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Sovereign Debt in a Monetary Union

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Abstract

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The current debt crisis in the European Monetary Union (EMU) shows that excessive debt and bailout policies in a monetary union (MU) can severely jeopardise financial and political stability of the MU. We show that financial and political stability of a MU are determined by the degree of heterogeneity in the stage of development of its member states and their benefits and costs from being a member of the MU. The existence of financial and political stability turns out to be mutually exclusive. We show that a MU is politically stable if gains from political stability are high for solvent countries. In this case solvent countries rather bail insolvent countries out than expel them. In contrast the MU is politically unstable if differences in the stage of development between countries are high. In this case bailout costs are high and solvent countries rather expel insolvent countries than bail them out. The current equilibrium in EMU, in which more solvent countries give a bailout, proves to be unsustainable in our model. We predict a core EMU that consists of more homogeneous countries.

Keywords: European debt crisis, bailout, haircut, financial stability

JEL-Codes: H12, H63, H73, H74

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1 Introduction

The recent sovereign debt crisis in the European Monetary Union (EMU) has highlighted the problems that a monetary union (MU) encounters when there is no corresponding fiscal union. This creates problems not only for the financial stability, but also for the political stability of EMU. While these problems of a MU without fiscal union are extensively discussed in the relevant literature (e.g. Beetsma and Bovenberg 1998; Dixit and Lambertini 2001, 2003; Chari and Kehoe 2007), two recent developments remain puzzling. First, EMU's no-bailout clause was never invoked. Even though financial markets seem to have never doubted that there would be bailouts, a default without a (partial) bailout always was out of the question. This is surprising given the huge volume of guarantees that may put guarantors into financial difficulties sooner or later. Second, countries seeking for assistance - like Greece or Ireland - face strict and painful conditionality in connection with a de-facto bailout. The governments of these countries have to put up with an angry electorate. Still, they have knowingly built up excessive debt.

Our paper helps to shed light on the incentive structures in a MU with countries as heterogeneous as in EMU. We give an explanation for why some countries build up excessive debt, while others do not, and why those who do not tend to bail out those who do. Countries in EMU are very heterogeneous with respect to their stage of economic development and also with regard to their competitiveness. These differences can to a certain extent be interpreted as fundamental differences, like stage of development or competitiveness depend on the endowment with natural resources to a certain extent. Such fundamental differences can also reflect differences in preferences for, e.g. saving. For simplicity, we assume that countries differ in one variable only that can be interpreted as initial wealth, natural resources, stage of development, or competitiveness. Countries derive different benefits and costs from forming a MU. We focus on two types of benefits: First, all countries benefit from the network effects of the union. These network effects could be easier access to foreign markets without exchange rate risk or the implicit need for the network when some sectors of the countries are very interrelated.[1] Second, those countries with high debt levels enjoy low refinancing costs because of the implicit bailout policy that eliminates the credit risk for lenders. However those countries with lower debt levels have to bear the cost of a implicit bailout policy. The importance of the second benefit and cost is linked to the stage of development as in our model less developed countries tend to be potential bailout receivers and more developed countries potential bailout payers.

[1]For example, Germany and France derive benefits from coordination, because their banking sector is very interrelated and a recapitalization of the banking sector in one or another country would cause major political hickups.

In particular, our model helps to distinguish three cases. First, a union in which every country is fiscally prudent. Second, a union in which there are some fiscally prudent countries that bail out less prudent ones. Third, a union in which fiscally imprudent countries are expelled. We show that large benefits from political stability for prudent countries make the second scenario most likely. If benefits from political stability for prudent countries are very large they rather bail imprudent countries out than expel those countries. This bailout policy results in lower refinancing costs for countries at the risk of bankruptcy and thus in excessive debt. In contrast, significant initial heterogeneity (e.g. resource endowment or the stage of economic development) makes the third scenario most likely. If imprudent countries are significantly lesser developed than prudent ones, the costs of a bailout are high and prudent countries rather expel imprudent countries than bail them out. Our normative analysis is designed to get a benchmark case, where EMU invokes its no bailout clause and a country is automatically expelled from EMU in case of default. Our positive analysis is designed to mirror the current situation in EMU. We conclude that EMU member states did not expel highly indebted countries in the past as they derive high utility from political stability. Their implicit bailout policy resulted in excessive debt and amplified the difference in the stage of development between countries. This increased bailout costs for the future. Consequently, EMU as it is designed today is not feasible in the long run. If bailout costs once exceed benefits from political stability EMU will expel the highly indebted countries. The only feasible option therefore will be a core Europe without the peripheral countries.

