\sqrt{\alpha + \beta}}{\alpha} \Phi^{-1} \left(\frac{1}{R} \right)$ and precision $\frac{\alpha^2}{\beta}$.

Uniqueness: The equilibrium described by θ^* is unique if the slope of the right hand side of equation (3.11), which is given by $\varphi \frac{\alpha}{\sqrt{\beta}}$, is less than 1 everywhere, where φ denotes the density of the standard normal evaluated at the appropriate point. As $\varphi \leq \frac{1}{\sqrt{2\pi}}$, a unique equilibrium in switching strategies exists if, and only if

$$\frac{\alpha}{\sqrt{\beta}} \leq \sqrt{2\pi}. \quad (3.12)$$

This condition, which is both necessary and sufficient for the existence of a unique dominance-solvable equilibrium, holds whenever the private signals are sufficiently accurate as compared to the underlying uncertainty captured by α .¹⁵

Limiting case: In order to maintain tractability, the analysis focuses on the limiting case when private signals of the short-term creditors become very precise ($\beta \rightarrow \infty$). Even though the private signals now almost perfectly reveal the true state of the country's ability to service its debt, strategic uncertainty persists since each creditor is still uncertain about the actions of the other short-term creditors. In the limit, the country's critical state of liquid assets is given by:

$$\theta^* = \frac{1}{R} - m. \quad (3.13)$$

Consequently, the EU can prevent default by providing assistance if $\theta < \frac{1}{R}$. Let r^* be the critical amount of overall resources necessary to stave off default, that is $r^* = \theta^* + m$. The country thus defaults if $r < \frac{1}{R}$.

3.3.4.2 The EU's commitment problem

The EU chooses the size of the bailout m so as to maximise the expected welfare of the entire federation. When determining m , the EU knows that θ is normally

¹⁵ According to Morris and Shin (2006), this condition is also sufficient for the existence of a unique equilibrium in any class of strategies.

distributed with mean $y = \phi + e$ and precision α , where ϕ and e are common knowledge. Moreover, the EU anticipates the critical value θ^* at which the country is on the brink of default. Recalling equation (3.7), the federation's expected welfare becomes:

$$\begin{aligned} & \text{Prob}(\theta \geq \theta^*)W^{ND} + \text{Prob}(\theta < \theta^*)W^D \\ &= (1 - \Phi(\sqrt{\alpha}(\theta^* - y)))W^{ND} + \Phi(\sqrt{\alpha}(\theta^* - y))W^D \\ &= \left(1 - \Phi\left(\sqrt{\alpha}\left(\frac{1}{R} - m - y\right)\right)\right)W^{ND} + \Phi\left(\sqrt{\alpha}\left(\frac{1}{R} - m - y\right)\right)W^D, \end{aligned} \quad (3.14)$$

where $\theta^* = \frac{1}{R} - m$, the solution of the creditors' subgame, is substituted in the last line.

Limiting case: In order to obtain an explicit solution for the EU's subgame, the model is simplified by taking the limit as $\alpha \rightarrow \infty$. With the ex ante distribution of θ becoming a degenerate spike around its mean y , the EU's information serves as a good indicator for the true state of the country's ability to service its debt. As a result, the EU's expected welfare boils down to:

$$W(\theta, m, \ell) = \begin{cases} Y_d - c(e) + Y_f - m + u_s & \text{if } y > \frac{1}{R} - m \\ -c(e) + Y_f - m & \text{if } y \leq \frac{1}{R} - m. \end{cases}$$

For $y > \frac{1}{R}$, the country is sufficiently liquid and not in danger of defaulting. There is consequently no need for EU intervention and m is equal to zero. More interestingly, for $y < \frac{1}{R}$, which implies that the country might be facing a liquidity crunch, the EU can stave off default by providing financial assistance. The European Union intervenes if the benefits to the entire federation of doing so outweigh the costs of the bailout. The EU thus bails out the country if $\Delta W = W^{ND} - W^D \geq 0$. This is true if the benefit from preserving macroeconomic stability, u_s , is sufficiently large or if m and hence the cost to the European taxpayer is relatively small. In this case, the EU chooses m so as to just avert default, i.e. m is set to satisfy $y = \frac{1}{R} - m$. If the costs surpass the benefits, by contrast, m is set equal to zero. As a result, the bailout function amounts to:

$$m(e) \simeq \begin{cases} \frac{1}{R} - y = \frac{1}{R} - \phi - e & \text{if } \Delta W \geq 0 \\ 0 & \text{if } \Delta W < 0 \text{ or } y \geq \frac{1}{R}. \end{cases} \quad (3.15)$$

Using (3.15) to determine ΔW and taking e as given at this stage of the game,

the EU provides assistance if:

$$\begin{aligned}\Delta W &= Y_d - e^2 + Y_f - m + u_s - Y_f + e^2 \geq 0 \\ Y_d + u_s - \frac{1}{R} + \phi + e &\geq 0 \\ Y_d + u_s &\geq \frac{1}{R} - \phi - e.\end{aligned}$$

The size of the bailout ($\frac{1}{R} - \phi - e$) is thus restricted by the gains from preventing a sovereign debt crisis ($Y_d + u_s$). The latter can also be interpreted as the EU's maximum willingness to pay.

To summarise, the optimal size of m is similar to the bailout function derived in Morris and Shin (2006) and is given by:

$$m^* \simeq \begin{cases} \frac{1}{R} - \phi - e & \text{if } Y_d + u_s \geq \frac{1}{R} - \phi - e \\ 0 & \text{if } Y_d + u_s < \frac{1}{R} - \phi - e \text{ or } y \geq \frac{1}{R}. \end{cases} \quad (3.16)$$

Note that the conditions under which the EU provides assistance to the debtor country differ from Morris and Shin (2006), reflecting the potential commitment problem of the EU. Whereas the IMF can credibly commit not to bail out a country which is fundamentally unsound ($y < 0$), the EU intervenes if it is beneficial for the entire federation, irrespective of any solvency issues ($\Delta W \geq 0$). As a result, bailouts occur more often since the range of fundamentals for which the EU provides financial assistance increases compared to Morris and Shin (2006). Moreover, the EU's willingness to pay is relatively higher, implying that the maximum bailout available to countries is larger in the current set-up.

3.3.5 Debtor country moral hazard

The debtor country chooses effort so as to maximise its expected payoff. The assumption that α is large is maintained throughout this section. The country anticipates European intervention whenever $Y_d + u_s \geq \frac{1}{R} - \phi - e$. The country also knows that default occurs for $y < \frac{1}{R}$ if the EU does not provide assistance. The payoff function of the debtor country consequently becomes:

$$u_d(\theta, m, \ell) = \begin{cases} Y_d - e^2 & \text{if } Y_d + u_s \geq \frac{1}{R} - \phi - e \text{ or } y \geq \frac{1}{R} \\ -e^2 & \text{if } Y_d + u_s < \frac{1}{R} - \phi - e \text{ or } y < \frac{1}{R}. \end{cases} \quad (3.17)$$

When deciding on the optimal e , the country faces a trade-off. On the one hand, effort is costly and the country is therefore incentivised to minimise e . If the country anticipates default, it will put in no effort, generating a payoff of zero. In the case of no default, the country is willing to adopt painful austerity measures if the resulting net gain is sufficiently high, or, more precisely, if

$$Y_d - e^2 \geq 0.$$

Solving for e , the maximum level of effort that the country is willing to exert is given by:

$$e^{max} = \sqrt{Y_d}.$$

On the other hand, painful austerity policies can stave off default by triggering a European bailout. Similar to Morris and Shin (2006), the choice of effort is determined relative to the soundness of the economic fundamentals ϕ . The relationship between e , ϕ and m is illustrated in Figure 3.3.

For $\phi \geq \frac{1}{R}$, the country's economy is sufficiently sound to rule out a sovereign default. In this interval, it is neither necessary for the country to put in any effort nor for the EU to intervene. For $\phi < \frac{1}{R}$, however, the EU bails out the debtor country if the benefits to the federation outweigh the costs. If the economy is relatively strong, the country can completely externalise its costs onto the European taxpayer and exert no effort, knowing that the stakes are too high for the federation. Recalling the EU's maximum willingness to pay, the maximum available bailout equals the gains of staving off default. The critical threshold $\bar{\phi}$ below which a bailout becomes too costly for the EU, assuming that the country exerts no effort, is given by:

$$\bar{\phi} = \frac{1}{R} - u_s - Y_d. \quad (3.18)$$

For $\bar{\phi} < \phi < \frac{1}{R}$, the bailout is chosen according to (3.16) and $e = 0$ which is the typical moral hazard result.

If the fundamentals are too weak, by contrast, meaning that $\phi < \bar{\phi}$, the country is incentivised to contribute to the bailout. Otherwise, the EU would not provide financial assistance since the size of the bailout exceeds its maximum willingness to pay. By exerting effort, the country can lower the costs of a bailout for a given ϕ , thereby rendering financial assistance profitable for the EU. The country thus

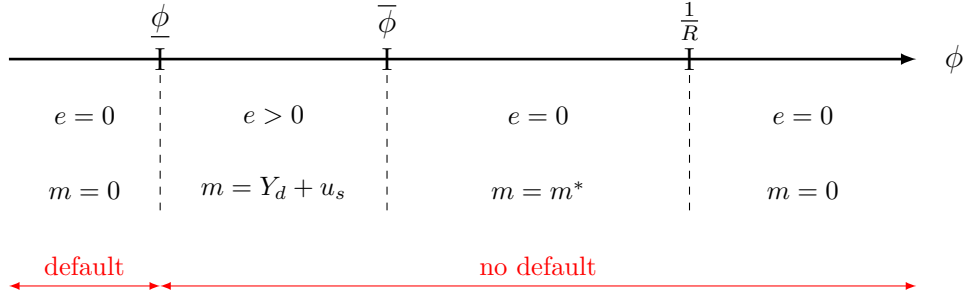


Figure 3.3: Relationship between e , m and ϕ in the benchmark

chooses e to solve $Y_d + u_s = \frac{1}{R} - \phi - e$ subject to the condition that $e \leq e^{max}$. The threshold $\underline{\phi}$ below which it is too costly for the country to adopt austerity measures is equivalent to $\bar{\phi} - e^{max}$, or, more precisely:

$$\underline{\phi} = \frac{1}{R} - u_s - Y_d - \sqrt{Y_d}. \quad (3.19)$$

For $\underline{\phi} < \phi < \bar{\phi}$, effort is consequently positive and European financial assistance is at its maximum. The country's optimal effort as a function of the fundamentals can now be summarised as:

$$e^* = \begin{cases} \frac{1}{R} - u_s - Y_d - \phi & \text{if } \underline{\phi} < \phi < \bar{\phi} \\ 0 & \text{otherwise.} \end{cases} \quad (3.20)$$

Effort is thus maximised when $\phi = \underline{\phi}$ and is linearly decreasing in ϕ . Note that default only occurs for $\phi < \underline{\phi}$. If the EU can credibly commit to its no-bailout policy ($m = 0$), by contrast, the critical value of ϕ below which the country defaults is given by $\frac{1}{R} - e^{max}$. Compared to a world without European intervention, default is consequently prevented for a larger range of fundamentals, thereby making default less likely. If countries face a liquidity crunch, a bailout might indeed be efficient. The EU, however, is also more likely to support a country whose fundamentals are so weak that it is considered insolvent. In comparison to Morris and Shin (2006), moral hazard is more severe since the range of ϕ for which the country exerts no effort is larger than in their model. Moreover, countries are less likely to default in the current set-up, suggesting that too few countries restructure their debts due to the EU's lack of commitment.

3.4 Orderly debt restructuring

In the benchmark model, the EU cannot credibly commit to its no-bailout policy as stated in Article 125 of the TFEU if the financial distress of one member country threatens the macroeconomic stability of the entire Eurozone, i.e. when u_s is large. As a result, sovereign default does not occur in equilibrium unless the country's fundamentals are extremely weak. In order to mitigate this commitment problem, Eurozone leaders have recently signed the *ESM Treaty* which establishes a permanent mechanism to resolve future sovereign debt crises. The ESM also provides for orderly debt restructuring to ensure that private creditors bear a part of the burden of future bailouts. This section incorporates the proposed insolvency mechanism into the benchmark model.

3.4.1 Modification of players' payoff functions

In the following, the players' payoff functions are modified in order to model the impact of an orderly debt restructuring mechanism. The latter is determined before the value of the fundamentals is known so that it cannot be tailored to a particular ϕ . All other assumptions remain unchanged.

In the benchmark model, EU intervention staves off default, thereby benefitting both creditors and debtors at the expense of the European taxpayer. As sovereign default does not occur in equilibrium unless fundamentals are extremely weak, default risk is eliminated for a large range of fundamentals so that creditors in effect receive R . These adverse incentives resulted in countries such as Germany and Greece paying similar interest rates on their long-term debt, albeit differing in their fundamentals. Introducing insolvency procedures renders sovereign default possible and might overcome the inconsistency of the European framework which previously ruled out default, exit and bailout (Münchau, 2010). As a result, creditors have to shoulder some of the costs of future bailouts. Bondholders, however, also benefit from an orderly debt restructuring mechanism. In case of disorderly sovereign default, creditors often have to write off their claim completely. Under the proposed insolvency procedures, bondholders can retrieve a fixed fraction z of their investment even if the country defaults. Off the equilibrium path, the payoff function to rolling over thus becomes more profitable

compared to the benchmark scenario since the costs of default are lowered:

$$w_I(\theta, m, \ell) \equiv \begin{cases} R & \text{if } \theta + m \geq \ell & \text{No default} \\ zR & \text{if } \theta + m < \ell & \text{Default,} \end{cases} \quad (3.21)$$

where $0 < z < 1$ and $zR < 1$.

The debtor country is also better off under insolvency procedures, taking into account that there is “money on the table for both creditors and debtors” (Gianviti et al., 2010). If the country defaults, a fraction of its debt will be forgiven, and output, denoted by E , is positive. The country’s modified payoff function is given by:

$$u_d(\theta, m, \ell) = \begin{cases} Y_d - c(e) & \text{No default} \\ E - c(e) & \text{Default,} \end{cases} \quad (3.22)$$

where $Y_d > E > 0$. Note that z and E are partially interdependent and thus determine, at least to some extent, how costs are split between debtor and creditors. Similar to the benchmark, the difference $Y_d - E$ captures the costs of defaulting. The parameter E consequently reflects the amount of debt relief granted to the country, which depends on z , as well as indirect costs unrelated to z , such as the loss of access to capital markets and lawyers’ fees. For analytical purposes, z and E are treated as independent parameters.

The fact that the debtor country receives debt relief in the case of default is taken into account in the EU’s welfare function which is modified as follows:

$$W_I(\theta, m, \ell) = \begin{cases} Y_d - c(e) + Y_f - m + u_s & \text{No default} \\ E - c(e) + Y_f - m & \text{Default.} \end{cases} \quad (3.23)$$

Note that the modelling of insolvency procedures entails more automaticity than suggested in the *ESM Treaty*. Whereas the treaty envisages dealing with debtor countries on a case-by-case basis, the model assumes a generic debt restructuring mechanism for all debtor countries.

3.4.2 Results

3.4.2.1 Roll-over decision and θ^*

Following the global game methodology outlined in the benchmark scenario, the critical θ approaches

$$\theta_I^* = \frac{\frac{1}{R} - z}{1 - z} - m \quad (3.24)$$

in the limit $\beta \rightarrow \infty$. This implies that the critical amount of overall resources necessary to avoid default amounts to $r_I^* = \frac{\frac{1}{R} - z}{1 - z}$. Compared to the benchmark, this critical amount decreases since $r_I^* < r^*$. Intuitively, as rolling over becomes more profitable for creditors, due to the positive payoff in case of default, bondholders are more likely to roll over their claims under insolvency procedures. More generally, the higher the return to rolling over in case of default, the lower will be the critical amount of overall resources needed to stave off default, as stated by the following lemma:

Lemma 3.1. *The critical amount of overall resources, r_I^* , is decreasing in z since*

$$\frac{dr_I^*}{dz} = \frac{\frac{1}{R} - 1}{(1 - z)^2} < 0.$$

This effect, dubbed the critical threshold effect, also impacts the decision-making by both the EU and the debtor country.

3.4.2.2 The EU's commitment problem

Solving for the EU's bailout function in the limiting case proceeds similarly to the benchmark scenario. Anticipating θ_I^* and taking the limit as $\alpha \rightarrow \infty$, the EU's payoff function boils down to:

$$W_I(\theta, m, \ell) = \begin{cases} Y_d - c(e) + Y_f - m + u_s & \text{if } y > \frac{\frac{1}{R} - z}{1 - z} - m \\ E - c(e) + Y_f - m & \text{if } y \leq \frac{\frac{1}{R} - z}{1 - z} - m. \end{cases}$$

Again, there is no EU intervention required for $y > \frac{\frac{1}{R} - z}{1 - z}$ but the EU bails out the country if $\Delta W_I \geq 0$ in which case m is chosen such that default is just averted.

If $\Delta W_I < 0$, m is equal to zero. The bailout function thus becomes:

$$m_I(e) = \begin{cases} \frac{\frac{1}{R}-z}{1-z} - y = \frac{\frac{1}{R}-z}{1-z} - \phi - e & \text{if } \Delta W_I \geq 0 \\ 0 & \text{if } \Delta W_I < 0 \text{ or } y > \frac{\frac{1}{R}-z}{1-z}. \end{cases} \quad (3.25)$$

Taking e as given and using the solution for m_I to determine ΔW_I , the EU intervenes if

$$\Delta W_I = Y_d - e^2 + Y_f - m_I + u_s - E - Y_f + e^2 \geq 0,$$

which simplifies to

$$\begin{aligned} Y_d + u_s - E - \frac{\frac{1}{R}-z}{1-z} + \phi + e &\geq 0 \\ Y_d + u_s - E &\geq \frac{\frac{1}{R}-z}{1-z} - \phi - e. \end{aligned}$$

Similar to the benchmark, the extent of financial assistance $(\frac{\frac{1}{R}-z}{1-z} - \phi - e)$ is limited by the benefits from staving off default $(Y_d + u_s - E)$. Comparing the EU's maximum willingness to pay with the benchmark, it turns out that insolvency laws have an ambiguous effect on the EU's incentives. On the one hand, the debt relief granted to the debtor country, captured by E , reduces the net gain of the bailout, thereby lowering the benefits from preventing default. As a result, it becomes more difficult for a country to trigger a bailout. On the other hand, recalling Lemma 3.1, r_I^* is decreasing in z so that the size of the bailout which is required to stave off default falls. A smaller bailout, however, is less costly, thereby making EU intervention more likely. Whether the EU's commitment problem is mitigated by introducing insolvency procedures thus depends on the relative sizes of these opposing effects. The net effect on the EU's ability to commit will be discussed in more detail once the country's optimal choice of effort has been determined.

The EU's bailout function under insolvency procedures can now be summarised as follows:

$$m_I^* \simeq \begin{cases} \frac{\frac{1}{R}-z}{1-z} - \phi - e & \text{if } Y_d + u_s - E \geq \frac{\frac{1}{R}-z}{1-z} - \phi - e \\ 0 & \text{if } Y_d + u_s - E < \frac{\frac{1}{R}-z}{1-z} - \phi - e \text{ or } y > \frac{\frac{1}{R}-z}{1-z}. \end{cases} \quad (3.26)$$

3.4.3 Debtor country moral hazard

Following the approach of the benchmark analysis, the country foresees a European bailout whenever $Y_d + u_s - E \geq \frac{\frac{1}{R}-z}{1-z} - \phi - e$. The modified payoff function of the debtor country is given by:

$$u_d(\theta, m, \ell) = \begin{cases} Y_d - c(e) & \text{if } Y_d + u_s - E \geq \frac{\frac{1}{R}-z}{1-z} - \phi - e \quad \text{or } y > \frac{\frac{1}{R}-z}{1-z} \\ E - c(e) & \text{if } Y_d + u_s - E < \frac{\frac{1}{R}-z}{1-z} - \phi - e \quad \text{or } y < \frac{\frac{1}{R}-z}{1-z}. \end{cases} \quad (3.27)$$

Interestingly, granting debt relief in case of default limits the country's output loss, thereby lowering its maximum willingness to exert effort. When anticipating default, the country does not put in any effort and receives a payoff of E . Consequently, the country adopts austerity measures if

$$Y_d - e^2 \geq E.$$

As a result, the country's effort does not exceed

$$e_I^{max} = \sqrt{Y_d - E}.$$

Note that $e_I^{max} < e^{max}$ since the country is now better off in the case of default.

Using a similar diagram as in the benchmark, Figure 3.4 depicts effort and financial assistance in relation to the fundamentals ϕ . For $\phi \geq \frac{\frac{1}{R}-z}{1-z}$, default can be ruled out due to the strength of the country's economy so that both m and e are equal to zero. As stated in Lemma 3.1, introducing insolvency procedures lowers the critical amount of overall resources necessary to avoid default. The critical threshold effect is illustrated in Figure 3.4. The range of fundamentals for which ϕ is so strong that there is no danger of default increases compared to the benchmark as it also encompasses fundamentals in the interval $[\frac{\frac{1}{R}-z}{1-z}, \frac{1}{R}]$. Similar to the benchmark, EU intervention results in moral hazard for $\overline{\phi}_I < \phi < \frac{\frac{1}{R}-z}{1-z}$, where the lower bound is determined by the EU's maximum willingness to pay and is given by:

$$\overline{\phi}_I = \frac{\frac{1}{R}-z}{1-z} - u_s - Y_d + E. \quad (3.28)$$

In this interval, the benefits of the bailout to the federation surpass the costs even if the country does not exert any effort. The EU thus chooses m according to (3.26) and $e = 0$. Note that the interval in which this result holds is smaller

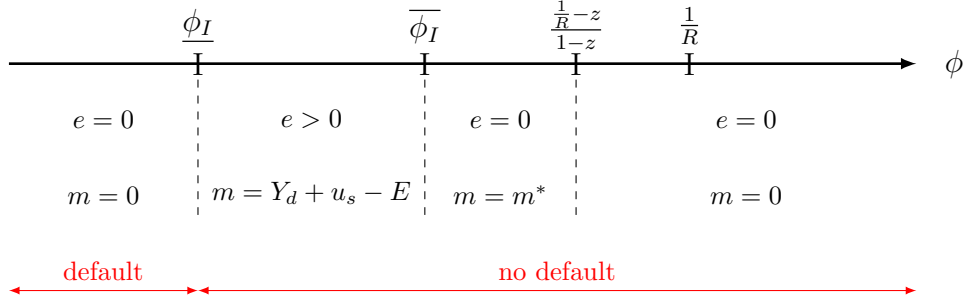


Figure 3.4: Relationship between e , m and ϕ in the insolvency law regime

than in the benchmark due to the reduction in net gains and the lower critical threshold of overall resources.

For sufficiently low ϕ , the country is incentivised to exert effort in order to lower the costs of the bailout and make intervention profitable for the EU. As effort is costly, the country will set e to satisfy $Y_d + u_s - E = \frac{\frac{1}{R} - z}{1 - z} - \phi - e$ subject to the condition $e \leq e_I^{max}$. The threshold below which effort becomes too costly for the country is determined by e_I^{max} and amounts to:

$$\underline{\phi}_I = \frac{\frac{1}{R} - z}{1 - z} - u_s - Y_d + E - \sqrt{Y_d - E}. \quad (3.29)$$

For $\underline{\phi}_I < \phi < \overline{\phi}_I$, the debtor country puts in effort and financial assistance is maximal. Summarising, the country's optimal effort as a function of the fundamentals amounts to:

$$e_I^* = \begin{cases} \frac{\frac{1}{R} - z}{1 - z} - u_s - Y_d + E - \phi & \text{if } \underline{\phi}_I < \phi < \overline{\phi}_I \\ 0 & \text{otherwise.} \end{cases} \quad (3.30)$$

Focusing on the level of effort only, the impact of insolvency procedures is ambiguous. On the one hand, a lower critical threshold r_I^* requires less effort to stave off default for a given ϕ so that effort is lower compared to the benchmark. On the other hand, externalising the costs onto the European taxpayer becomes more difficult since the net benefit to the federation is reduced by E . In order to offset this effect and to trigger a bailout, the country consequently needs to exert more effort for a given ϕ . Again, the net effect of the insolvency mechanism is determined by the relative sizes of these opposing effects.

3.5 How effective are insolvency procedures?

Proponents of orderly sovereign debt restructuring argue that insolvency proceedings can relieve the European taxpayer and mitigate the moral hazard problems which are embedded in the current European framework. In order to assess these arguments and to examine the impact on EU welfare, the effects of insolvency procedures on m , e and W are examined by comparing the benchmark with the insolvency law scenario. When doing this, the size of the bailout, the level of effort and the effect on welfare have to be analysed in relation to the fundamentals ϕ .

Assume first that the effect resulting from E , termed the credit relief effect, is sufficiently large so that the following condition holds:

Condition 3.1. *The credit relief effect dominates the critical threshold effect if*

$$E \geq \frac{1}{R} - \frac{\frac{1}{R} - z}{1 - z} = \frac{(1 - \frac{1}{R})z}{1 - z}.$$

In the following, three cases are distinguished, depending on the size of the credit relief effect and the default threshold under insolvency laws, $\underline{\phi}_I$. Anticipating some of the results, Table 3.2 provides a brief overview of the welfare effects of orderly debt restructuring. Irrespective of the parameter configuration, insolvency laws improve EU welfare if the fundamentals are so weak that the country defaults ($\phi < \underline{\phi}_I$) or if the country's economy is sufficiently strong ($\phi > \overline{\phi}_I$). If fundamentals fall into the intermediate range $[\underline{\phi}_I, \overline{\phi}_I]$, however, the welfare effects hinge on the model's parameters as insolvency laws are welfare-improving in case C but yield ambiguous welfare results in the other cases. This is due to the differing impact of the bankruptcy regime on the country's effort decision: while insolvency procedures lower incentives to put in effort in case C, the country might be incentivised to exert 'too much' effort in the other cases.¹⁶ For insolvency laws to be welfare-enhancing in those cases, a 'strong' bankruptcy regime should be implemented, meaning that the amount of debt relief granted to the debtor country has to be sufficiently large. Such a bankruptcy regime would restrict the size of the bailout and encourage insolvent countries to default rather than to exert ultimately wasteful effort, thus improving EU welfare for

¹⁶In case B, the country is only incentivised to exert more effort compared to the benchmark for fundamentals relatively close to the default threshold $\underline{\phi}_I$. Otherwise, effort tends to be lower and welfare unambiguously higher under insolvency laws, see Figure 3.6.

Cases	Fundamentals ϕ		
	‘Default’ $\phi < \underline{\phi}_I$	‘Intermediate’ $\phi \in [\underline{\phi}_I, \overline{\phi}_I]$	‘Strong’ $\phi > \overline{\phi}_I$
A: Condition 3.1 holds	$W_I > W$	$W_I \geq W$	$W_I \geq W$
B: Condition 3.1 violated and $\underline{\phi}_I < \underline{\phi}$	$W_I > W$	$W_I \geq W$	$W_I \geq W$
C: Condition 3.1 violated and $\underline{\phi}_I > \underline{\phi}$	$W_I > W$	$W_I > W$	$W_I \geq W$

Table 3.2: Welfare Effects of Insolvency Procedures

intermediate fundamentals.

Having outlined the main welfare results, each of the three cases is now analysed in more detail, starting with case A. If condition 3.1 is satisfied, it follows that $\overline{\phi}_I > \overline{\phi}$. Recall that $e_I^{max} < e^{max}$ which implies that $\underline{\phi}_I > \underline{\phi}$. Figure 3.5 contrasts the two regimes and depicts the effects of insolvency laws on financial assistance, effort and welfare in relation to the strength of the economy.¹⁷ The upper line in Figure 3.5 illustrates the benchmark case whereas the lower line shows the effects of insolvency laws.

Comparing m under the two different regimes, it turns out that insolvency proceedings can indeed mitigate the EU’s commitment problem by limiting the size of the bailout. The European taxpayer, who has to fund the bailout through taxation, will consequently be better off under the insolvency mechanism, confirming a claim made in the political debate. For $\frac{1}{R-z} \leq \phi \leq \frac{1}{R}$, the bailout m is positive and determined by equation (3.16) whereas m_I is equal to zero due to the positive effect of insolvency procedures on the critical threshold of overall resources. This effect also translates into a smaller m_I for $\overline{\phi}_I \leq \phi \leq \frac{1}{R-z}$. Moreover, the credit relief effect restricts the EU’s maximum willingness to pay under insolvency proceedings, resulting in lower bailouts for $\underline{\phi}_I \leq \phi \leq \overline{\phi}_I$. Note that $m_I = 0$ for $\phi < \underline{\phi}_I$ since default is not averted. As has been pointed out by critics of the mechanism, insolvency procedures therefore encourage default as the range of fundamentals for which the country restructures its debt increases in comparison to the benchmark.

The impact of insolvency procedures on effort is less obvious since moral hazard is both encouraged and discouraged, depending on the country’s fundamentals.

¹⁷Note that it is possible that $\overline{\phi} < \underline{\phi}_I$. As E tends towards Y_d , $\underline{\phi}_I$ approaches $\overline{\phi}_I$ so that the default range increases.

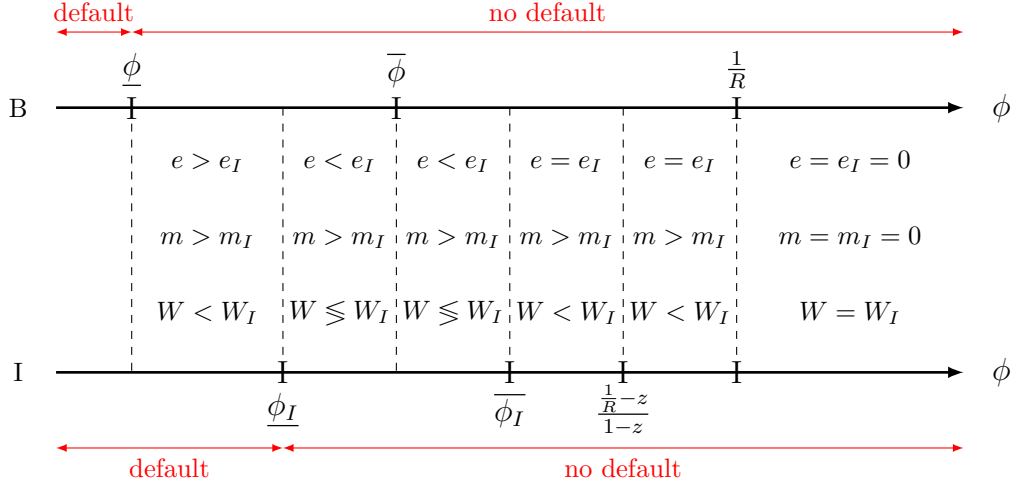


Figure 3.5: Comparison of the two regimes if condition 3.1 holds

For $\underline{\phi}_I \leq \phi \leq \bar{\phi}_I$, the country exerts more effort in the insolvency law regime than in the benchmark so that moral hazard is reduced. Intuitively, as the net gain to the federation is substantially lowered due to the relatively large E , the country has to put in more effort for a given ϕ in order to trigger a bailout. At the same time, if fundamentals are extremely weak ($\phi \leq \underline{\phi}_I$), the country exerts no effort and defaults under insolvency laws, whereas it puts in effort in the benchmark. Since the country is more likely to be insolvent if ϕ is very low, this negative effect on effort is beneficial as insolvent countries are encouraged to restructure their debts.

If the country's economy is so strong that it does not require any financial assistance ($\phi > \frac{1}{R}$), EU welfare is the same under both regimes. Due to the smaller bailout, EU welfare is higher under insolvency laws for $\bar{\phi}_I < \phi < \frac{1}{R}$. By encouraging default, insolvency procedures are also welfare-improving for extremely low fundamentals. In the interval $[\underline{\phi}, \underline{\phi}_I]$, $m_I = 0$ and the country exerts no effort and defaults in the insolvency law regime so that welfare amounts to $W_I^D = Y_f + E$. In contrast to that, both m and e are positive in the benchmark, with the EU providing maximal financial assistance. Exerting painful effort, however, reduces welfare, and the benefits from staving off default are exactly offset by the costs of the bailout. EU welfare is thus given by $W^{ND} = Y_f - e^2$ so that $W < W_I$ despite the fact that the country does not default in the benchmark. Surprisingly, encouraging default thus improves EU welfare for this range of fundamentals by preventing the country from exerting wasteful effort.

For $\underline{\phi}_I < \phi < \overline{\phi}_I$, by contrast, the effect on welfare is ambiguous since the bailout is smaller but effort is higher under orderly debt restructuring. In this interval, the welfare function under insolvency procedures is given by:

$$\begin{aligned} W_I^{ND} &= Y_d + Y_f + u_s - m_I - e_I^2 \\ &= Y_f + E - \left(\frac{\frac{1}{R} - z}{1 - z} - u_s - Y_d + E - \phi \right)^2, \end{aligned} \quad (3.31)$$

where the results for m_I and e_I were substituted in the second line. Comparing this expression with the welfare function in the benchmark case does not yield clear analytical results. In the interval $[\underline{\phi}, \overline{\phi}_I]$, benchmark welfare amounts to $W^{ND} = Y_d + Y_f + u_s - (\frac{1}{R} - \phi)$ whereas for $\underline{\phi}_I < \phi < \overline{\phi}$, EU welfare is given by $W^{ND} = Y_f - (\frac{1}{R} - u_s - Y_d - \phi)^2$. Intuitively, for fundamentals close to the threshold $\overline{\phi}_I$, welfare is likely to be higher under insolvency laws since e_I is relatively small. Compared to the costs of a large bailout m , a low level of effort e_I is hence relatively cheaper. As the country's fundamentals get weaker and approach $\underline{\phi}_I$, however, exerting effort becomes more costly due to the increasing marginal costs, thereby possibly surpassing the expenses of a large bailout m . This implies that welfare might indeed be lower under insolvency laws, depending on the model's parameters. Numerical examples support this intuition, suggesting that in a 'weak' insolvency regime, in which $z \rightarrow 0$ and E is sufficiently small¹⁸, insolvency proceedings lower EU welfare for fundamentals close to the threshold $\underline{\phi}_I$.

The effects of insolvency procedures are not as straightforward, however, if condition 3.1 is not met. This implies that $\overline{\phi}_I < \overline{\phi}$ but the relation between the other thresholds $(\underline{\phi}_I, \underline{\phi}, \overline{\phi}_I)$ hinges on the parameters of the model. Assume first that the latter are such that $\underline{\phi}_I < \underline{\phi}$. The impact on m , e and W depending on ϕ is illustrated in Figure 3.6. As before, B stands for benchmark whereas I refers to the insolvency law regime.

For $\phi > \frac{\frac{1}{R} - z}{1 - z}$, the same reasoning applies as above. Similar to the case in which condition 3.1 holds, the EU's commitment problem is alleviated for a large range of fundamentals. As the critical threshold r_I^* is lower than in the benchmark, the bailout which is required to stave off default is smaller so that $m > m_I$ for $\overline{\phi} \leq \phi \leq \frac{\frac{1}{R} - z}{1 - z}$. Due to the credit relief effect which restricts the size of the bailout, the EU also provides a smaller amount of financial assistance under insolvency laws for $\underline{\phi} \leq \phi \leq \overline{\phi}$, thereby relieving the European taxpayer. Interestingly, the

¹⁸ $2E < Y_d$ is used in the numerical examples.

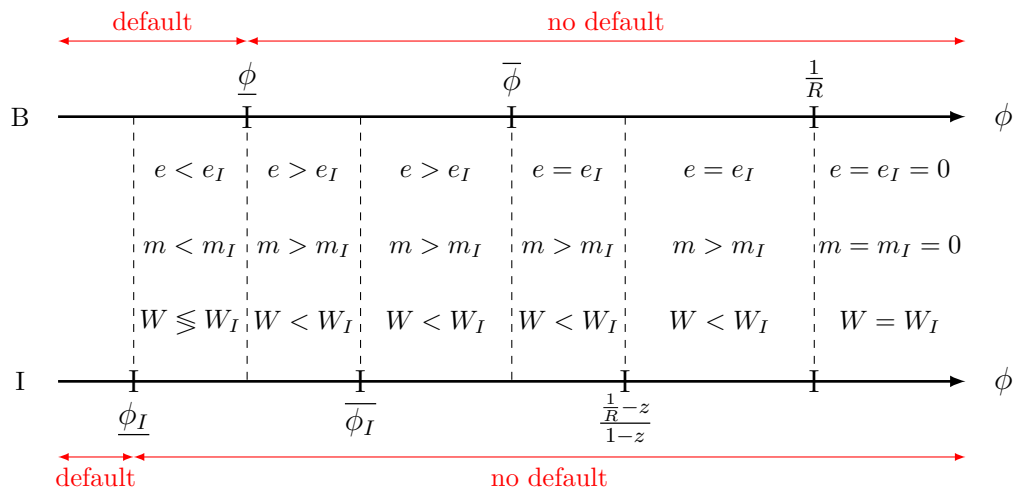


Figure 3.6: Comparison of the two regimes if condition 3.1 is violated and $\underline{\phi}_I < \underline{\phi}$

EU commits less under insolvency procedures if fundamentals are relatively low ($\underline{\phi}_I \leq \phi \leq \underline{\phi}$). Moreover, default is discouraged compared to the benchmark so that the country receives maximal assistance under the insolvency mechanism whereas $m = 0$.¹⁹

Again, the effects of insolvency proceedings on the country's incentives are more ambiguous. For $\underline{\phi} \leq \phi \leq \bar{\phi}$, moral hazard is indeed aggravated. In the interval $[\bar{\phi}_I, \bar{\phi}]$, e_I is equal to zero whereas the country exerts effort in the benchmark. For $\underline{\phi} \leq \phi \leq \bar{\phi}_I$, effort is positive in both regimes but less effort is required under insolvency laws since r_I^* is substantially lowered if condition 3.1 does not hold. Since less effort and a smaller bailout are needed in the insolvency law regime, EU welfare is enhanced for $\underline{\phi} < \phi < \bar{\phi}$. Only for a very weak economy do insolvency laws encourage effort in comparison to the benchmark. This might not necessarily be beneficial, however, since the country is likely to be insolvent rather than illiquid.