Our main result is that we show that a MU is more stable when countries that form the MU are homogeneous. A union of more heterogeneous countries faces two problems. First, the incentives for lesser developed countries to build up excessive debt are higher. Second, the incentives to bail out a country that has built up excessive debt are lower. Our paper also gives a main contribution in explicitly modeling the financial markets' reaction to the countries' and MU's policies.

This paper is structured as follows. Section 2 relates our model to earlier work in the field. Section 3 introduces the basic model set-up. We present the normative analysis in section 4 and the positive analysis in section 5. Section 6 concludes.

2 Literature Review

Our work is most closely related to De Britto (2004). However, we focus on the incentives to accumulate excessive debt, while De Britto assumes exogenous debt levels, and rather focuses on the incentives of countries to choose sound or unsound fiscal policies. Unsound

fiscal policies result in a default, while sound fiscal policies result in a default with a certain probability. Our model also includes a stochastic element, which is the probability of achieving economic growth sufficient to service the debt, that decreases with the debt level.

In De Britto, an independent institution (the IMF) decides on a continuous bailout, whereas in our model the member states of the MU that have to finance the the bailout decide between bailout and no bailout. This makes a large difference, because the independent institution in De Britto maximises the utility of the defaulting countries and the investors. In our model, the member states of the MU that have to finance the bailout maximise their utility. This is closer to the current situation in EMU.

De Britto's inclusion of the financial market is relatively exogenous, because the financial market only decides on a continuous sanction, while we model the setting of interest rate spreads explicitly; the interest rate is endogenous. In our model, the financial market directly influences the incentives to take up debt. This difference is reflected in the timing of the model. In De Britto the financial market's (short term) reaction to certain debt levels comes to the fore, while in our model the financial market assesses the stability of the MU. Our model is thus more suitable for the pre-crisis situation in EMU and helps to explain how the crisis came about.

3 The Basic Model

The model describes the incentives to build up debt in a MU when countries differ in conditions when they form the MU. These initial conditions, which we describe in the following as differences in wealth, can be interpreted more broadly. For example, they can be interpreted as differences in initial endowment with natural resources or just as differences in economic strength or competitiveness. The important assumption for our model is that the ability to service debt depends on this variable according to which the countries differ. For example, countries with a larger tax base are more likely to service their debt reliably ceteris paribus. In our model, the larger economic strength, or in the term that we use, the higher initial wealth, the less likely a country faces bankruptcy. If a country has a lower initial wealth or is less competitive, it has to achieve sufficient GDP growth to service the debt. If this cannot be achieved, the country faces bankruptcy and turns into a potential recipient of a bailout. The smaller the initial wealth of the defaulting country, the higher the costs associated with the bailout. This implies that the probability of a bailout is smaller the smaller the initial wealth of the defaulting country.

We first present a version of the model with 1 lesser developed country (type 1 coun-

try) and n more developed countries (type 2 countries). In a second version, we assume a continuum of different levels of economic development. This allows us to determine which countries are candidates for building up excessive debt and receiving a bailout and which countries are potential bailout payers.

3.1 The Time Structure

In the first stage, investors decide to either invest in the type 1 country or in one of the type 2 countries in the MU. Their choice is reflected in the interest rate spread s for the type 1 country that compensates for its bankruptcy risk. In the second stage the type 1 country chooses a debt level d_1. In the third stage the type 2 countries decide whether they want to bail the type 1 country out or expel it from the union in case of a default. Their choice is reflected in the probability of bailout conditional on default q. The timing is shown in figure 1.

[Figure 1 about here.]

The game is solved by backward induction. In doing so, we first determine in 4 the normative equilibrium, in which the MU cannot bail the type 1 country out but the type 1 country is automatically expelled from the MU in case of default. Second, we determine the positive equilibrium in 5 in which the MU can give a bailout in case of default.