The welfare implications for extremely low fundamentals ($\underline{\phi}_I < \phi < \underline{\phi}$) are indeed ambiguous. As in the previous case, welfare in the insolvency law regime is given by equation (3.31). Since the country defaults in the benchmark, welfare amounts to $W^D = Y_f$. Intuitively, if the credit relief effect, which limits the size of the bailout and boosts welfare, outweighs the costs associated with exerting effort, insolvency proceedings are welfare-improving in this interval. In particular,

¹⁹Note that it is possible that $\underline{\phi} > \bar{\phi}_I$. In this case, the EU commits less under insolvency laws and default is discouraged for an even larger range of fundamentals compared to the benchmark.

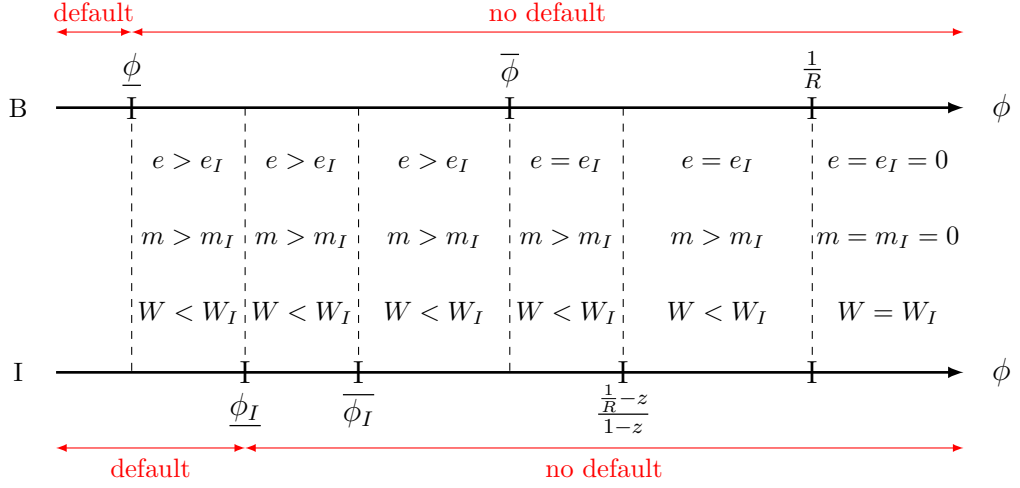


Figure 3.7: Comparison of the two regimes if condition 3.1 is violated and $\underline{\phi}_I > \underline{\phi}$

if $\phi \rightarrow \underline{\phi}_I$, which implies that $e_I \rightarrow e_I^{max}$, welfare in the insolvency law regime approaches $W_I^{ND} = Y_f + 2E - Y_d$. Consequently, welfare under insolvency laws would be higher than in the benchmark if $2E > Y_d$. This intuition is supported by numerical examples.

The results look slightly different, however, if condition 3.1 is not met and the model's parameters imply that $\underline{\phi}_I > \underline{\phi}$. The effects on the bailout, the country's effort and EU welfare in relation to ϕ are shown in Figure 3.7. In comparison to Figure 3.6, the results only change for $\phi < \bar{\phi}$. Similar to Figure 3.5, the size of the bailout is restricted for $\underline{\phi} \leq \phi \leq \bar{\phi}$ due to both the credit relief effect and the lower critical threshold of overall resources, thereby making the European taxpayer better off. Interestingly, moral hazard is exacerbated in this range ($e > e_I$) since less effort is needed to stave off default but insolvency procedures are still welfare-improving. Also, in the interval $[\underline{\phi}, \underline{\phi}_I]$, default is encouraged compared to the benchmark, thereby forcing potentially insolvent countries to restructure their debts.²⁰

The following propositions summarise the main results of this section.

Proposition 3.1. *If condition 3.1 is satisfied, insolvency procedures mitigate the EU's commitment problem but their effect on moral hazard is ambiguous. Effort is encouraged for intermediate ϕ . If fundamentals are extremely weak, however, the country exerts no effort and defaults while it does put in effort in the benchmark.*

²⁰Note that $\bar{\phi} > \frac{\frac{1}{R}-z}{1-z}$ if $\frac{1}{R} - \frac{\frac{1}{R}-z}{1-z} > Y_d + u_s$. In this case, the main results of Figures 3.6 and 3.7 still hold. For $\frac{\frac{1}{R}-z}{1-z} \leq \phi \leq \bar{\phi}$, the results are given by $e > e_I$, $m > m_I$ and $W < W_I$.

If condition 3.1 is violated, results hinge on the model's parameters. If the latter imply that $\underline{\phi}_I < \underline{\phi}$, insolvency laws discourage default and the EU's commitment problem is exacerbated for low fundamentals. If the parameters are such that $\underline{\phi}_I > \underline{\phi}$, the debtor country exerts less effort for intermediate and low ϕ and orderly debt restructuring encourages default.

Contrary to policymakers' beliefs, insolvency procedures do not necessarily discourage moral hazard. Instead, the debtor country exerts more or less effort than in the benchmark, depending on the strength of the economy. The claim that insolvency laws succeed in relieving the European taxpayer holds for all but one range of fundamentals. Finally, an orderly debt restructuring mechanism does not always encourage default, challenging another assertion made in the policy literature. Rather, this statement is only true if condition 3.1 is satisfied. Otherwise, default is either encouraged or discouraged, depending on the model's parameters. While a higher occurrence of debt restructuring is indeed beneficial, the welfare implications of a lower frequency of sovereign defaults are not obvious.

Proposition 3.2. *Focusing on the particular range of extremely weak fundamentals for which default is encouraged in comparison to the benchmark, EU welfare increases in the insolvency law regime although the country defaults. Similarly, considering the interval for which default is averted compared to the benchmark, EU welfare is either higher or lower under insolvency laws even though default is averted.*

Despite the negative effects associated with default such as output loss ($Y_d - E$) and loss of macroeconomic stability (u_s), it turns out that orderly default enhances EU welfare for very weak fundamentals. Intuitively, this positive welfare effect results from the fact that the EU provides a bailout in the benchmark even though the country is potentially insolvent. This suggests that avoiding or postponing restructuring is even more costly than an outright orderly default if the country's level of public debt is ultimately unsustainable. Since fundamentals are extremely weak in this case, the benefits from staving off default are exactly offset by the costs of the bailout so that there is no net benefit to the federation. Also, adopting austerity measures is very costly to the point of being wasteful due to the weakness of the economy. By comparison, both e_I and m_I are zero for this interval under insolvency laws. Since the costs of providing financial aid and exerting effort outweigh the costs of defaulting for extremely low ϕ , the country is in fact better off restructuring its debt. Encouraging default

via the implementation of insolvency procedures is consequently beneficial in this particular range of fundamentals as it prevents the country from exerting wasteful effort and the EU from providing an expensive bailout. In a sense, the sovereign debt restructuring mechanism corrects the outcome of the benchmark where too few countries default due to the EU's commitment problem. For intermediate levels of fundamentals, however, for which the country does not default under either regime, an orderly debt restructuring mechanism does not necessarily increase EU welfare.

Proposition 3.3. *Compared to the benchmark, an orderly debt restructuring mechanism is not always welfare-improving for all ranges of economic fundamentals.*

Disproving some arguments in the policy literature which describe orderly debt restructuring as a panacea, insolvency procedures can lower EU welfare for some ranges of fundamentals, depending on the model's parameters.

3.6 Policy implications

The previous section has shown that an orderly debt restructuring mechanism is not always beneficial in the sense that it simultaneously mitigates the EU's commitment problem, discourages moral hazard and enhances EU welfare. This does not imply, however, that the EU's approach to include private creditors in future bailouts is flawed. The results suggest, rather, that insolvency procedures need to be carefully designed to make sure that they bring about the positive effects ascribed to them by the policy literature. The choice of the parameters which determine the mechanism, namely E and z in the model, is thus crucial to the success of an orderly default mechanism.

The major policy implication which can be derived from the model is that a half-hearted debt restructuring mechanism fails to mitigate the commitment and moral hazard problems embedded in the current EMU framework. Only a 'strong' insolvency mechanism which substantially lowers the costs of default for both sides succeeds in accomplishing policymakers' objectives, namely relieving the European taxpayer, alleviating moral hazard and improving EU welfare. The consequences for the design of the sovereign debt restructuring mechanism are as follows. Firstly, insolvency procedures need to ensure that the amount of debt relief granted to the debtor country is sufficiently large. Intuitively, if the credit

relief effect is sufficiently strong, the net benefit to the federation of averting default is significantly lowered. As a result, the EU's maximum willingness to pay drops, thereby reducing the size of the bailout and incentivising the country to exert more effort for a given state of the economy. Secondly, the haircuts imposed on creditors should be relatively subdued, i.e. z must be sufficiently large, in order to guarantee that the positive effects on commitment and effort also translate into higher welfare. Thirdly, taking into account the partial interdependence of the size of the haircut and the extent of the debt relief, the mechanism needs to provide for a fair distribution between debtors and creditors, trying to balance the interests of both groups. This proposed design of a 'strong' mechanism is not without problems. Distributional concerns aside, a very high level of debt relief as captured by a large E lowers the maximum amount of effort that the country is willing to exert. As a result, the range of fundamentals for which the country puts in effort becomes very small, thereby notably raising the occurrence of sovereign default. The higher frequency of defaults nevertheless enhances EU welfare since it remedies the outcome of the benchmark where too few countries restructure their debts as a result of the EU's commitment problem.

If the sovereign debt restructuring mechanism only allows for a small amount of debt relief as reflected by a low E , by contrast, countries might exert less effort than in the benchmark, depending on the economic fundamentals. Here, two cases need to be distinguished. In the first case, the model's parameters imply that default is discouraged under insolvency procedures. While the amount of debt relief can still be chosen such that insolvency procedures are welfare-improving, the EU's commitment problem is exacerbated if fundamentals are extremely weak. This design is consequently not beneficial to the European taxpayer, who has to fund an even larger bailout under the insolvency mechanism, and should therefore be rejected. An orderly debt restructuring mechanism with a small amount of debt relief only seems sensible when the model's parameters are such that default is encouraged. In this case, the mechanism reduces the size of the bailout and improves EU welfare. Effort, however, will be lower in this regime, thereby aggravating the moral hazard problem. Policymakers might still endorse this design for political economy reasons. If austerity measures are less painful, they are more likely to be supported by the public in the respective debtor country. Taking Greece as an example, this issue is very important as the government's announcements of austerity measures have regularly been followed by strikes and public action. Furthermore, 'too much' austerity might impede economic growth

so that the pressure on public finances will increase in the long run.

The chapter offers a stylised model which analyses the incentive effects of orderly debt restructuring in the context of the EMU and suggests a way of framing the policy debate. As with every model, the limitations of the modelling strategy should be kept in mind. Firstly, for the sake of analytical tractability, results are only discussed for the limiting case, thereby possibly ignoring insights from the general solution away from the limit. Secondly, the model abstracts from any effects of insolvency laws on interest rates since R , the creditors' return on their investment, is exogenous and the initial debt situation is taken as given. The model therefore does not provide an answer to the point of criticism raised by Trichet that the planned mechanism would potentially drive up interest rates for heavily indebted countries. Finally, being a one shot game, the model misses some of the dynamics characterising the situation in the Eurozone where all players interact repeatedly and actions might have potential knock-on effects on other countries in the bloc's periphery. The chapter nevertheless represents a good starting point for exploring the incentive effects of the planned insolvency mechanism. In particular, it casts some doubts on the predominantly positive attitude towards insolvency procedures in the policy literature which considers them a panacea.

3.7 Epilogue: a happy ending?

Greece's debt exchange offer closed on 8 March 2012. Investors holding 85.8 per cent of bonds governed by Greek law agreed to participate in the swap. After the Greek government invoked CACs, which had been inserted into the Greek-law bonds retroactively, participation was increased to 95.7 per cent. Bondholders accepted a 53.5 per cent reduction in the nominal face value of their bonds, effectively writing off €106bn of Greek debt. With a total of €206bn owed to the private sector, the Greek debt swap is the largest sovereign debt restructuring in history and the first non-war related debt restructuring of an advanced economy.²¹ Nevertheless, the odds seem to be against a happy ending to the two-year long Greek tragedy. The exchanged bonds are currently trading at distressed levels comparable to those in autumn 2011. Even in the best case scenario, Greece's debt-to-GDP ratio is forecast to reach 117 per cent in 2020, a level which can

²¹ The settlement for bonds governed by foreign law has not been completed yet. The total amount of foreign-law bonds held by private investors is estimated at €18bn.

still be considered unsustainable. The extent of the debt relief, despite being substantial, is consequently likely to prove insufficient. El-Erian (2012) therefore concludes that “the Greek debt drama has merely paused for an interval.” If Greece has to restructure its debt again, which looks increasingly likely, it will be more difficult to engineer a default, however. As the exchanged bonds are issued under English law, the Greek government can no longer pass legislation to adjust their terms, thus making them harder to restructure (El-Erian, 2012). Moreover, official creditors will hold 75 per cent of Greek debt by 2014 so that a second Greek default will be costly to the European taxpayer. Since the bailout programmes effectively bought private creditors time to sell off their claims, Roubini (2012) argues that “PSI came too little too late.” In a sense, the model supports this view since a ‘weak’ insolvency mechanism, either in the form of delays or insufficient debt relief, may result in less commitment and lower EU welfare.

4 To be, or not to be: can a ‘closer union’ save the Euro?

To be, or not to be, that is the question.
(Shakespeare, 1600)

4.1 Introduction

Two years into the Eurozone debt crisis, the Euro project seems to have reached a critical juncture, with one path leading to enhanced political co-operation and integration and the other leading to the potential dissolution of the Euro Area. Although Eurozone membership is considered to be irreversible, the eventuality of a break-up has been contemplated even before the single currency came into existence in 1999. With French and German leaders breaking a taboo by openly questioning Greece’s status in the monetary union following its announcement of a referendum on the EU bailout, the threat of a Eurozone break-up has become so real that businesses are reported to be drawing up contingency plans for the collapse of the single currency. In order to restore confidence in the Euro and to put an end to the sovereign debt crisis, European policymakers have been looking into a comprehensive overhaul of the EU’s institutional structure (European Council, 9.12.2011) and have recently signed the *Treaty on Stability, Coordination and Governance in the Economic and Monetary Union*, also known as Fiscal Compact, which has been hailed as a major step towards enhanced fiscal integration (European Council, 30.1.2012).

By putting institutional reform at the top of the political agenda, policymakers have apparently subscribed to the conventional wisdom that solely a ‘closer union’ can save the Euro. This view is shared by many Euro critics who, drawing on the theory of optimum currency areas developed by Mundell (1961), have repeatedly argued that a monetary union is doomed to fail unless it is complemented by a fiscal or a political union. There seems to be a growing consensus that confidence in the single currency can only be restored by correcting the flaws inherent in the EU’s institutional structure. Roubini (2011), for example, calls for the

implementation of a fiscal union which includes larger central federal revenues and the issuance of Eurobonds. De Grauwe (2010a) favours a political union with a system of automatic solidarity or transfers between member states. The former ECB president Trichet supports the creation of a European Treasury headed by a European finance minister (Trichet, 2011). Some commentators, however, have questioned the widespread belief that the answer to the crisis is “more Europe” (Kay, 2011) and have drawn attention to the political aspects of the Eurozone’s troubles. Against the backdrop of rising nationalism across Europe, Rachman (2011) argues that instead of increasing solidarity, a political union is likely to drive citizens further apart. Buiter and Rahbari (2011) believe that the Euro Area’s electorate has no interest in political integration or the implementation of a fiscal transfer system. Finally, Issing (2011) considers the attempt to save the Euro via transferring national sovereignty to European institutions which are not elected according to democratic principles as illogical, concluding that “it will only further alienate the people from Europe itself”.

This chapter attempts to analyse the claim that closer integration can save the Euro, using a simple political economy framework. The model compares several institutional settings, namely the current “muddling through” scenario, an orderly default mechanism as well as a fiscal and a political union set-up, and contrasts their implications for the Eurozone’s stability and welfare. The “muddling through” scenario serves as the benchmark for comparison so that the model differs from the policy literature, which uses the no-bailout scenario as the reference case against which to judge institutional reforms. The chapter extends the framework by Dur and Staal (2008), who examine the incentives of unequally sized districts to consolidate, in order to study European member states’ incentives to secede. Building on the secession literature, the benefits and costs of exiting the Euro Area are modelled, taking into account the specifics of the current debt crisis. Since the economic impact of Eurozone exit depends on the characteristics of the seceding state, the model distinguishes between two types of countries, the core and the periphery. The core is made up of creditor countries whose economies are based on exports. Secession is likely to lead to an appreciation of the core’s new currency, thus depressing income. Core countries are assumed to be in the majority, reflecting the fact that they can dictate policies in return for cash. Periphery countries, by contrast, are characterised by unsustainable levels of public debt and a lack of competitiveness. For them, Eurozone exit can prove beneficial since the new

currency is likely to depreciate, thereby boosting competitiveness and income. The modelling approach thus departs from the secession literature which often assumes symmetrical proportional income effects for all regions in case of exit (see for example Bolton and Roland (1997)). Since the periphery might be better off in autarky, it can credibly threaten to abandon the single currency and thus extract transfers from the core. Finally, the chapter introduces peripheral debt into the Dur and Staal (2008) framework in order to examine the effects of debt accumulation on the Eurozone's stability.

Interestingly, the model's results cast some doubts on the conventional wisdom that the Euro cannot survive without closer integration. In particular, the model shows that the current "muddling through" scenario is not more prone to break-up than the political or the fiscal union set-up. The political union is in fact *less* stable than the status quo if countries are heterogeneous in their preferences for public good provision, thus confirming the claims made by Rachman (2011) and Issing (2011). Intuitively, in the political union, the core has to compensate the periphery countries for imposing 'German-style' policies on them, making bailouts potentially more expensive and rendering Eurozone exit attractive for the core. By comparison, the stability implications of a fiscal union hinge on its institutional design. A fiscal union with an explicit exit clause is as sustainable as the status quo and yields the same welfare results. If the fiscal union is irreversible, by contrast, the Eurozone tends to be more stable but EU welfare is lower and voters in the periphery are unlikely to support the institutional reform. Finally, Eurobonds, despite being advocated as a potential solution in the policy literature, improve neither EU welfare nor the Eurozone's stability. This result can be explained by the fact that the current "muddling through" scenario constitutes already, albeit implicitly, a debt or transfer union.

The model suggests that implementing an orderly default mechanism and inserting an explicit exit clause into the European Treaties might prove more effective in stabilising the Eurozone than far-reaching institutional reforms which transfer more powers to Brussels. Allowing countries to default on their debt within the monetary union weakens the periphery's bargaining power and prevents periphery countries from externalising their debts onto the core taxpayer, thus alleviating moral hazard. Policymakers should therefore not water down the requirements for private creditors of peripheral countries to suffer haircuts, as initially envisaged by the European Stability Mechanism (European Council, 9.12.2011). While it seems counterintuitive that an exit clause increases the

stability of the monetary union, this is a well-known result in the fiscal federalism literature, going back to the seminal paper by Buchanan and Faith (1987). Intuitively, granting countries the right to secede protects the minority and gives the periphery a voice in the policymaking process, thereby re-establishing the exit-voice mechanism (Meyer, 2010). A credible secession threat induces the core to internalise the periphery's interests, thus leading to the socially efficient outcome. Interestingly, both policy recommendations only require minor treaty changes, making them relatively easy to implement.

The chapter is closely related to the literature on the integration and separation of states and regions adopting a political economy framework.¹ In these types of models, sovereign entities face a critical trade-off between the benefits of size and the costs of reverting to autarky. While separation is usually associated with policies that are closer to the preferences of the people, the benefits arising from membership in a union or a nation state have been modelled in different ways. First, membership in a union can prove beneficial since it provides insurance against economic shocks (Fidrmuc, 2011). Second, being part of a union increases the size of the local market as transaction costs between states are lowered (Alesina and Spolaore, 2003). Third, union membership can generate efficiency gains as regions benefit from economies of scale and a larger tax base which reduces the per capita costs of public goods (Bolton and Roland, 1997; Dur and Staal, 2008; Alesina and Spolaore, 2003). Finally, the centralisation of policies on the union level can improve welfare as cross-country spillovers are internalised (Alesina et al., 2005). Following the latter approach, this chapter models the Euro Area as an economic union in which the core benefits from positive spillovers induced by public good provision in the periphery.

While the policy literature on solutions to the Eurozone crisis is expanding rapidly, there are currently very few papers that model the issues at hand in a more formal and rigorous way. Luque et al. (2011) provide a formal framework in order to examine how the allocation of voting weights influences member states' decisions to deepen the union. In their model, a fiscal union insures member states against economic shocks. Similar to this chapter, they assume that autarky proves beneficial since it gives countries the opportunity to devalue their currency, thus limiting the volatility of shocks. Their approach differs from this chapter in that transfers between countries do not occur in the status quo

¹ For a survey of the literature, see for example Alesina et al. (1995), Bolton et al. (1996), or Ruta (2005).

and in that it is not clear *ex ante* which countries need a bailout. Fidrmuc (2011) pursues a similar modelling strategy by introducing economic shocks into the Bolton and Roland (1997) framework. Focusing both on the correlation and persistence of shocks, he finds that a fiscal union is prone to dissolution if shocks are asymmetric and permanent. Since his analysis applies to a fiscal federalism setting, his results suggest that a union which is characterised by unidirectional and permanent transfer flows is unstable, thus further weakening the case for a fiscal union as a solution to the current crisis. Finally, Fahrholz and Wójcik (2011) analyse bailouts in a brinkmanship game between the core and the periphery. Since a default imposes negative externalities on the rest of the union, the periphery might be able to credibly threaten to default and thus elicit a bailout, depending on the core's willingness to pay and the attitude of the domestic electorate. Contrary to this chapter, the authors recommend policies that limit the periphery's bargaining power. Since they assume that membership in the union is always advantageous for the periphery, their analysis focuses on how to prevent bailouts rather than on how to preserve the Euro Area.

The remainder of the chapter is organised as follows. Section 4.2 provides a brief overview of the main economic, legal and political issues regarding a Eurozone break-up. Section 4.3 presents the current "muddling through" scenario which serves as the benchmark for comparison with other institutional settings. Section 4.4 modifies the benchmark to incorporate an orderly default mechanism. The results for the political union and the fiscal union settings are presented in sections 4.5 and 4.6 respectively. Section 4.7 discusses the policy implications and concludes.

4.2 Eurozone break-up: background

While the literature on optimal currency areas and the resulting implications for the Eurozone is vast², starting with the seminal model by Mundell (1961), research on monetary disintegration is surprisingly scarce (Meyer, 2010). Recent economic history also provides little guidance, with Argentina's abandonment of its currency board in 2002 being the closest available precedent (Blejer and Levy-Yeyati, 2010). The debate on Eurozone exit is consequently afflicted with uncertainty. While Eichengreen (2010, 2007) considers Euro membership to be permanent due to the high economic, political and procedural costs of exit, other

² See Jonung and Drea (2009) for an overview.

economists have suggested that periphery countries might be better off returning to their old currencies (Roubini, 2011). This section provides a brief overview of the main economic, legal and political issues shaping the debate and forms the basis for the subsequent modelling framework.

4.2.1 Economic impact

The economic consequences of Eurozone exit are effectively determined by the economic fundamentals of the seceding member state. For simplicity, the analysis and the subsequent model distinguish between two types of countries, the core and the periphery. Core countries can be thought of as creditor countries whose economies rely heavily on exports, e.g. Germany. The periphery consists of debtor countries which are characterised by unsustainable levels of public debt and feeble economic growth, e.g. Greece.

The lack of competitiveness of periphery countries relative to the core has been described as one of the major imbalances within the Euro Area (Mattich, 2011). This view is substantiated by Figure 4.1 which shows that relative unit labour costs, a measure of competitiveness, have increased in the periphery since 2006, most notably in Ireland, Greece and Italy. In order to restore competitiveness, the periphery has the choice between two options. If it remains in the Eurozone, regaining competitiveness requires cutting wages and prices. Such an internal devaluation is likely to lead to a sharp contraction in economic output, thus aggravating the current recession. Leaving the monetary union, by contrast, might offer a quicker and less painful solution (EEAG, 2011; Roubini, 2011). A newly introduced Drachma is likely to depreciate immediately, thereby making peripheral exports cheaper and re-igniting export-led growth. Buitier and Rahbari (2012), for example, estimate that a Greek exit will result in a nominal depreciation of the new Drachma of 50 to 70 per cent relative to the Euro. Some economists, however, consider this benefit of a more competitive exchange rate to be short-lived if the effects of the currency depreciation are counteracted by wage inflation or if necessary structural reforms in the periphery are postponed (Buitier and Rahbari, 2011; Eichengreen, 2010).

A rapid depreciation of the new Drachma will further increase the pressure on the periphery's public finances as the existing external liabilities are still denominated in Euro. Leaving the single currency is therefore likely to involve an outright default in order to reduce public debt to more sustainable levels

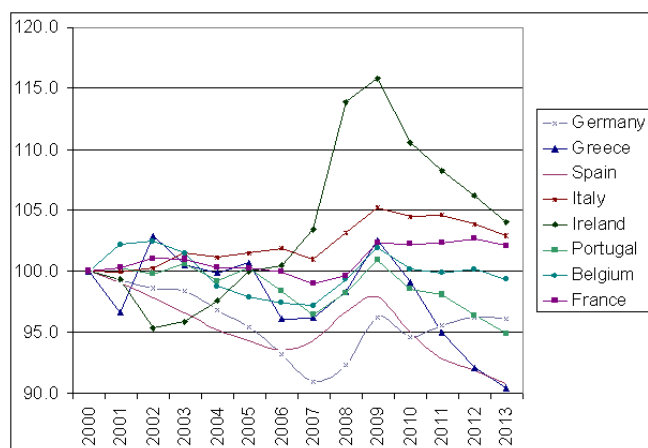


Figure 4.1: Relative Unit Labour Costs, Base Year 2000 (Source: AMECO)

(Blejer and Levy-Yeyati, 2010; EEAG, 2011). Having regained its monetary independence, the peripheral government can also easily monetise its debt, thus imposing further losses on creditors and fuelling inflation. While some authors have argued that Eurozone exit entails higher refinancing costs due to lower credit ratings and higher risk premia (Eichengreen, 2007), this argument is no longer relevant as many periphery countries have already lost access to capital markets. It is important to note that default will not be limited to sovereign debt as the private sector might also find itself unable to repay Euro-denominated debt (Blejer and Levy-Yeyati, 2010; Jenkins, 2011). In particular, if debt contracts are in Euro, firms and households will face unchanged liabilities while their income, which is paid in devalued Drachmas, has shrunk (Fidler, 2011b). These asymmetric balance sheet effects are likely to spur widespread bankruptcies. Unlike agreements with external creditors, domestic debt contracts can easily be converted into Drachma. Whilst net debtors will benefit from lower debt repayments, net deposit holders will see the value of their savings decrease (Blejer and Levy-Yeyati, 2010). The redenomination will hence result in a redistribution of wealth in the country, potentially causing social unrest.

Moreover, the mere prospect of a Eurozone break-up will trigger bank runs in the periphery as citizens rush to the banks to withdraw deposits before the latter are converted into a less valuable currency (Blejer and Levy-Yeyati, 2010; Eichengreen, 2010). Deposit holders will either transfer their savings to banks in the core countries or hold the Euros as cash. As Greek banks become illiquid, the entire banking system in the periphery is likely to collapse (Buiter, 2011; EEAG, 2011). As shown in Figure 4.2, household deposits in Greek banks have steadily

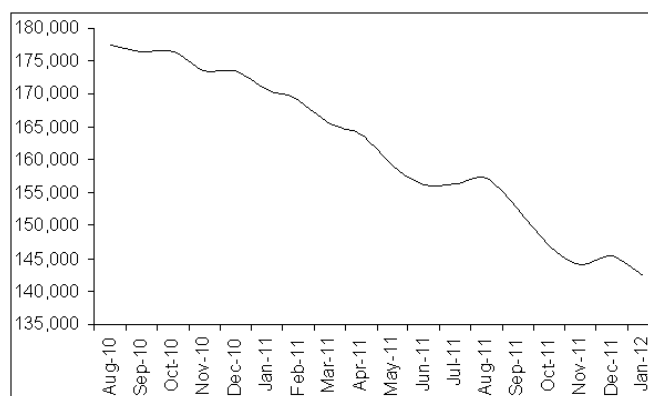


Figure 4.2: Greek Household Deposits in EUR Millions (Source: Bank of Greece)

declined over the last 18 months, reflecting both depositors' dwindling confidence in the Euro and the erosion of savings due to the recession. In Argentina, the bank run began approximately nine months before the country abandoned the currency board (Blejer and Levy-Yeyati, 2010).

Taking into account all these factors, the economic cost-benefit analysis of Eurozone exit for the periphery is ambiguous (Eichengreen, 2007). Economists at UBS estimate that periphery countries would incur a cost of 50 per cent of their GDP in the first year (Deo et al., 2011). Monetary independence might prove beneficial in the long run, however, especially if the alternative is a prolonged period of austerity and economic hardship (Roubini, 2011). In the subsequent model, it is therefore assumed that abandoning the Euro boosts peripheral income.

If a core country is to leave the single currency area, by contrast, the economic impact will be diametrically opposed to that experienced by the periphery. Similar to the Swiss Franc's recent rise, the newly introduced currency will appreciate quickly, thus eroding any competitive advantage and making core exports more expensive. Unless its economy rebalances towards domestic demand, exit will result in a significant slowdown of economic activity in the export-based core (Bremmer, 2011b; Hannon, 2011). Moreover, core investors, i.e. banks, pension funds or insurance companies, which hold peripheral assets denominated in Euro will suffer capital losses as these holdings, measured in Deutschmarks, are now worth less (Buiters, 2011; Wolf, 2011; Fidler, 2011a). To some extent, the core might also benefit from a stronger currency. Being perceived as a safe haven for investments, core countries are likely to see capital flooding into the country. Likewise, demand for government bonds will increase, thereby

driving down bond yields (Hannon, 2011; Economist, 2010; Fidler, 2011a). This positive effect on debt servicing costs will be amplified if public debt is not converted into new Deutschmarks (Economist, 2010). On balance, however, the costs of exiting the Euro seem to outweigh the benefits in the export-oriented core. UBS estimates the output loss of a seceding core country at 20 to 25 per cent of GDP, which is significantly higher than the cost of bailing out the periphery (Deo et al., 2011).³

4.2.2 Legal and procedural issues

Since Eurozone exit might look enticing for some countries, the question arises whether abandoning the Euro is legally possible. While some authors insist that “nothing is truly irreversible for a sovereign nation” (Economist, 2010), it is worth looking at the legal provisions regarding Euro membership.

Interestingly, the European Treaties are silent on unilateral withdrawal from the Euro Area. This absence of an explicit legal provision is possibly due to the fact that the founders of the single currency wanted to avoid any speculation as to the longevity of the Euro by emphasising the irreversibility of the monetary union (Athanassiou, 2009; Chaffin, 2011b). With the ratification of the *Lisbon Treaty* in 2009, however, an exit clause providing for voluntary secession from the EU was introduced into the treaty. Article 50.1 states that “Any Member State may decide to withdraw from the Union in accordance with its own constitutional requirements.” If a country wants to discontinue EU membership, it must inform the Council of its intention. The Council then sets out guidelines which form the basis for the subsequent negotiations of a withdrawal agreement with the Union. If the European Parliament consents to the agreement, it is concluded on behalf of the Union by the Council, acting by a qualified majority.

Surprisingly, the exit clause does not spell out any specific procedures for member states which use the Euro as their legal tender. Since the Eurozone is a sub-set of the European Union, the consensus view is that a member state which decided to leave the EU would automatically have to exit the Euro Area (Athanassiou, 2009; Proctor, 2011). Similarly, under the current legal framework, a country which considered abandoning the Euro would consequently also have to discontinue EU membership (Athanassiou, 2009). A member state which wanted to leave the Euro Area while remaining in the EU would thus have to exit under

³ UBS estimates the cost of secession at €6000 per capita in the first year compared to €1000 per capita if the core has to bail out Greece, Ireland and Portugal.

Article 50 and immediately apply for re-admission to the EU (Proctor, 2011). Alternatively, the seceding country could negotiate a withdrawal through treaty amendment (Scott, 2012). Despite being advocated by some policymakers and economists, the expulsion of a member state from the Eurozone or the EU is legally impossible under the current framework (Athanassiou, 2009; Proctor, 2011).

Moreover, the seceding country faces notable procedural difficulties, making a potential exit expensive (Eichengreen, 2010, 2007). Firstly, a legal framework is required which establishes the new currency as the sole legal tender and unit of account in the seceding country (Blejer and Levy-Yeyati, 2010). Secondly, all contracts have to be redenominated into the new currency at a prescribed substitution rate, which poses a major legal challenge (Proctor, 2011). Costly legal lawsuits are likely to ensue as the contracting parties question the validity of existing contracts and try to determine the currency in which monetary obligations are to be performed, leading to a period of pronounced uncertainty (Eichengreen, 2007). As a rule of thumb, contracts with a significant international dimension would be payable in Euro whereas contracts which are domestic to the seceding country would be converted into the new currency (Proctor, 2011).

In order to stem the bank run and the resulting outflow of Euros, the seceding country would have to impose capital controls as well as caps on bank withdrawals and possibly even prohibit cross-border travel to prevent people from leaving with cash, thereby suspending EU rules (Scott, 2012; Wolf, 2011; Chaffin, 2011a; Jenkins, 2011). Drawing on lessons from Argentina, Blejer and Levy-Yeyati (2010) advocate a selective deposit freeze which excludes sights and savings deposits used for day-to-day transactions. Argentina's *corralito* in 2001, by contrast, imposed a cap on all withdrawals, thus leading to a liquidity crunch and exacerbating the economic slump. In order to limit the ensuing financial chaos, the changeover would have to be rapid and unanticipated (Fidler, 2011b; Economist, 2010). A swift exit and introduction of a new currency, however, is incompatible with Article 50 of the *Lisbon Treaty* which requires extensive negotiations.

4.2.3 The political dimension

History has shown that monetary disintegration is predominantly driven by political rather than economic factors (Meyer, 2010). While voters across the

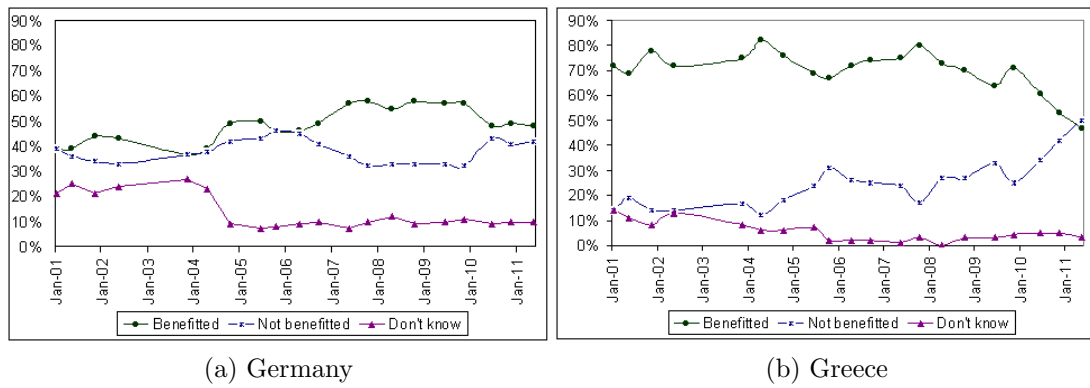


Figure 4.3: Eurobarometer (Source: European Commission)

Eurozone still support the Euro, opinion polls show that confidence in the single currency is waning and European solidarity is eroding. The Eurobarometer, for example, gauges popular sentiment towards the EU by asking people whether they think that on balance their country has benefitted from EU membership. Figure 4.3 shows the results of the survey for Germany and Greece since 2001. Whilst the majority of Germans considered EU membership to be beneficial in the period between May 2007 and November 2009, the percentage of Germans thinking that the EU benefitted their country has fallen since and now stands at 48 per cent. In Greece, by contrast, a large number of people initially believed in the benefits of EU membership. Sentiment in Greece, however, has turned around since January 2010. As of May 2011, there are now more Greeks thinking that the EU had adverse effects on their country than those who consider EU membership to be beneficial.