First Stage: Determination of the Interest Rate Spread in the Financial Market In the first stage, the financial market decides on the interest rate spread for the type 1 country of a recently formed MU that compensates for its bankruptcy risk. The financial market takes into account the differences between countries and the incentives to build up debt and the probability of a bailout if a country builds up excessive debt. This is explicitly meant to mirror real developments in the MU, because financial market assessment of the union during the first ten years has shown that financial markets did not assign credibility to the no-bailout clause (§125 TFEU). Instead, financial markets implicitly assumed a bailout, because interest rate spreads were so low.

Second Stage: Choice of Debt Level by the Type 1 Country Given the reaction of the financial market, the type 1 country chooses its debt level. It knows that it can accumulate debt to such an extent that a bailout is still likely and the financial market still assigns a low interest rate spread to it.

Third Stage: Bailout-Decision of the Monetary Union Given the debt level of the type 1 country the type 2 countries decide whether they want to bail the type 1 country out or expel it from the MU in case of default. They have to take into account that this decision affects the incentive of the type 1 country to take up debt and that this will effectively determine the financial market reaction.

The interesting aspect about this structure is that there exists an equilibrium in which the interest rate spread is sufficiently low, because the MU cannot commit to a no-bailout, such that the type 1 country accumulates excessive debt. This exacerbates the problem.

3.2 The Monetary Union

The MU consists of one less developed country (type 1 country) and n more developed countries (type 2 countries). The type 1 country is at risk of bankruptcy; depending on how productive the employment of its debt turns out to be, it can suffer a default or not. The type 2 countries are not at risk of bankruptcy. They can rescue the poor country with a full bailout or not rescue it with the consequence that the country will be excluded from the MU.

The payoffs of the two kinds of countries, poor country and rich countries, for the three states of the world, no default, default with bailout and default with no bailout, are given in the matrix in Table 1.

	No default	Default	
		Bailout	No Bailout
Poor country	$e_1+\alpha_1 d_1+g_1(n+1)$ $-(i+s)d_1$	$g_1(n+1)$	$e_1+\alpha_1 d_1$
Rich countries	$n(e_2+\alpha_2 d_2$ $+g_2(n+1)-id_2)$	$n(e_2+\alpha_2 d_2+g_2(n+1)-id_2)$ $-((i+s)d_1-e_1-\alpha_1 d_1)$	$n(e_2+\alpha_2 d_2$ $+g_2(n)-id_2)$

Table 1: Payoff Matrix

where e_i denotes the initial wealth level, $\alpha_i \sim U[0, a_i]$ the productivity parameter, d_i the debt level and $g_i(\cdot)$ the network effect for type i country, $i = 1, 2$, i the interest rate, s an interest rate spread and n the number of type 2 countries in the MU.

The type 1 country is less developed as its initial wealth level e_1 is low whereas the type 2 countries are more developed as their initial wealth levels e_2 are high. Initial wealth might just comprise the initial stock of assets or resources but can also be interpreted more

broadly as initial fundamentals like stage of development or competitiveness (e.g. as reflected in labour costs). A country does not suffer a default if its wealth consisting of its initial wealth e_i and its production by employment of debt $\alpha_i d_i$ is larger than its interest payment on debt $(i+s)d_i$, it suffers a default if it is smaller. We assume that the type 1 country is at risk of bankruptcy; i.e. it has a sufficient small initial wealth so that it will suffer a default if production by employment of its debt turns out to be sufficiently small, especially if it turns out to be zero ($e_1 < (i+s)d_1$), but it has a sufficiently high initial wealth so that it will not suffer a default, if production turns out to be sufficiently high, especially in the case if it turns out to be $a_1 d_1$ ($e_1 + a_1 d_1 > (i+s)d_1$). In contrast, the type 2 countries are not at risk of bankruptcy; they do not suffer a default no matter how low production turns out to be, even if it turns out to be zero ($e_2 > id_2$). As the type 1 country involves a bankruptcy risk it has to offer lenders in the financial market a positive interest rate spread s in addition to the risk free interest rate i. If the type 1 country does not suffer a default, the payoffs of both kind of countries consist of their monetary payoff in the amount of the difference between wealth and interest payment and of its non monetary political benefit from network g_i, that increases with the number of countries in the MU. This benefit can be broadly interpreted as the access to the larger market at no exchange rate risk or the political benefit of stronger ties with neighbouring countries. If the type 1 country suffers a default, the type 2 countries can rescue it with a full bailout or not rescue it with the consequence that the country will be expelled from the MU. If the type 2 countries rescue the type 1 country, their payoff will still include the monetary payoff and the political benefit from network but will be reduced by the costs of the full bailout in amount of interest debt that the type 1 country cannot pay to its lenders. The payoff of the type 1 country will just comprise the political benefit from the MU and no monetary payoff as it has to give all of its wealth to its lenders. If the type 2 countries do not rescue the type 1 country, their payoff will still include the monetary payoff but a reduced network effect as the type 1 country will be excluded from the MU. The payoff of the type 1 country will just comprise its wealth and no network effect as it does not pay its interest debt and is expelled from the MU.