Evidence also suggests that nationalism is on the rise across Europe, thus generating a rift between the Eurozone’s core and periphery (Spiegel and Peel, 2011; Persson, 2011). Having suffered a period of economic slowdown and rising unemployment, periphery countries are rattled by strikes and peripheral governments face the wrath of their voters, with most incumbent governments losing the election following the country’s bailout. Moreover, core countries seem to have caught the “British disease” (Stephens, 2011) since voters increasingly dislike bailing out periphery countries and thus turn towards Eurosceptic parties. In April 2011, the *True Finns* became the third largest party in the Finnish parliament and recent opinion polls show that Marine Le Pen, who advocates France’s gradual departure from the Euro, is a real contender in the 2012 French presidential race (Persson, 2011; Carnegy, 2011). Some authors have therefore

concluded that the Eurozone’s problem is not so much an economic as a political one, with policymakers lacking the will to implement a comprehensive solution to the debt crisis (Stiglitz, 2011; Stephens, 2011). The lack of attention paid to the political economy aspects of monetary unions has been described as one of the major shortcomings of the optimum currency area approach (Goodhart in Jonung and Drea, 2009). The subsequent model tries to fill this gap by focusing on the political dimension of the Eurozone crisis.

4.3 The status quo (SQ): “muddling through”

4.3.1 Model set-up

The monetary union consists of $n \geq 2$ countries which differ in terms of income and preferences for public goods. There are two types of countries indexed by $i \in \{c, p\}$ which can be thought of as the Eurozone’s core and periphery. Citizens are assumed to be homogeneous and immobile. The number of core and periphery countries is given by n_c and n_p respectively, with $n = n_c + n_p$. Following Alesina et al. (2005), EU policy is determined by a one-country-one-vote-rule and majority voting. It is assumed that the core countries are in the majority ($n_c > n_p$) so that policies reflect the wishes of the core. This additional assumption seems reasonable in the given context as creditor countries are able to dictate the conditions of the bailouts in return for cash.

The periphery: For simplicity, all periphery countries are assumed to be identical and utility is linear. Each periphery country provides a local public good, denoted by g , which yields utility \sqrt{g} . Public good provision is financed through a tax τ on periphery income y_p . As a member of the Eurozone, the periphery country also receives a bailout or transfer T which constitutes a simple cash payment from the core to the periphery. Finally, each citizen holds a fraction μ of the country’s total debt and thus benefits from interest and principal repayments, denoted by R . The latter have been determined in the previous period and are thus exogenous to the model. In summary, the utility function of an individual living in the periphery is:

$$U_p = (1 - \tau)y_p + m_p\sqrt{g} + T + \mu R, \quad (4.1)$$

where m_p measures how much the representative citizen of the periphery values public good consumption relative to private consumption. Both public spending

and debt repayment are financed via income tax so that the peripheral budget constraint reads:

$$g = \tau y_p - R. \quad (4.2)$$

For the periphery, the decision whether to abandon the single currency involves a trade-off. On the one hand, the Eurozone ceases to provide financial assistance ($T = 0$). On the other hand, the periphery country is no longer subject to EU policies and regains its sovereignty over monetary policy and public spending. As outlined in the background section, a new Drachma is likely to depreciate quickly, thereby boosting the country's competitiveness. This in turn has a positive impact on income y_p and hence on tax revenues τy_p which is captured by the parameter α , where $\alpha \geq 1$. Since a depreciation of the new currency also implies a higher debt burden as public debt is denominated in the old currency, exit is likely to entail an outright default whose extent is described by the parameter h , where $0 < h < 1$. Creditors consequently suffer a haircut of $(1 - h)R$ so that the representative citizen now receives debt repayments of hR . The country does not give preferential treatment to domestic creditors so that the haircut is identical for internal and external investors. To sum up, the periphery's utility function in case of Eurozone exit becomes:

$$U_p = \alpha(1 - \tau)y_p + m_p\sqrt{g} + \mu hR, \quad (4.3)$$

and the corresponding budget constraint is given by:

$$g = \alpha\tau y_p - hR. \quad (4.4)$$

The model thus assumes that the EU, being concerned about financial contagion, prevents any coercive debt restructuring while the periphery country is a member of the monetary union.

The core: Again, all core countries are assumed to be identical. As a member of the single currency area, a core country benefits from spillovers induced by public good provision in each of the n_p periphery countries. The degree of spillovers is measured by the parameter $\kappa \in [0, 1]$. This approach follows Alesina et al. (2005) who assume that membership in an economic union is a necessary condition for receiving externalities. Unlike their model, this chapter focuses solely on spillovers from periphery to core as the latter are considered to be

crucial in the given context.⁴ While the core does not directly fund g , it might pay a cash transfer or bailout T which is unrelated to the level of public good provision. The costs of bailing out the n_p periphery countries are shared amongst the n_c core countries. Finally, the representative citizen also receives principal and interest payments by the n_p periphery countries, where γ refers to the extent of peripheral debt held by core countries. Note that a fraction ρ of the peripheral debt is held outside the Eurozone and $\mu + \gamma + \rho = 1$. To sum up, the utility of an individual living in the core is:

$$U_c = y_c + \kappa m_c n_p \sqrt{g} - \frac{n_p}{n_c} T + \frac{n_p}{n_c} \gamma R, \quad (4.5)$$

where m_c measures the core's preference for the public good and consequently captures the core's attitude towards the union. If the core does not value the periphery's public good highly ($m_c \rightarrow 0$), core voters are less willing to hold the European project together. Low values of m_c can thus be reinterpreted as growing Euroscepticism or dwindling European solidarity.

Leaving the Euro Area entails both costs and benefits for the core. While the core country no longer has to provide financial assistance to the periphery, it also foregoes the positive spillovers. More importantly, a newly introduced Deutschmark is likely to appreciate, thereby hurting the core's export-based economy. The resulting negative impact is captured by the parameter $\beta < 1$ and income consequently falls to βy_c . Moreover, peripheral debt is still denominated in Euro. If the Deutschmark appreciates, the real value of the core country's claims drops. As this effect is comparable to a haircut, it is assumed that the net effect on peripheral debt holdings is exactly the same as in the case where the periphery country exits, meaning that creditors in the core country receive hR . The utility of the representative citizen in the case of autarky consequently becomes:

$$U_c = \beta y_c + \frac{n_p}{n_c} \gamma hR. \quad (4.6)$$

The assumption that the losses incurred by creditors are similar irrespective of which country leaves the union first seems justified in the model's symmetric set-up: if a single core country is incentivised to deviate and leave the Euro Area, the same holds for all other core countries and the monetary union therefore falls apart. The break-up of the Eurozone is then likely to lead to the default of the

⁴ The model thus assumes that spillovers from periphery to periphery and from core to periphery are negligible.

periphery due to the ensuing depreciation of the peripheral currency and the lack of financial assistance.⁵

4.3.2 Periphery's utility after exit

If a periphery country decides to leave the Euro Area, it can choose its level of public good provision independently by maximising (4.3) with respect to g subject to the budget constraint under separation (4.4). Solving the maximisation problem, public good provision in the autonomous country amounts to:

$$g^S = \frac{m_p^2}{4}. \quad (4.7)$$

Using g^S , the periphery's utility under separation is given by:

$$U_p^S = \alpha y_p + \frac{m_p^2}{4} + (\mu - 1)hR. \quad (4.8)$$

4.3.3 Institutional set-up

In the pre-crisis setting where the no-bailout clause was binding, the core would not have provided a bailout whilst enjoying the positive spillovers generated by public good provision in the periphery. With the implementation of the temporary rescue fund in May 2010 and the permanent European Stability Mechanism (ESM) coming into effect in 2012, however, the rules of the game have changed, turning the previous no-bailout into a “muddling through” game. Most importantly, recent developments in the periphery have rendered Eurozone membership less beneficial, thus lowering the periphery's costs of abandoning the Euro. Firstly, structural reform programmes have stalled in many periphery countries, requiring additional bailouts and further austerity programmes. Secondly, the periphery has been rattled by several government crises⁶, with citizens taking to the streets in order to protest against the painful austerity measures imposed by the creditor countries. In November 2011, the popular resistance in Greece culminated in the threat by the Greek Prime Minister to call a referendum on the second European bailout.

⁵ The model makes no predictions as to whether the core and periphery countries rejoin to form two separate monetary unions, e.g. a Northern and a Southern Euro, as discussed in the policy literature, see for example Henkel (2011).

⁶ Recall the snap elections in Ireland and Portugal, the government crisis in Greece in June 2011 and the implementation of technocratic governments in both Italy and Greece.

As the costs of leaving the monetary union have fallen, periphery countries can credibly threaten to exit the Eurozone, thereby strengthening their bargaining position. This is modelled as a two-stage game. In the first stage, the monetary union votes over public good provision in the periphery. Since $n_c > n_p$, the core countries will set g according to their wishes, reflecting the conditionality of the current bailout programmes. In the second stage of the game, the periphery countries decide whether to leave the single currency area or not. The model is solved by backward induction so that the periphery's choice whether to exit is considered first.

4.3.4 Results

Even though the periphery countries are in the minority, the fact that they can credibly threaten to exit the monetary union imposes an additional constraint on the core countries. In order to prevent a Eurozone break-up, the core must ensure that the periphery enjoys at least the same utility as under separation, i.e. that $U_p \geq U_p^S$. Using equations (4.1) and (4.8), the non-separation constraint (NSC) is given by:

$$(1 - \tau)y_p + m_p\sqrt{g} + T + \mu R \geq \alpha y_p + \frac{m_p^2}{4} + (\mu - 1)hR$$

$$\Leftrightarrow T \geq (\alpha - 1)y_p + \tau y_p - m_p\sqrt{g} - \mu R + (\mu - 1)hR + \frac{m_p^2}{4},$$

which determines the minimum bailout required to preserve the union in the status quo, T^{SQ} . In the optimum, this equation holds with equality since the core wants to minimise costly transfers:

$$T^{SQ} = (\alpha - 1)y_p + g - m_p\sqrt{g} + (1 - \mu)(1 - h)R + \frac{m_p^2}{4},$$

where the periphery's budget constraint (4.2) was substituted. Using $1 - \mu = \gamma + \rho$, the bailout becomes:

$$T^{SQ} = (\alpha - 1)y_p + g - m_p\sqrt{g} + (\gamma + \rho)(1 - h)R + \frac{m_p^2}{4}. \quad (4.9)$$

Equation (4.9) shows that the core compensates the periphery for the forgone savings regarding debt obligations, $(\gamma + \rho)(1 - h)R$, for the foregone income gain, $(\alpha - 1)y_p$, and the difference in the net utility from public good provision in

order to render Eurozone membership attractive. Despite the lack of Eurobonds or any other official scheme of debt socialisation, part of the periphery's debt is effectively repaid by the core, as stated by the following lemma:

Lemma 4.1. *If the periphery country remains within the union, it can partially externalise the repayment of its external debt onto the core taxpayer. The extent of debt socialisation amounts to $(\gamma + \rho)(1 - h)R$ and thus depends on both the fraction of debt held by core and non-Eurozone countries and the size of the haircut in case of default. The bigger the haircut, i.e. the smaller h , and the higher the fraction of external debt $(\gamma + \rho)$, the larger the bailout.*

Surprisingly, the “muddling through” scenario already exhibits some features of a transfer or debt union, a fact that is often neglected by political commentators. The status quo is thus likely to generate moral hazard since the periphery has an incentive to overborrow, anticipating that the bill is partly footed by the core.

Taking into account the minimum transfer necessary to avoid dissolution, the core chooses public good provision so as to maximise its utility (4.5). Solving the optimisation problem yields the following level of public good provision in the union:

$$g^{SQ} = \left(\frac{m_p + \kappa m_c n_c}{2} \right)^2. \quad (4.10)$$

The periphery's threat to leave the Eurozone consequently induces the core to internalise the periphery's interests and vote for the socially optimal level of the peripheral public good. If the periphery country could not credibly threaten to exit the Eurozone, by contrast, it would not be able to influence the majority vote and the core would simply ignore the periphery's wishes. This result corresponds with the findings in the seminal paper by Buchanan and Faith (1987) who show that a secession threat restricts potentially exploitative behaviour of the ruling coalition, i.e. the core, thereby internalising the interests of the minority.

Finally, given g^{SQ} and T^{SQ} , it remains to be seen whether a core country has an incentive to stay in the union. This is the case if a core country's utility of being a member outweighs the utility of abandoning the Euro, i.e. if $\Delta_c = U_c^{SQ} - U_c^S \geq 0$, which implies that:

$$y_c - \frac{n_p}{n_c}(\alpha - 1)y_p - \frac{n_p}{n_c}(\gamma + \rho)(1 - h)R - \frac{n_p}{n_c} \frac{(\kappa m_c n_c)^2}{4} + \kappa m_c n_p \frac{m_p + \kappa m_c n_c}{2} + \frac{n_p}{n_c} \gamma R - \beta y_c - \frac{n_p}{n_c} \gamma h R \geq 0.$$

Rearranging gives the following condition:

$$\frac{n_c}{n_p}(1 - \beta)y_c - (\alpha - 1)y_p \geq -\frac{1}{4}\kappa m_c n_c(2m_p + \kappa m_c n_c) + (1 - h)\rho R, \quad (4.11)$$

which determines the stability of the monetary union in the status quo. Condition (4.11) shows that the Euro's sustainability depends on three factors: the effect of a break-up on member states' incomes, member states' attitude towards the union as captured by the preference parameters m_c and m_p and the amount of peripheral debt held *outside* the Euro Area. The impact of the periphery's debt on the union's stability is summarised in the following proposition:

Proposition 4.1. *The probability of a Eurozone break-up increases with the amount of peripheral debt held by foreign creditors. The larger the fraction of debt held outside the Eurozone, ρ , and the larger the haircut $(1 - h)$, the more prone is the union to dissolution as the stability condition is less likely to be satisfied. In the extreme case in which peripheral debt is only held within the Eurozone ($\rho = 0$), debt obligations do not affect the sustainability of the monetary union.*

Although the sheer extent of peripheral debt is often seen as the major threat to the Euro's survival, it turns out that solely debt owed to non-Eurozone creditors destabilises the union. The intuition behind this result is subtle and can be best understood when comparing the core citizen's overall net return on lending under both scenarios. Consider first the situation where the core stays in the union. Recalling Lemma 4.1, part of the periphery's external debt is effectively paid off by the core in order to entice the periphery to continue its membership in the union. Taking into account the bailout T^{SQ} and focusing on debt obligations, the core's overall net return on lending amounts to:

$$\frac{n_p}{n_c}\gamma R - \frac{n_p}{n_c}((\gamma + \rho)(1 - h)R) = \frac{n_p}{n_c}\gamma h R - \frac{n_p}{n_c}(1 - h)\rho R.$$

The return on peripheral debt held by the core is consequently reduced to $\frac{n_p}{n_c}\gamma h R$, suggesting that the effect is similar to an implicit debt write-off. As the periphery cannot be worse off within the union than under autarky where default is possible, the core alleviates the periphery's debt burden by transferring cash. In a sense, European leaders' idea of a voluntary debt restructuring of Greek debt can be interpreted as an attempt to dissuade Greece from exiting the Euro by relieving its debt burden. Furthermore, the core supports the periphery in making foreign

creditors whole by repaying $\frac{n_p}{n_c}(1-h)\rho R$ of the periphery's external debt, implying that its overall net return on lending is lowered by this amount.

Now consider the net return in the autarky case. Recalling equation (4.6), core creditors incur a loss on their debt holdings but no longer have to bail out the periphery so that the net return on lending is $\frac{n_p}{n_c}\gamma hR$. When deciding whether to exit, the core only considers the *difference* in net returns under both settings. Since both scenarios involve a debt write-off, either in explicit or implicit form, this difference is equal to the amount of foreign debt, $\frac{n_p}{n_c}(1-h)\rho R$. By leaving the union, the core can avoid repaying foreign creditors and the incentive to abandon the single currency is stronger for larger levels of debt owed to non-Eurozone creditors.⁷

The term on the LHS of equation (4.11), which describes the impact of a break-up on income, can be either positive or negative, depending on the relative sizes of the income effects in core and periphery. The larger the boost to peripheral income as a result of exit, α , the higher is the probability that the monetary union dissolves as the LHS is smaller and the stability condition is thus less likely to be satisfied. The fact that the impact on income is asymmetric ($\beta \neq \alpha$) is a destabilising factor in itself. If the income effect were identical and negative for both regions, as for example in Bolton and Roland (1997), the LHS would always be positive and the monetary union would be inherently stable for $\rho = 0$.

As for the attitude towards the monetary union, the higher the valuation of the public good as captured by m_c , the more stable is the Eurozone. The recent surge of Euroscepticism can be reinterpreted as $m_c \rightarrow 0$. This implies that the Euro Area is now more prone to break-up as the RHS of (4.11) increases for low values of the preference parameter, meaning that the stability condition is less likely to be satisfied.

4.3.5 EU welfare

While stability considerations are obviously crucial for any institutional reform, a revision of institutional rules also needs to take into account the resulting welfare implications. EU welfare takes the form of a utilitarian welfare function so that EU welfare is simply the sum of countries' utilities. Assuming condition (4.11)

⁷ The result is driven by the assumption that the losses due to the haircut and the losses in case of the core's exit are similar as previously discussed.

holds, EU welfare in the status quo amounts to:

$$W^{SQ} = n_p U_p^{SQ} + n_c U_c^{SQ} = n_p y_p + n_c y_c + \frac{n_p}{4} (m_p + \kappa m_c n_c)^2 - \rho n_p R, \quad (4.12)$$

where the solutions for g^{SQ} and T^{SQ} have been substituted. W^{SQ} constitutes the minimum level of total welfare any institutional reform should provide. Note that EU welfare is lowered by the amount of peripheral debt obligations owed to foreigners. Peripheral debt held by Eurozone nationals, by contrast, simply leads to a redistribution between creditor and debtor countries and thus does not impact EU welfare as a whole.

In the “muddling through” scenario, the periphery’s utility within the union is always the same as under separation so that $U_p^{SQ} = U_p^S$. Assuming condition (4.11) holds, the core’s utility differs from the autarky case and is given by:

$$U_c^{SQ} = y_c - \frac{n_p}{n_c} (\alpha - 1) y_p + \kappa m_c n_p \frac{m_p + \kappa m_c n_c}{2} - \frac{n_p}{n_c} \frac{(\kappa m_c n_c)^2}{4} + \frac{n_p}{n_c} \gamma h R - \frac{n_p}{n_c} \rho (1 - h) R.$$

An institutional reform is said to be feasible if both the periphery and the core are at least as well off after the reform as they are in the status quo.