3.3 The Financial Market

Investors in the financial market can invest either in the type 1 country or in one of the type 2 countries in the MU. The expected rate of return of an investment in the type 1 country is

$$Er_1 = p(1+i+s) + (1-p)(q(1+i+s) + (1-q)0) \tag{1}$$

where p denotes the probability of no default and q the probability of a bailout conditional on default. For the cases of no default and default with bailout, the investor gets its interest

claim, whereas in case of a default without bailout the investor does not get its interest claim. The expected rate of return of an investment in one of the rich countries in the MU is the risk free rate i.

4 Normative Analysis

To construct a benchmark case we assume that §125 TFEU holds, such that the MU cannot bail the type 1 country out but the type 1 country is automatically expelled from the MU in case of default. This means that the third stage drops out and we start our backward induction with the second stage. In 4.1 the type 1 country chooses its debt level d_1 given the interest rate spread s. Its optimal choice is $d_1(s)$ and forms the equilibrium of the subgame. In 4.2 investors decide in which country they want to invest, anticipating the optimal debt level $d_1(s)$. Their optimal choice is reflected in the optimal interest rate spread s^N and forms together with the optimal debt level $d_1^N = d_1(s)$ the subgame perfect equilibrium.

4.1 Second Stage: Choice of Debt Level

In the second stage the type 1 country chooses its debt level d_1, given the interest rate spread s, by maximizing its expected utility

$$Eu_1(d_1, s) = p(e_1 + \beta d_1 + g_1(n+1) - (i+s)d_1) + (1-p)(e_1 + \gamma d_1) \tag{2}$$

where β and γ denote the expected productivity parameter in case of no default resp. default. The values for p, β and γ can be derived from the uniform distribution of the producitivity parameter. For the probabilitiy of no default we get $p((d_1, s) = \frac{(a_1-(i+s))d_1+e_1}{a_1 d_1}$ with $\frac{\partial p}{\partial d_1} < 0$. If the country chooses a higher debt level, its default probability will increase. For the expected productivity parameter in case of no default resp. default we get $\beta(d_1, s) = \frac{(a_1-(i+s))d_1-e_1}{2d_1}$ with $\frac{\partial \beta}{\partial d_1} > 0$ resp. $\gamma(d_1, s) = \frac{(i+s)d_1-e_1}{2d_1}$ with $\frac{\partial \gamma}{\partial d_1} > 0$. Inserting the values in the expected utility and differentiating it with respect to d_1, building the first order condition and solving for d_1 results in the optimal debt level

$$d_1(s) = \sqrt{\frac{2e_1 g_1(n+1)}{(a_1-(i+s))^2 + (i+s)^2}} \tag{3}$$

with $\frac{\partial d_1}{\partial s} < 0$ for $a_1 < 2(i+s)$ and $\frac{\partial d_1}{\partial s} > 0$ for $a_1 > 2(i+s)$. If the interest rate spread increases the optimal debt level decreases for a sufficient small maximal productivity resp.

sufficient high risk free interest rate and increases for a sufficient high maximal productivity resp. sufficient low risk free interest rate.

Inserting $d_1(s)$ in $p(d_1, s)$ results in the optimal probability of no default $p(s)$. Calculation shows that if the interest rate spread increases the default probability increases for a sufficient small maximal productivity resp. sufficient high risk free interest rate and decreases for a sufficient high maximal productivity resp. sufficient low risk free interest rate. Inserting $d_1(s)$ in $\beta(d_1, s)$ and $\gamma(d_1, s)$ results in the expected productivity parameter in case of no default resp. default $\beta(s)$ and $\gamma(s)$.