4.4 The ESM: an orderly default mechanism

In February 2012, Eurozone leaders signed the treaty establishing the European Stability Mechanism (ESM) which now awaits ratification by the parliaments of all 17 member states. Intended to substitute the temporary crisis management framework, the ESM initially provided for orderly debt restructuring, meaning that insolvent countries would be able to default *while* being a member of the monetary union.⁸ In the context of the model, all creditors consequently suffer haircuts irrespective of a periphery country’s exit. If the periphery remains a member of the union, its utility function is therefore given by:

$$U_p = (1 - \tau) y_p + m_p \sqrt{g} + T + \mu h R, \quad (4.13)$$

⁸ As previously mentioned, the requirements for private sector involvement have been watered down (European Council, 9.12.2011).

where the corresponding budget constraint (4.2) is changed accordingly to take into account the haircut. Similar to the status quo, both the periphery and the core can leave the single currency area if the benefits of doing so outweigh the costs. The periphery's utility function and budget constraint in case of exit are identical to the "muddling through" scenario and given by equations (4.3) and (4.4) respectively. If the core country stays in the union with the periphery, core creditors also suffer a haircut and the core's utility function becomes:

$$U_c = y_c + \kappa m_c n_p \sqrt{g} - \frac{n_p}{n_c} T + \frac{n_p}{n_c} h \gamma R, \quad (4.14)$$

while its utility under autarky is the same as in the status quo and is given by (4.6).

Deriving the stability condition proceeds similarly to the status quo and only major results are reported. Anticipating the periphery's NSC, the minimum bailout which is required to preserve the union amounts to:

$$T^{ESM} = (\alpha - 1)y_p + g - m_p \sqrt{g} + \frac{m_p^2}{4}. \quad (4.15)$$

Solving the optimisation problem yields the same level of public good provision as in the "muddling through" scenario, meaning that $g^{SQ} = g^{ESM}$. From (4.15), it follows that while the core still needs to compensate the periphery for the foregone income gain, $(\alpha - 1)y_p$, and the difference in the net utility from public good provision in order to entice the latter to keep the single currency, the transfer no longer includes external debt obligations. Although the core taxpayer suffers a haircut, she also benefits from the ESM, as summarised by the following lemma:

Lemma 4.2. *An orderly default mechanism renders it impossible for the periphery to externalise its external debt obligations onto the core countries. As a result, the bailout, T^{ESM} , is smaller than in the status quo. For $\rho > 0$, the reduction in the bailout is larger than the loss incurred by creditors due to the haircut so that the ESM generates a net benefit for core citizens.*

Proof. Recall that, taking into account the bailout T^{SQ} , the net return on lending in the status quo is given by $\frac{n_p}{n_c} \gamma h R - \frac{n_p}{n_c} (1 - h) \rho R$. As the bailout T^{ESM} does not include any debt obligations and all creditors suffer a haircut, the net return on lending under the ESM amounts to $\frac{n_p}{n_c} \gamma h R$ and is consequently larger. The ESM consequently benefits core citizens for $\rho > 0$. \square

The sovereign debt restructuring mechanism thus puts an end to the implicit socialisation of peripheral debt which occurs in the “muddling through” scenario. Since the core no longer has to assist the periphery in making foreign creditors whole, the core taxpayer is better off.

Finally, the core is incentivised to continue its membership in the Euro Area if the following stability condition holds:

$$\frac{n_c}{n_p}(1 - \beta)y_c - (\alpha - 1)y_p \geq -\frac{1}{4}\kappa m_c n_c(2m_p + \kappa m_c n_c). \quad (4.16)$$

Unlike in (4.11), payments to creditors outside the Eurozone no longer appear on the RHS of the stability condition. This means that the stability condition is more likely to be satisfied under the ESM. The union’s sustainability no longer depends on the distribution of peripheral debt between Eurozone and non-Eurozone creditors. Contrary to the widespread view as for example stated by De Grauwe (2010b), an orderly default mechanism thus stabilises the Eurozone. Intuitively, allowing a periphery state to default while remaining in the union restricts its bargaining power by reducing the benefits of Eurozone exit. As a result, the periphery no longer receives compensation for foregone savings regarding debt repayments. Since bailing out the periphery has become cheaper and the core taxpayer is better off, the core is now more likely to support the single currency. The ESM’s stabilising effect is thus a direct result of the smaller cash transfer T^{ESM} , as described in Lemma 4.2.

Assuming condition (4.16) holds, EU welfare under the ESM is given by:

$$W^{ESM} = n_p y_p + n_c y_c + \frac{n_p}{4}(m_p + \kappa m_c n_c)^2 - \rho n_p h R. \quad (4.17)$$

Compared to the welfare in the status quo as given by (4.12), an institutional reform that implements an orderly default mechanism is thus welfare-improving. As the level of public good provision is the same under both scenarios, however, this increase in EU welfare results from the debt write-off, hR , and thus comes at the expense of non-Eurozone creditors who have to suffer a haircut. It is important to note that the ESM and the status quo scenario perform equally well regarding stability and welfare if peripheral debt is not held outside the Eurozone ($\rho = 0$).

The periphery’s utility is identical under both institutional settings, meaning that it is indifferent as to whether to introduce the ESM. The core, by contrast,

benefits from an orderly default mechanism, as shown in Lemma 4.2. Its utility is higher than in the status quo and amounts to:

$$U_c^{ESM} = y_c - \frac{n_p}{n_c}(\alpha - 1)y_p + \kappa m_c n_p \frac{m_p + \kappa m_c n_c}{2} - \frac{n_p}{n_c} \frac{(\kappa m_c n_c)^2}{4} + \frac{n_p}{n_c} \gamma h R.$$

Implementing an orderly default mechanism is consequently feasible as the institutional reform is supported by the core.

4.5 Political union (PU): economic governance

4.5.1 Institutional set-up

Proposals to reinforce closer co-ordination among member states and to strengthen the economic governance of the Euro Area were first outlined in August 2011 and advanced at the European summits in October and December 2011 (European Council, 26.10.2011 and 9.12.2011). Initially, it was thought that enhanced integration required limited changes to the European Treaties. Following the UK's veto at the December summit, however, the so-called Fiscal Compact was set up as an intergovernmental treaty which was signed by 25 EU member countries in March 2012 and now awaits ratification by national parliaments.

While the concept of economic governance is yet to be defined by policymakers, ideas which have been discussed include harmonising corporate tax rates, electing a Eurozone president and implementing balanced budget rules. The main element of the Fiscal Compact is the requirement for signatory countries to adopt balanced budget rules at the national level. Although this has been hailed as the first step towards a fiscal union, member states effectively maintain their sovereignty over fiscal policy. Regulations have been drafted, however, in order to give the European Commission more powers to scrutinise the budgets of member states which are subject to an excessive deficit procedure or which receive financial assistance (European Council, 21.2.2012). With the European Commission being able to comment on draft budgets, monitor execution and propose amendments, member states' sovereignty is potentially restricted (European Council, 26.10.2011). Since neither proposal provides for a larger federal budget, the economic governance concept resembles a political rather than a fiscal union.

The model set-up is adapted in order to analyse the potential stability effects

of such a union. Similar to the status quo, the economic governance initiative does not pool resources into a common federal budget to finance the peripheral public good. Unlike the “muddling through” scenario, political co-ordination assumes the existence of a central planner, e.g. the European Commission, who maximises EU welfare. Drawing on some important lessons from the fiscal federalism literature (Oates, 1972), centralised decision-making can be beneficial since it internalises cross-country spillovers. The downside of centralisation is that public good provision does not necessarily reflect the wishes of the populace since acquiring information on local tastes tends to be costly (Ruta, 2005).

Compared to the “muddling through” scenario, the major difference in the model set-up is that the local preference parameters m_p and m_c are now replaced with the preference parameter of the European planner, denoted by m_e , reflecting the fact that the planning institution might be ignorant of local tastes.⁹ Moreover, the central planner maximises EU welfare. Similar to the status quo, the core and the periphery can secede from the union and they will do so if their utility under autarky is higher.

4.5.2 Results

The European planner maximises the following utilitarian welfare function:

$$\begin{aligned} & n_p U_p + n_c U_c \\ = & n_p \left((1 - \tau_p) y_p + m_e \sqrt{g} + T + \mu R \right) + n_c \left(y_c + \kappa m_e n_p \sqrt{g} - \frac{n_p}{n_c} T + \frac{n_p}{n_c} \gamma R \right), \end{aligned}$$

with respect to g subject to the periphery’s budget constraint (4.2). Solving for g , public good provision in the political union amounts to:

$$g^{PU} = \left(\frac{(1 + \kappa n_c) m_e}{2} \right)^2, \quad (4.18)$$

which is equivalent to the socially optimal level in (4.10) if member states are homogeneous and their preferences are identical to m_e . The parameter m_e can be thought of as representing the tastes of the European Commission, which is likely to receive more powers in a political union and follows its own political agenda. For simplicity, it is assumed that the European planner has the same tastes as

⁹ Standard models examining centralised provision in the context of two local public goods usually assume uniform provision of the public goods, see for example Besley and Coate (2003). Using m_e as the planner’s preference parameter has a similar effect.

the core countries so that m_e is set equal to m_c in the following. This approach captures the idea that ‘German-style’ policies might be imposed upon periphery countries.

Having determined g^{PU} , the question arises whether closer co-ordination in a political union makes the Euro more sustainable and incentivises both core and periphery to keep the common currency. A periphery country continues membership in the union if the utility of doing so is higher than under autarky:

$$y_p - R - \frac{((1 + \kappa n_c)m_c)^2}{4} + m_p \frac{(1 + \kappa n_c)m_c}{2} + T + \mu R \geq \alpha y_p + \frac{m_p^2}{4} + (\mu - 1)hR.$$

Rearranging gives the minimum bailout required to prevent the periphery from leaving the single currency area:

$$T^{PU} = (\alpha - 1)y_p + \frac{((1 + \kappa n_c)m_c)^2}{4} - m_p \frac{(1 + \kappa n_c)m_c}{2} + \frac{m_p^2}{4} + (\gamma + \rho)(1 - h)R. \quad (4.19)$$

It turns out that the periphery can still externalise part of its external debt obligations onto the core taxpayer, leading to the following lemma:

Lemma 4.3. *Enhanced co-ordination does not eliminate implicit debt socialisation as the extent of debt borne by each core country, $(\gamma + \rho)(1 - h)R$, is identical to the status quo.*

If member states are homogeneous in their preferences ($m_c = m_p$), the magnitude of the bailout is the same as in the ‘muddling through’ scenario. For heterogeneous preferences, however, the bailouts differ in size. In the limit case where $m_c \rightarrow 0$, which reflects the recent surge of Euroscepticism in the core, the transfer to the periphery is indeed larger than in the current setting. The intuition behind this result is that the periphery has to be compensated for the utility loss resulting from the imposition of policies which ignore peripheral interests, i.e. for a very low level of public good provision. Otherwise, the periphery would be incentivised to leave the Euro Area and set g according to its wishes. For sufficiently low levels of m_c relative to m_p , a political union is thus likely to entail larger bailouts, thereby accelerating the move towards a transfer union.¹⁰

¹⁰ For relatively high levels of m_c relative to m_p , the results are not as clear-cut. $T^{PU} > T^{SQ}$ if the following condition holds: $m_p^2 - (2 + 2\kappa n_c)m_p m_c + (1 + 2\kappa n_c)m_c^2 > 0$.

Similarly, a core country has an incentive to keep the Euro if the benefits of doing so outweigh the costs. If the tastes of the planner are identical to those of the core countries, the bailout determined by the planner is unlikely to exceed the minimum transfer required to hold the union together, T^{PU} . Inserting T^{PU} and g^{PU} in the core's utility function gives the following stability condition:

$$\begin{aligned} \frac{n_c}{n_p}(1 - \beta)y_c - (\alpha - 1)y_p \geq \\ \frac{1}{4}m_p(m_p - (2 + 2\kappa n_c)m_c) + \frac{1 - (\kappa n_c)^2}{4}m_c^2 + (1 - h)\rho R. \end{aligned} \quad (4.20)$$

When comparing this expression to the stability condition of the status quo given in (4.11), the following lessons can be drawn. Firstly, if all member states exhibit homogeneous preferences, the institutional setting does not matter since both scenarios are equally stable. Secondly, in the more relevant case where preferences are heterogeneous, the political union is indeed more prone to break-up, thus contradicting claims made in the policy literature. The results are summarised in the following proposition:

Proposition 4.2. *For $m_c = m_p$, the political union and the status quo are equally sustainable. If the core and the periphery differ in their tastes ($m_c \neq m_p$), the political union is less stable than the “muddling through” scenario.*

Proof. See Appendix. □

Rather than meeting its stated objective of making the Euro more sustainable, the economic governance initiative further destabilises the monetary union. If preferences are heterogeneous ($m_c \neq m_p$), public good provision is distorted and differs from the socially optimal level. EU welfare is consequently lower than in the status quo. Taking the effects on welfare and stability into account, European policymakers should be advised against the implementation of a political union. Finally, even if the European planner is perfectly informed about local tastes, i.e. the local preference parameters are not replaced with m_e , economic governance yields exactly the same results as the “muddling through” scenario regarding both the stability and the welfare of the union and therefore does not provide any advantages over the current institutional set-up.

4.6 Fiscal union (FU)

In a monetary union cum fiscal union, the peripheral public goods are centrally provided and funded via union-wide income taxes. The tax rates can be differentiated with respect to the individual's place of residence and are denoted by τ_c and τ_p respectively. While public good provision is financed through a common EU budget, debt and interest repayments still have to be paid for by the individual periphery country so that there is no official socialisation of debt. The debt servicing costs, R , are financed with a lump sum tax so that the net effect of debt holdings and debt repayments in the periphery amounts to $(\mu - 1)R$. The utility function of an individual living in the periphery consequently becomes:

$$U_p = (1 - \tau_p)y_p + m_p\sqrt{g} + (\mu - 1)R. \quad (4.21)$$

Replacing the previous cash transfer T with an income tax τ_c , the core's utility function is now given by:

$$U_c = (1 - \tau_c)y_c + \kappa m_c n_p \sqrt{g} + \frac{n_p}{n_c} \gamma R. \quad (4.22)$$

Finally, the common budget constraint in the EU amounts to:

$$n_p g = n_p \tau_p y_p + n_c \tau_c y_c, \quad (4.23)$$

as there are n_p peripheral public goods to be funded by the EU. All other assumptions as well as the utility functions under autarky remain unchanged.

4.6.1 FU with exit clause

First consider a scenario where the treaty establishing the fiscal union includes an explicit exit clause, thereby making it possible for countries to secede in a relatively costless and orderly fashion. Similar to the status quo, this institutional set-up can be described as a two-stage game. In the first stage, the amount of public good provision is determined by majority vote, i.e. by the core countries. Then periphery countries decide whether to leave the FU or not. Introducing an explicit exit clause enhances the periphery's bargaining power. When choosing g , the core countries have to make sure that the periphery's utility as a member of the FU is at least tantamount to that after exit, i.e. that $U_p \geq U_p^S$. As a result, the core maximises its utility (4.22) with respect to g , τ_p , and τ_c subject to the

common budget constraint (4.23) and the periphery's non-separation constraint (NSC):

$$(1 - \tau_p)y_p + m_p\sqrt{g} + (\mu - 1)R \geq \alpha y_p + \frac{m_p^2}{4} + (\mu - 1)hR.$$

Solving the optimisation problem yields the following level of public good provision:

$$g^{FE} = \left(\frac{m_p + \kappa m_c n_c}{2} \right)^2, \quad (4.24)$$

which is equivalent to the socially optimal level in (4.10). As the periphery's NSC holds with equality, inserting g^{FE} and solving for the periphery's tax rate gives:

$$\tau_p^{FE} = (1 - \alpha) + \frac{m_p^2}{4y_p} + \frac{\kappa m_c m_p n_c}{2y_p} + (1 - h)(\mu - 1)\frac{R}{y_p}.$$

The core's tax rate is derived by plugging the values for g^{FE} and τ_p^{FE} into the common budget constraint yielding:

$$\tau_c^{FE} = \frac{n_p}{n_c y_c} \left((\alpha - 1)y_p + \frac{(\kappa m_c n_c)^2}{4} + (\gamma + \rho)(1 - h)R \right).$$

Although Eurobonds do not exist in this scenario and the periphery is officially responsible for repaying its own obligations, peripheral debt is partly paid off by the core countries, as stated by the following lemma:

Lemma 4.4. *In a fiscal union with an explicit exit clause, implicit debt socialisation occurs as each periphery country is able to externalise part of its external debt obligations onto the core taxpayer. The amount of debt borne by each core citizen, $(\gamma + \rho)(1 - h)R$, is the same as in the “muddling through” scenario.*

From a moral hazard point of view, this set-up therefore does not provide any advantage over the “muddling through” scenario.

When comparing the levels of public good provision and each country's net contribution with the status quo, it turns out that both scenarios yield the same results, leading to the following proposition:

Proposition 4.3. *The real variables are unaffected by an institutional reform which implements a fiscal union with exit clause, and EU welfare is identical to the “muddling through” scenario.*

Proof. As for g , this follows directly from a comparison of (4.10) and (4.24). Regarding the core's net contribution, compare $\frac{n_p}{n_c}T^{SQ}$ and $\tau_c^{FE}y_c$. As for the periphery's net contribution, compare $\tau_p y_p - T^{SQ} - \mu R$ and $\tau_p^{FE}y_p + (1 - \mu)R$. \square

Funding the peripheral public good via income taxes rather than via a direct bailout therefore does not enhance EU welfare. Furthermore, none of the countries can individually fare better in a fiscal union by shifting their burden of financing onto the rest of the federation.

Finally, the core has an incentive to remain a member of the Euro Area if the utility of staying is higher than the utility of leaving, i.e. $\Delta_c = U_c^{FE} - U_c^S \geq 0$. Using the solutions for g^{FE} , τ_p^{FE} and τ_c^{FE} , the following stability condition can be derived:

$$\frac{n_c}{n_p}(1 - \beta)y_c - (\alpha - 1)y_p \geq -\frac{1}{4}\kappa m_c n_c(2m_p + \kappa m_c n_c) + \rho(1 - h)R, \quad (4.25)$$

which is equivalent to the condition in the status quo, implying that both institutional settings are also equally stable.

Intuitively, both EU welfare and the Euro's sustainability depend on the political bargaining process which is determined by the periphery's bargaining power. The latter is driven by the differences in income y_p , debt servicing costs R and net utilities of public good provision between the respective setting and autarky. If both cash transfers (T) and income taxes (τ_p, τ_c) are non-distortive, meaning that there is no deadweight loss of raising funds for public good provision, citizens' consumption of the public good is the same irrespective of the source of funding. This implies that income, debt and the utility of the public good are not affected when switching from cash bailouts to union-wide income taxes, thus neither weakening nor strengthening the periphery's bargaining position. As a result, EU welfare and the Eurozone's stability are identical to the "muddling through" scenario. What matters is not so much the source of funding, provided taxation does not distort citizens' consumption choices, but the fact that the periphery can credibly threaten to leave the union.

4.6.2 FU without exit clause

Now consider a fiscal union which is irreversible once the new treaty is signed. This is modelled by assuming that Eurozone exit involves a large procedural cost λ for the periphery. Similar to the previous scenarios, the core countries are in

the majority and can therefore set g according to their wishes. In this setting, two cases need to be distinguished, depending on the size of the procedural cost.

If λ is sufficiently small so that the benefits of Eurozone exit still outweigh the total costs, the periphery can credibly threaten to abandon the single currency. In this case, the policy game yields the same results as in a fiscal union with exit clause with one minor difference: introducing a procedural cost lowers the gains of secession as the periphery's utility under autarky falls by λ , thus weakening its bargaining position.¹¹ While public good provision is still at its social optimum, part of the burden of funding g is therefore redistributed to the periphery.

If the procedural costs are sufficiently large to offset any gains from leaving the union, by contrast, Eurozone exit is inconceivable and the periphery's secession threat is no longer credible. As a result, the policy game has no second stage where periphery countries decide whether to secede. If the fiscal union is unlikely to dissolve, the core maximises its own utility (4.22) with respect to g subject to the common budget constraint (4.23), resulting in the following level of public good provision:

$$g^{FU} = \left(\frac{\kappa m_c n_c}{2} \right)^2, \quad (4.26)$$

and a potentially infinite tax τ_p on the periphery countries. Note that while the core is incentivised to impose the highest possible τ_p , it faces an upper bound since an exploitative tax rate renders Eurozone exit attractive for the periphery, despite the existence of procedural costs. In a fiscal union with large exit costs, the peripheral public good is underprovided since the core no longer takes into account the periphery's interests. Irrespective of the exact level of τ_p , an institutional reform which implements a fiscal union excluding an exit option lowers EU welfare compared to the status quo. Although the core is less likely to leave the Eurozone, thereby making this setting more stable than the "muddling through" scenario, the reform would entail a welfare cost for the entire Euro Area. In addition, introducing this type of fiscal union is not feasible since the electorate in the periphery, correctly anticipating that it is worse off for low levels of m_c , is unlikely to vote for the reform.

¹¹The previous section on the fiscal union with exit clause can thus be interpreted as the limit case where $\lambda = 0$.

4.6.3 A note on Eurobonds

Throughout the Eurozone crisis, policymakers and economists have floated the idea of Eurobonds as a solution to the crisis, meaning that the Eurozone would jointly guarantee the public debt of other member states.¹² The *Lisbon Treaty* currently prohibits any joint liability of member states and this interdiction was recently upheld by a ruling of the German Constitutional Court. If the European Treaties are to be renegotiated as presently discussed, however, Eurobonds might become legal. In order to analyse their potential effects within the current model, the fiscal union with exit clause set-up is extended by assuming that the costs of debt repayment are officially shared amongst all members states. The utility functions consequently become:

$$U_p = (1 - \tau_p)y_p + m_p\sqrt{g} + \mu R - \frac{n_p}{n}R$$

$$U_c = (1 - \tau_c)y_c + \kappa m_c n_p \sqrt{g} + \frac{n_p}{n_c} \gamma R - \frac{n_p}{n}R,$$

where the total peripheral debt obligations $n_p R$ are divided equally amongst the n Eurozone countries.¹³

Surprisingly, introducing Eurobonds makes no difference as the real variables are unaffected. Public good provision as well as the core's and periphery's net contributions are identical to the status quo and the fiscal union with exit clause. Consequently, Eurobonds neither improve EU welfare nor do they stabilise the Eurozone since the stability condition is the same as in equations (4.11) and (4.25). Recalling Lemmata 4.1 and 4.4, these results can be explained by the fact that debt socialisation already occurs, albeit implicitly, in the other institutional settings.

It is important to note that these results are derived under the assumption that R is exogenous. In a set-up where R is determined by the markets prior to the first stage of the political game, Eurobonds possibly affect interest rates and thus the size of the debt obligations. If the joint guarantee lowers R compared to the status quo, the Eurozone is indeed more stable and Eurobonds are welfare-improving. There are, however, two caveats to this analysis. Firstly, the effect of Eurobonds on Eurozone interest rates is a matter of considerable debate. Secondly, introducing an orderly default mechanism might do the same

¹² Amongst the most prominent proponents are the former Italian finance minister Giulio Tremonti and Jean-Claude Juncker, the President of the Euro Group.

¹³ Alternatively, the common budget constraint can be changed to include $n_p R$.

trick. Which of the two settings, i.e. ESM or Eurobonds, is more beneficial depends on the relative size of the debt reduction which is generated by either haircuts or lower interest rates.

Regardless of the impact of a joint guarantee on R , the following corollary can be made:

Corollary 4.1. *Eurobonds are ineffective in stabilising the monetary union if peripheral debt is mainly held by member states.*

This follows directly from Proposition 4.1.

4.7 Concluding remarks: can a ‘closer union’ save the Euro?

Euro critics and proponents of Mundell’s theory of optimum currency areas have argued that the European monetary union is doomed to fail unless it is complemented by a political or a fiscal union, and have consequently called for closer European integration. Based on a simple political economy approach where creditor countries are in the majority and determine European policies, this chapter casts some doubts on their claim that solely a ‘closer union’ can save the Euro. In particular, the model shows that the current “muddling through” scenario is surprisingly stable. Intuitively, the recent hardship experienced by citizens living in the periphery has lowered the costs of exiting the union, thus rendering the periphery’s secession threat credible and strengthening its bargaining position. In order to prevent the peripheral countries from leaving, the core is incentivised to internalise the periphery’s interests and provide the socially optimal level of the peripheral public good. As shown in Lemma 4.1, the periphery is also able to externalise part of its debt obligations onto the core taxpayer so that the current institutional framework constitutes already, albeit implicitly, a transfer or debt union. Another important insight, summarised in Proposition 4.1, is that the probability of a Eurozone break-up increases with the amount of peripheral debt held by creditors outside the Euro Area.

In the policy literature, the pre-crisis setting, in which the no-bailout clause is binding and transfers do not occur, usually serves as the benchmark for comparison with alternative institutional set-ups. This chapter departs from this approach by employing the more relevant “muddling through” scenario as the reference case against which to judge any institutional reform. When doing so, it turns out that neither a political union nor a fiscal union make the Euro more

sustainable compared to the status quo. As shown in Proposition 4.2, if countries differ in their preferences for the peripheral public good, a political union is even *more* prone to break-up. The intuition behind this result is that the periphery has to be compensated for the policies imposed by the European central planner, e.g. the European Commission. As a result, bailouts are more costly and Eurozone exit becomes more attractive for the core.

The stability implications of a fiscal union depend on the concrete institutional set-up. A fiscal union with explicit exit clause yields exactly the same results as the status quo and is therefore equally stable. If the fiscal union is irreversible, by contrast, EU welfare is lower than in the status quo. As the core imposes a high tax on the periphery, the electorate in the latter is also unlikely to support this institutional reform. Both arguments imply that introducing a fiscal union excluding an exit option does not represent a feasible solution to the debt crisis. Finally, contrary to claims made in the policy literature, introducing Eurobonds into the model improves neither EU welfare nor the Eurozone's sustainability. This result can be explained by the fact that implicit debt socialisation already occurs in the other institutional settings. An official scheme of debt socialisation which makes member states jointly liable for peripheral debt therefore does not make any difference. Interestingly, Eurobonds are ineffective in stabilising the monetary union if peripheral debt is mainly held by Eurozone creditors.

The Eurobonds scenario does, however, reveal some shortcomings of the modelling approach. As the sovereign debt market is not explicitly modelled and debt obligations are exogenous, the model does not take into account the interdependence between the institutional setting and debt servicing costs. For example, Eurobonds will have a stabilising effect if they succeed in reducing peripheral interest rates. Whether they do so and whether any of the other institutional settings affect interest rates has been a matter of considerable debate. Although the model holds debt constant, it offers some important insights into the political bargaining process and its implications for the stability of the monetary union. Most importantly, the chapter questions the conventional wisdom that the Euro cannot survive without closer integration.

The model's main policy recommendation is that implementing an orderly default mechanism as well as inserting an exit clause into the European Treaties might prove more effective in preventing a Eurozone break-up than far-reaching institutional reforms which further transfer sovereignty from the national to the European level. Allowing countries to default while remaining a member of the

union restricts the periphery's bargaining power and mitigates moral hazard as periphery countries are no longer able to externalise their debts onto the core taxpayer. As a result, the bailout is smaller and core countries have a stronger incentive to remain in the union. Given their stabilising effect, policymakers are urged not to abandon their efforts to implement an orderly default mechanism as part of the European Stability Mechanism (European Council, 9.12.2011). While the insight that an explicit exit clause makes the monetary union more stable seems counterintuitive, this is a well-known result in the fiscal federalism literature. Granting countries the right to secede protects the minority, i.e. the periphery, from exploitation by the majority, here the creditor countries. Facilitating Eurozone exit by introducing an official exit procedure makes sure that the minority has a voice in the policymaking process. A similar point is made by Roubini (2011) who argues that comparable to "a broken marriage that requires a break-up, it is better to have rules that make separation less costly to both sides". Interestingly, introducing an orderly default mechanism and extending the current exit clause would probably require only minor changes to the European Treaties, which means that these reforms are also easier to implement than a comprehensive overhaul of the EU's institutional structure. In November 2011, Merkel's conservative CDU party passed a resolution calling for amendments to the *Lisbon Treaty* which would allow voluntary Eurozone exit without giving up EU membership (Boston and Lane, 2011).

Whilst the outlook for the Eurozone remains uncertain and the disintegration of the monetary union cannot be completely ruled out, the model suggests that it might be too early to compose the Euro's obituary. The chapter has shown that the current piecemeal approach to crisis management is more sustainable than previously thought and that minor changes to the European Treaties could improve the stability of the monetary union. The Eurozone is consequently likely to continue to "bob along" (Bremmer, 2011a). These predictions are echoed by Buitter and Rahbari (2011) who discard both dissolution and fiscal union as potential outcomes of the crisis and endorse a third alternative entitled 'You Break it, You Own it Europe'. The latter is described as the "minimum institutional, fiscal and regulatory framework to ensure the long-term survival" of the Euro Area. It comprises a sufficiently large liquidity facility intended to support illiquid but solvent sovereigns and banks, an orderly default mechanism for insolvent member states and a resolution regime for European banks. Recent EU summits have made some progress in this respect. With European solidarity continuing

to erode, however, Buiter and Rahbari (2012) have recently raised the estimated probability of Greek exit from the Euro, dubbed 'Grexit', over the next 18 months from 25 to 50 per cent.

It remains to be seen whether the Fiscal Compact will mark the turning point in the two-year long sovereign debt crisis, as has been suggested by policymakers. Gros (2012) argues that the treaty has been oversold and, contrary to policymakers' claims, does not represent the first step towards a closer union. Moreover, national politics might once again derail the Eurozone's crisis strategy and endanger the ratification of the treaty. Firstly, the Irish Constitution requires that the Fiscal Compact is put to a referendum due to be held on May 31. Secondly, French presidential frontrunner François Hollande announced that he would seek a renegotiation of the treaty if elected in May. At least in the short run, the Fiscal Compact is thus likely to create further uncertainty.

4.A Status quo

The core maximises (4.5) with respect to g subject to the non-separation constraint. Inserting T^{SQ} into the core's utility function, the maximisation problem boils down to:

$$\max_g U_c = y_c + \kappa m_c n_p \sqrt{g} - \frac{n_p}{n_c} \left((\alpha - 1) y_p + g - m_p \sqrt{g} + (\gamma + \rho)(1 - h)R + \frac{m_p^2}{4} \right) + \frac{n_p}{n_c} \gamma R,$$

yielding the following FOC:

$$-\frac{n_p}{n_c} + \frac{n_p}{n_c} \frac{m_p}{2\sqrt{g}} + \frac{\kappa m_c n_p}{2\sqrt{g}} = 0.$$

Solving for g gives:

$$g^{SQ} = \left(\frac{m_p + \kappa m_c n_c}{2} \right)^2.$$

4.B Proof of Proposition 4.2

For the first statement, set $m_p = m_c$ in equations (4.11) and (4.20) and compare the resulting stability conditions. The second statement can be derived by comparing the RHS of equations (4.11) and (4.20) respectively. If the RHS of (4.20) is larger than the RHS of (4.11), the political union is more prone to break-up. The political union is consequently more likely to dissolve if:

$$\frac{m_p^2}{4} - \frac{m_c m_p}{2} - \frac{\kappa n_c m_c m_p}{2} + \frac{m_c^2}{4} - \frac{(\kappa n_c m_c)^2}{4} > -\frac{(\kappa n_c m_c)^2}{4} - \frac{\kappa n_c m_c m_p}{2}$$

$$m_p^2 - 2m_c m_p + m_c^2 > 0.$$

The last line can be rewritten in form of the binomial $(m_p - m_c)^2$ which is always positive, regardless of the difference in preferences. It follows that the political union is always less stable than the status quo for $m_c \neq m_p$.

4.C FU with exit clause

The core maximises (4.22) with respect to g subject to (4.23) and the non-separation constraint. Using a Lagrange function, the maximisation problem

becomes:

$$\begin{aligned} \max_{g, \tau_p, \tau_c} L = & (1 - \tau_c)y_c + \kappa m_c n_p \sqrt{g} + \frac{n_p}{n_c} \gamma R \\ & + \lambda_1 ((1 - \tau_p)y_p + m_p \sqrt{g} + (\mu - 1)R - U_p^S) \\ & + \lambda_2 (n_p \tau_p y_p + n_c \tau_c y_c - n_p g), \end{aligned}$$

which results in the following FOCs:

$$\begin{aligned} -y_c + \lambda_2 n_c y_c = 0 & \Rightarrow \lambda_2 = \frac{1}{n_c} \\ -\lambda_1 y_p + \lambda_2 n_p y_p = 0 & \Rightarrow \lambda_1 = \frac{n_p}{n_c} \\ \frac{\kappa m_c n_p}{2\sqrt{g}} + \lambda_1 \frac{m_p}{2\sqrt{g}} - \lambda_2 n_p = 0. \end{aligned}$$

Using the solutions for λ_1 and λ_2 , public good provision is given by:

$$g^{FE} = \left(\frac{m_p + \kappa m_c n_c}{2} \right)^2.$$

4.D FU without exit clause

The core maximises (4.22) with respect to g subject to (4.23). Using a Lagrange function, the maximisation problem becomes:

$$\max_{g, \tau_p, \tau_c} L = (1 - \tau_c)y_c + \kappa m_c n_p \sqrt{g} + \frac{n_p}{n_c} \gamma R + \lambda (n_p \tau_p y_p + n_c \tau_c y_c - n_p g),$$

which leads to the following FOCs:

$$\begin{aligned} -y_c + \lambda n_c y_c = 0 & \Rightarrow \lambda = \frac{1}{n_c} \\ \frac{\kappa m_c n_p}{2\sqrt{g}} - \lambda n_p = 0, \end{aligned}$$

and a potentially infinite tax τ_p . Using the solution for λ , public good provision amounts to:

$$g^{FU} = \left(\frac{\kappa m_c n_c}{2} \right)^2.$$

Bibliography

- Akai, N. and Sato, M. (2008). Too big or too small? A synthetic view of the commitment problem of interregional transfers. *Journal of Urban Economics*, 64:551–559.
- Akai, N. and Silva, E. C. (2009). Interregional redistribution as a cure to the soft budget syndrome in federations. *International Tax and Public Finance*, 16:43–58.
- Alesina, A., Angeloni, I., and Etro, F. (2005). International Unions. *The American Economic Review*, 95(3):602–615.
- Alesina, A., Perotti, R., and Spolaore, E. (1995). Together or separately? Issues on the costs and benefits of political and fiscal unions. *European Economic Review*, 39:751–758.
- Alesina, A. and Spolaore, E. (2003). *The Size of Nations*. The MIT press.
- Athanassiou, P. (2009). Withdrawal and expulsion from the EU and EMU: some reflections. ECB Legal Working Paper Series, No. 10.
- Bayoumi, T., Goldstein, M., and Woglom, G. (1995). Do Credit Markets Discipline Sovereign Borrowers? Evidence from U.S. States. *Journal of Money, Credit and Banking*, 27(4):1046–1059.
- Besfamille, M. and Lockwood, B. (2008). Bailouts in Federations: Is a Hard Budget Constraint Always Best? *International Economic Review*, 49(2):577–593.
- Besley, T. and Coate, S. (2003). Centralized versus decentralized provision of local public goods: a political economy approach. *Journal of Public Economics*, 87:2611–2637.
- Blankart, C. B. and Klaiber, A. (2006). Subnational Government Organisation and Public Debt Crises. *Economic Affairs*, 26(3):48–54.

- Blejer, M. I. and Levy-Yeyati, E. (2010). Leaving the euro: What's in the box? VoxEU.org, 21.7.2010.
- Bolton, P. (2003). Toward a Statutory Approach to Sovereign Debt Restructuring: Lessons from Corporate Bankruptcy Practice Around the World. IMF Working Paper WP/03/13.
- Bolton, P. and Jeanne, O. (2007). Structuring and Restructuring Sovereign Debt: The Role of a Bankruptcy Regime. *The Journal of Political Economy*, 115(6):901–924.
- Bolton, P. and Roland, G. (1997). The Breakup of Nations: A Political Economy Analysis. *The Quarterly Journal of Economics*, 112(4):1057–1090.
- Bolton, P., Roland, G., and Spolaore, E. (1996). Economic theories of the break-up and integration of nations. *European Economic Review*, 40:697–705.
- Boston, W. and Lane, M. M. (2011). Merkel Party Seeks Euro Exit Policy. *The Wall Street Journal*, 15.11.2011.
- Bremmer, I. (2011a). The eurozone won't sink or swim; it will bob along. *Financial Times*, 5.12.2011.
- Bremmer, I. (2011b). Germany will never leave the eurozone. *Financial Times*, 18.10.2011.
- Breuil , M.-L., Madi s, T., and Taugourdeau, E. (2006). Does tax competition soften regional budget constraint? *Economics Letters*, 90(2):230–236.
- Breuil , M.-L., Madi s, T., and Taugourdeau, E. (2007). Funding source and soft budget constraint. *EconomiX Working Papers 2007-12*, Universit  Paris X-Nanterre.
- Breuil , M.-L., Madi s, T., and Taugourdeau, E. (2010). Gross versus net equalization scheme in a federation with decentralized leadership. *Journal of Urban Economics*, 68:205–214.
- Breuil , M.-L. and Vigneault, M. (2010). Overlapping soft budget constraints. *Journal of Urban Economics*, 67:259–269.