4.2 First Stage: Determination of the interest rate spread in the Financial Market

In the first stage investors decide in which country they want to invest, anticipating the optimal debt level $d_1(s)$. Financial market equilibrium requires

$$Er_1 = p(s)(1 + i + s) + (1 - p(s))0 = Er_2 = 1 + i \tag{4}$$

Solving for s results in the optimal interest rate spread in the normative equilibrium $s^N(e_1, a_1, i, g_1, n)$. Inserting s^N in $d_1(s)$ and $p(s)$ results in the optimal debt level $d_1^N(e_1, a_1, i, g_1, n)$ and no default probability $p^N(e_1, a_1, i, g_1, n)$.

5 Positive Analysis

Now the MU can give a bailout to the type 1 country in case of default. This means, that the third stage remains and we start our backward induction with stage 3. In 5.1 the type 2 countries decide whether they want to bail the type 1 country out or expel it from the MU, given the interest rate spread s and the debt level d_1. Their optimal choice is reflected in the bailout probability $q(d_1, s)$. In 5.2 the type 1 country chooses its debt level d_1 given the interest rate spread s and anticipating the bailout probability $q(d_1, s)$. Its optimal choice is $d_1(s)$ and forms with $q(s) = q(d_1(s), s)$ the equilibrium of the subgame. In 5.3 investors decide in which country they want to invest, anticipating the optimal debt level $d_1(s)$ and bailout probability $q(s)$. Their optimal choice is reflected in the optimal interest rate spread s^P and forms together with the optimal debt level $d_1^P = d_1(s^P)$ and the optimal bailout probability $q^P = q(s)$ the subgame perfect equilibrium.

5.1 Third Stage: Bailout-Decision of the Monetary Union

In the third stage the type 2 countries decide whether they want to bail the type 1 country out or expel it from the MU in case of a default, given the interest rate spread s and the debt level d. In case of a default the type 2 countries decide for a bailout of the type 1 country if their expected utility for this case

$$Eu_2(bailout/default) = n(e_2 + \alpha_2 d_2 + g_2(n+1) - id_2) - ((i+s)d - e - \alpha_1 d) \quad (5)$$

is larger than its expected utility for an expel of it from the MU

$$Eu_2(no\ bailout/default) = n(e_2 + \alpha_2 d_2 + g_2(n) - id_2) \quad (6)$$

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Using the uniform distribution of the producitivity parameter we derive the probability of a bailout conditional on default $q((d_1, s) = \frac{n(g_2(n+1)-g_2(n))}{(i+s)d_1-e_1}$ with $\frac{\partial q}{\partial d_1} < 0$. If the country chooses a higher debt level, the bailout probability will will decrease.

5.2 Second Stage: Choice of the debt level

In the second stage the type 1 country chooses its debt level d_1, given the interest rate spread s and anticiptating $q(d_1, s)$, by maximizing its expected utility

$$Eu_1(d_1, s) = p(e_1 + \beta d_1 + g_1(n+1) - (i+s)d_1) + (1-p)(qg_1(n+1) + (1-q)(e_1 + \delta d_1)) \quad (7)$$

where δ denotes the expected productivity parameter in case of no bailout conditional on default. The value for δ can be derived from the uniform distribution of the producitivity parameter, we get $\delta(d_1, s) = \frac{(i+s)d_1-e_1-(n(g_2(n+1)-g_2(n))}{2d_1}$ with $\frac{\partial \delta}{\partial d_1} < 0$. Inserting the value in the expected utility and differentiating it with respect to d_1, building the first order condition and solving for d_1 results in the optimal debt level

$$d_1(s) = \sqrt{\frac{2g_1(n+1)(e_1 + n\triangle g_2) + n^2 \triangle g_2^2}{(a_1 - (i+s))^2 + (i+s)^2}} \quad (8)$$

with $\triangle g_2 = g_2(n+1) - g_2(n)$ and $\frac{\partial d_1}{\partial s} < 0$ for $a_1 < 2(i+s)$ and $\frac{\partial d_1}{\partial s} > 0$ for $a_1 > 2(i+s)$. If the interest rate spread increases the optimal debt level decreases for a sufficient

small maximal productivity resp. sufficient high risk free interest rate and increases for a sufficient high maximal productivity resp. sufficient low risk free interest If one compares this debt level with the one we got in the normative equilibrium one will recognize that it is higher. The possibility of a bailout increases the incentives of the type 1 country to build up debt. Inserting $d_1(s)$ in $p(d_1, s)$ and $q(d_1, s)$ results in the optimal probability of no default resp. bailout probability $p(s)$ resp. $q(s)$. Calculation shows that if the interest rate spread increases the default probability and bailout probability increase for a sufficient small maximal productivity resp. sufficient high risk free interest rate and decrease for a sufficient high maximal productivity resp. sufficient low risk free interest rate. Inserting $d_1(s)$ in $\beta(d_1, s)$ and $\delta(d_1, s)$ results in the expected productivity parameter in case of no default resp. default and no bailout $\beta(s)$ and $\delta(s)$ same as default.