- Buchanan, J. M. and Faith, R. L. (1987). Secession and the Limits of Taxation: Toward a Theory of Internal Exit. *The American Economic Review*, 77(5):1023–1031.
- Buiter, W. (2011). A Greek Exit from the Euro Area: A Disaster for Greece, a Crisis for the World. Global Economics View, Citigroup Global Markets, 13.9.2011.
- Buiter, W. and Rahbari, E. (2010). Greece and the fiscal crisis in the EMU. Working Paper, 7.9.2010.
- Buiter, W. and Rahbari, E. (2011). The future of the euro area: fiscal union, break-up or blundering towards a ‘you break it you own it Europe’. Global Economics View, Citigroup Global Markets, 9.9.2011.
- Buiter, W. and Rahbari, E. (2012). Rising Risks of Greek Euro Area Exit. Global Economics View, Citigroup Global Markets, 6.2.2012.
- Buiter, W., Rahbari, E., Michels, J., and Giani, G. (2011). The Debt of Nations. Global Economics View, Citigroup Global Markets, 7.1.2011.
- Buiter, W. and Sibert, A. (2005). How the Eurosystem’s Treatment of Collateral in its Open Market Operations Weakens Fiscal Discipline in the Eurozone (and what to do about it). CEPR Discussion Paper No. 5387.
- Bullock, N. (2011). Lawmakers resist bankruptcy for US states. Financial Times, 15.2.2011.
- Bulow, J. and Rogoff, K. (1989). Sovereign Debt: Is to Forgive to Forget? *The American Economic Review*, 79(1):43–50.
- Caplan, A. J., Cornes, R. C., and Silva, E. C. (2000). Pure public goods and income redistribution in a federation with decentralized leadership and imperfect labor mobility. *Journal of Public Economics*, 77:265–284.
- Carlson, M. and Hale, G. (2005). Courage to Capital? A Model of the Effects of Rating Agencies on Sovereign Debt Roll-over. IIS Discussion Paper No. 62.
- Carlsson, H. and van Damme, E. (1993). Global Games and Equilibrium Selection. *Econometrica*, 61(5):989–1018.

- Carnegy, H. (2011). Le Pen calls for France to quit euro. *Financial Times*, 20.11.2011.
- Chaffin, J. (2011a). Eurozone exit could restore Greek competitiveness. *Financial Times*, 17.7.2011.
- Chaffin, J. (2011b). Greece: a hard puzzle to solve. *Financial Times*, 10.11.2011.
- Corsetti, G., Guimaraes, B., and Roubini, N. (2006). International lending of last resort and moral hazard: A model of IMF's catalytic finance. *Journal of Monetary Economics*, 53:441–471.
- Crivelli, E. and Staal, K. (2008). Size, Spillovers and Soft Budget Constraints. Preprints of the Max Planck Institute for Research on Collective Goods 2008/17.
- De Grauwe, P. (2010a). How to embed the Eurozone in a political union. *VoxEU.org*, 17.6.2010.
- De Grauwe, P. (2010b). A mechanism of self-destruction of the eurozone. CEPS Commentary, 9.11.2010.
- De Grauwe, P. and Ji, Y. (2012). Self-Fulfilling Crises in the Eurozone: An Empirical Test. CEPS Working Document No. 366.
- Deo, S., Donovan, P., and Hatheway, L. (2011). Euro break-up - the consequences. *Global Economic Perspectives*, UBS Investment Research, 6.9.2011.
- Diamond, D. W. and Dybvig, P. H. (1983). Bank Runs, Deposit Insurance, and Liquidity. *The Journal of Political Economy*, 91(3):401–419.
- Dreisbach, D. and Kindermann, F. (2009). Bailout in Financial Crisis - The Impact of Transparency on Moral Hazard. Working Paper.
- Dur, R. and Staal, K. (2008). Local public good provision, municipal consolidation, and national transfers. *Regional Science and Urban Economics*, 38:160–173.
- Eaton, J. and Gersovitz, M. (1981). Debt with Potential Repudiation: Theoretical and Empirical Analysis. *The Review of Economic Studies*, 48(2):289–309.

- Eaton, J., Gersovitz, M., and Stiglitz, J. E. (1986). The Pure Theory of Country Risk. *European Economic Review*, 30:481–513.
- Economist (2010). Breaking up the euro area. How to resign from the club. 2.12.2010.
- EEAG (2011). The EEAG Report on the European Economy. CESifo Munich.
- Eichengreen, B. (2007). The Breakup of the Euro Area. NBER Working Paper Series 13393.
- Eichengreen, B. (2010). The euro: love it or leave it? VoxEU.org, 4.5.2010.
- El-Erian, M. (2012). The Greek debt drama has merely paused for an interval. Financial Times, 13.3.2012.
- Eurogroup (2010). Statement by the Eurogroup, 28.11.2010.
- Eurogroup (2012a). Eurogroup statement, 21.2.2012.
- Eurogroup (2012b). Statement of the Eurogroup. 30.3.2012.
- European Central Bank (2010). Press release, 10.5.2010.
- European Commission (2012). The Second Economic Adjustment Programme for Greece. Occasional Papers 94, March 2012.
- European Council (2010a). Conclusion EUCO 30/10. Brussels, 17.12.2010.
- European Council (2010b). Press release 9596/10. Brussels, 9.5.2010.
- European Council (2011a). Conclusion EUCO 10/11. Brussels, 25.3.2011.
- European Council (2011b). Conclusion EUCO 23/11. Brussels, 24.6.2011.
- European Council (2011c). Conclusions of the Heads of State or Governments of the Euro Area. Brussels, 11.3.2011.
- European Council (2011d). Euro Summit Statement. Brussels, 26.10.2011.
- European Council (2011e). Statement by the Euro Area Heads of State or Government. Brussels, 9.12.2011.

European Council (2011f). Statement by the Heads of State or Government of the Euro Area and EU Institutions. Brussels, 21.7.2011.

European Council (2012a). Agreed lines of communication by euro area Member States. Brussels, 30.1.2012.

European Council (2012b). Council agrees on second economic governance package. Press release, 21.2.2012.

European Council (2012c). Treaty establishing the European Stability Mechanism. Brussels, 2.2.2012.

European Council (2012d). Treaty establishing the European Stability Mechanism. Factsheet, 2.2.2012.

European Council (2012e). Treaty on Stability, Coordination and Governance in the Economic and Monetary Union. Brussels, 2.3.2012.

European Union (2007a). Consolidated version of the Treaty on the Functioning of the European Union (TFEU). 2008/C 115/01, 13.12.2007.

European Union (2007b). Treaty of Lisbon Amending the Treaty on European Union and the Treaty Establishing the European Community. 2007/C 306/01, 13.12.2007.

European Union (2011). EFSF Framework Agreement.

Fahrholz, C. and Wójcik, C. (2011). A Positive Framework to Analyze Sovereign Bail-outs within the EMU. Working Papers on Global Financial Markets, No. 15.

Fay, S., Hurst, E., and White, M. (1998). The Bankruptcy Decision: Does Stigma Matter? Department of Economics Working Paper Series 98-01, University of Michigan.

Fidler, S. (2011a). An EU Currency Breakup Would be Unlike Any Other. The Wall Street Journal, 2.12.2011.

Fidler, S. (2011b). Exit Would Be Mess for Athens. The Wall Street Journal, 4.11.2011.

- Fidrmuc, J. (2011). Political Economy of Transfer Unions. CESifo Area Conference on Public Sector Economics.
- Forelle, C. (2011). A Nation of Dropouts Shakes Europe. *The Wall Street Journal*, 25.3.2011.
- Frisch, M. J. (1985). Selected Writings and Speeches of Alexander Hamilton. American Enterprise Institute for Public Policy Research.
- Gelpern, A. (2012). Bankruptcy, Backwards: The Problem of Quasi-Sovereign Debt. *The Yale Law Journal*, 121(4):888–942.
- Ghosal, S. and Miller, M. (2003). Co-Ordination Failure, Moral Hazard and Sovereign Bankruptcy Procedures. *The Economic Journal*, 113(487):276–304.
- Gianviti, F., Krueger, A. O., Pisani-Ferry, J., Sapir, A., and von Hagen, J. (2010). A European Mechanism for Sovereign Debt Crisis Resolution: A Proposal. bruegel.
- Goldstein, I. and Pauzner, A. (2005). Demand-Deposit Contracts and the Probability of Bank Runs. *The Journal of Finance*, 60(3):1293–1327.
- Goodspeed, T. J. (2002). Bailouts in a Federation. *International Tax and Public Finance*, 9(4):409–421.
- Gros, D. (2012). The Treaty on Stability, Coordination and Governance in the Economic and Monetary Union (aka Fiscal Compact). CEPS Commentary, 8.3.2012.
- Gros, D. and Mayer, T. (2010). How to deal with sovereign default in Europe: Create the European Monetary Fund now! CEPS Policy Brief, No. 202.
- Hannon, P. (2011). Imagining the Unmentionable. *The Wall Street Journal*, 16.8.2011.
- Heinemann, F. (2005). Die Theorie globaler Spiele: Private Informationen als Mittel zur Vermeidung multipler Gleichgewichte. *Journal für Betriebswirtschaft*, 55:209–241.
- Henes, J. S. and Hessler, S. E. (2011). Deja Vu, All Over Again. *New York Law Journal*, 27.6.2011.

- Henkel, H.-O. (2011). *Rettet unser Geld!* Heyne.
- Hüther, M. (2010). Europas Finanzen zwischen ordnungspolitischer Konsistenz und politischer Realität. *ifo Schnelldienst*, 63. Jahrgang, 23:3–7.
- Issing, O. (2010). Germany is right: bondholders must pay. *Financial Times*, 13.12.2010.
- Issing, O. (2011). Slithering to the wrong kind of union. *Financial Times*, 8.8.2011.
- Jenkins, R. (2011). Greek default within the euro is the only real option. *Financial Times*, 7.11.2011.
- Jonung, L. and Drea, E. (2009). The euro: It can't happen. It's a bad idea. It won't last. U.S. Economists on the EMU, 1989-2002. Economic Papers 395, European Commission.
- Kaminsky, G. L., Reinhart, C. M., and Vegh, C. A. (2003). The Unholy Trinity of Financial Contagion. NBER Working Paper No. 10061.
- Kay, J. (2011). Europe's elite is fighting reality and will lose. *Financial Times*, 25.10.2011.
- Kornai, J. (1979). Resource-constrained versus demand-constrained systems. *Econometrica*, 47(4):801–819.
- Kornai, J., Maskin, E., and Roland, G. (2003). Understanding the Soft Budget Constraint. *Journal of Economic Literature*, 41(4):1095–1136.
- Köthenbürger, M. (2004). Tax competition in a fiscal union with decentralized leadership. *Journal of Urban Economics*, 55(3):498–513.
- Köthenbürger, M. (2008). Federal tax-transfer policy and intergovernmental pre-commitment. *Regional Science and Urban Economics*, 38:16–31.
- Krueger, A. O. (2002). A New Approach To Sovereign Debt Restructuring. IMF.
- Landon, S. and Smith, C. E. (2000). Government Debt Spillovers and Creditworthiness in a Federation. *The Canadian Journal of Economics*, 33(3):634–661.

- Liu, L. (2008). Creating a Regulatory Framework for Managing Subnational Borrowing. In Lou, J. and Wang, S., editors, *Public Finance in China, Reform and Growth for a Harmonious Society*. World Bank.
- Liu, L. (2010). Strengthening Subnational Debt Financing and Managing Risks. Review of Economic Research, Ministry of Finance, China, 16.8.2010.
- Liu, L. and Waibel, M. (2008). Subnational Insolvency: Cross-Country Experiences and Lessons. Policy Research Working Paper 4496, World Bank.
- Liu, L. and Waibel, M. (2010). Managing Subnational Credit and Default Risks. In *Sovereign Debt and the Financial Crisis: Will This Time Be Different?* World Bank.
- Luque, J., Morelli, M., and Tavares, J. (2011). Fiscal Union Consensus Design under the Risk of Autarky. Working Paper, 15.7.2011.
- Mattich, A. (2011). What if Greeks Decide They Don't Want to Be Rescued? The Wall Street Journal, 17.6.2011.
- McConnell, M. W. and Picker, R. C. (1993). When Cities Go Broke: A Conceptual Introduction to Municipal Bankruptcy. *The University of Chicago Law Review*, 60(2):425–495.
- Meyer, D. (2010). Währungsdesintegration in der EURO-Zone. *Jahrbuch für Regionalwissenschaft*, 30:45–70.
- Morris, S. and Shin, H. S. (2001). Rethinking Multiple Equilibria in Macroeconomic Modeling. In *NBER Macroeconomics Annual 2000, Volume 15*, pages 139–182. MIT Press.
- Morris, S. and Shin, H. S. (2003). Global Games: Theory and Applications. In Dewatripont, M., Hansen, L. P., and Turnovsky, S. J., editors, *Advances in Economics and Econometrics*, volume I of *Econometric Society Monographs*, chapter 3, pages 56–114. Cambridge University Press.
- Morris, S. and Shin, H. S. (2004). Coordination risk and the price of debt. *European Economic Review*, 48:133–153.
- Morris, S. and Shin, H. S. (2006). Catalytic finance: When does it work? *Journal of International Economics*, 70:161–177.

- Münchau, W. (2010). This stability pact obsession is not helpful. *Financial Times*, 24.10.2010.
- Mundell, R. (1961). A Theory of Optimum Currency Areas. *The American Economic Review*, 51(4):657–665.
- Oates, W. E. (1972). *Fiscal Federalism*. Harcourt Brace Jovanovich.
- Oates, W. E. (2002). Fiscal Federalism and European Union: Some Reflections. Working Paper.
- Oates, W. E. (2008). On The Evolution of Fiscal Federalism: Theory and Institutions. *National Tax Journal*, 61(2):313–334.
- Panizza, U., Sturzenegger, F., and Zettelmeyer, J. (2009). The Economics and Law of Sovereign Debt and Default. *Journal of Economic Literature*, 47(3):651–698.
- Persson, M. (2011). The Price of the Euro in Finland. *The Wall Street Journal*, 19.4.2011.
- Proctor, C. (2011). The euro - fragmentation and the financial markets. *Capital Markets Law Journal*, 6(1):5–28.
- Prud'homme, R. (1994). On the Dangers of Decentralization. Policy Research Working Paper 1252, World Bank.
- Qian, Y. and Roland, G. (1998). Federalism and the Soft Budget Constraint. *The American Economic Review*, 88(5):1143–1162.
- Rachman, G. (2011). Political union cannot fix the euro. *Financial Times*, 20.6.2011.
- Reinhart, C. M. and Rogoff, K. (2009). *This Time is Different: Eight Centuries of Financial Folly*. Princeton University Press.
- Rochet, J.-C. and Vives, X. (2004). Coordination Failures and the Lender of Last Resort: was Bagehot right after all? *Journal of the European Economic Association*, 2(6):1116–1147.
- Rodden, J. (2006). *Hamilton's Paradox: The Promise and Peril of Fiscal Federalism*. Cambridge University Press.

- Rodden, J., Eskeland, G. S., and Litvack, J. I., editors (2003). *Fiscal Decentralization and the Challenge of Hard Budget Constraints*. The MIT Press.
- Rogoff, K. and Zettelmeyer, J. (2002). Bankruptcy Procedures for Sovereigns: A History of Ideas, 1976-2001. IMF Staff Papers, Vol. 49, No. 3.
- Roubini, N. (2002). Do We Need a New Bankruptcy Regime? *Brookings Papers on Economic Activity*, 1:321–333.
- Roubini, N. (2010). Irish woes should speed Europe’s default plan. Financial Times, 15.10.2010.
- Roubini, N. (2011). Greece should default and abandon the euro. Financial Times, 19.9.2011.
- Roubini, N. (2012). Greece’s private creditors are the lucky ones. Financial Times, 7.3.2012.
- Ruta, M. (2005). Economic theories of political (dis)integration. *Journal of Economic Surveys*, 19:1–21.
- Schuknecht, L., von Hagen, J., and Wolswijk, G. (2008). Government risk premiums in the bond market. EMU and Canada. ECB Working Paper Series, No. 879.
- Schuknecht, L., von Hagen, J., and Wolswijk, G. (2010). Government bond risk premiums in the EU revisited. The impact of the financial crisis. ECB Working Paper Series, No. 1152.
- Schwarcz, S. L. (2002). Global Decentralization and the Subnational Debt Problem. *Duke Law Journal*, 51(4):1179–1250.
- Schwarcz, S. L. (2011). A Minimalist Approach to State “Bankruptcy”. *UCLA Law Review*, 59:322–353.
- Scott, H. S. (2012). When the Euro Falls Apart - A Sequel. Working Paper, Harvard Law School, 31.1.2012.
- Sinn, H.-W. (2010). Rescuing Europe. *CESifo Forum Special Issue*, 11.
- Sinn, H.-W. and Carstensen, K. (2010). Ein Krisenmechanismus für die Eurozone. *ifo Schnelldienst, Special Issue*.

- Skeel, D. A. (2011). States of Bankruptcy. Public Law and Legal Theory Research Paper Series, No. 11-30.
- Spiegel, P. and Peel, Q. (2011). Europe: Northern exposure. *Financial Times*, 9.3.2011.
- Stephens, P. (2011). Europe's return to Westphalia. *Financial Times*, 23.6.2011.
- Stiglitz, J. (2011). Eurozone's problems are political, not economic. *Financial Times*, 20.7.2011.
- Stiglitz, J. and Weiss, A. (1981). Credit Rationing in Markets with Imperfect Information. *The American Economic Review*, 71(3):393–410.
- Sturzenegger, F. and Zettelmeyer, J. (2007). *Debt Defaults and Lessons from a Decade of Crises*. The MIT Press.
- Ter-Minassian, T. and Craig, J. (1997). Control of Subnational Government Borrowing. In *Fiscal Federalism in Theory and Practice*. IMF.
- Thomas, J. P. (2004). Bankruptcy Proceedings for Sovereign State Insolvency. *World Economy*, 27(2):265–279.
- Trichet, J.-C. (2011). Building Europe, building institutions. Speech on receiving the Karlspreis, 2.6.2011.
- Vigneault, M. (2007). Grants and Soft Budget Constraints. In Boadway, R. W. and Shah, A., editors, *Intergovernmental Fiscal Transfers: Principles and Practice*. World Bank.
- Wang, H.-J. and White, M. (2000). An Optimal Personal Bankruptcy Procedure and Proposed Reforms. *Journal of Legal Studies*, 29:255–286.
- White, M. (2002). Sovereigns in Distress: Do They Need Bankruptcy? *Brookings Papers on Economic Activity*, 1:287–319.
- White, M. (2005). Personal Bankruptcy: Insurance, Work Effort, Opportunism and the Efficiency of the 'Fresh Start'. Unpublished.
- White, M. (2007). Bankruptcy Law. In *Handbook of Law and Economics*, volume 2. Elsevier.

Wildasin, D. (1997). Externalities and Bailouts. Hard and Soft Budget Constraints in Intergovernmental Fiscal Relations. Policy Research Working Paper Series 1843, World Bank.

Wissenschaftlicher Beirat beim Bundesministerium der Finanzen (2005). Haushaltskrisen im Bundesstaat. Schriftenreihe des Bundesministeriums der Finanzen 78.

Wolf, M. (2011). Why breaking up is so hard to do. Financial Times, 20.9.2011.