5.3 First Stage: Determination of the interest rate spread in the Financial Market

In the first stage investors decide in which country they want to invest, anticipating the optimal debt level $d_1(s)$ and the bailout probability $q(s)$. Financial market equilibrium requires

$$Er_1 = p(s)(1 + i + s) + (1 - p(s))(q(s)(1 + i + s) + (1 - q(s))0) = Er_2 = s \tag{9}$$

Solving for s results in the optimal interest rate spread in the positive equilibrium $s^P(e_1, a_1, i, g_1, g_2, n)$ with $\frac{\partial s^P}{\partial g_2} < 0$ and $\frac{\partial s^P}{\partial e_1} > 0$. Inserting s^P in $d_(s)$, $p(s)$ and $q(s)$ results in the optimal debt level $d_1^P(e_1, a_1, i, g_1, g_2, n)$ with $\frac{\partial d_1^P}{\partial g_2} > 0$ and $\frac{\partial d_1^P}{\partial e_1} < 0$, no default probability $p_1^P(e_1, a_1, i, g_1, g_2, n)$ with $\frac{\partial p_1^P}{\partial g_2} < 0$ and $\frac{\partial p_1^P}{\partial e_1} > 0$ and probability of bailout conditional on default $q_d 1^P(e_1, a_1, i, g_1, g_2, n)$ with $\frac{\partial q^P}{\partial g_2} > 0$ and $\frac{\partial q^P}{\partial e_1} < 0$. The story behind these results is quite intuitive. If political benefits of the type 2 countries increase a bailout in case of a default becomes more likely. Consequently, the interest rate spread decreases and the debt level increases, a default becomes more likely. In contrast, if the initial wealth decreases, an expel from the monetary union in case of a default becomes more likely. The interest rate spread increases and debt level decreases, a default becomes less likely.

6 Conclusion

In this paper we provide an analysis of the impacts of excessive debt and bailout resp. expulsion policy on the financial and political stability of a Monetary Union (MU). In doing so, we explicitly model the valuation of bankruptcy risk of different countries by the financial market by endogenizing the determination of interest rate spreads.

Our analysis is based on a three stage model that comprises one less developed country that is at risk or default when it borrows from the financial market and n more developed countries that do not risk a default when they take up new debt, but decide whether they want to bail the less developed country out or expel it from the MU in case of default. When investors lend their money to the countries in the financial market, they allocate their capital in the MU so that their expected rate of return on investment is the same in each country. In the first stage the financial market eqilibrium determines the interest rate spread for the less developed country that compensates for its bankruptcy risk. In the second stage, the less developed country chooses a debt level and in the third stage, the more developed countries decide whether they want to bail the less developed country out or expel it from the union in case of default.

The game is solved by backward induction. We show that financial stability and political stability of a MU are determined by the degree of heterogeneity in the stage of development of its member states and their benefits and costs from being a member. It turns out that financial and political stability cannot co-exist. More specifically, we show that if benefits from political stability for prudent countries are very large or the number of prudent countries is very high, the bailout probability is high which involves political stability. A higher bailout probability results in a lower interest rate spread and thus a higher debt which results in financial instability. In contrast, if initial wealth of the imprudent country is very low resp. differences in the stage of development are very high, the bailout costs are very high and the bailout probability is low, which results in political instability. A higher bailout probability results in a adequate interest rate spread and moderate debt which involves financial stability.

Our results are very relevant in the current policy context. They suggest, that the European Monetary Union (EMU) gave a bailout to highly indebted member states, because political benefits from the network are very high for its members. This bailout policy was anticipated by financial markets, which set low interest rate spreads and thus caused in excessive debt in some member states. This amplified the difference in the stage of development between member states. As a consequence, future bailout costs increase. If bailout costs become larger than political benefits, EMU will face strong incentives to expel highly indebted countries. This implies that EMU is not stable in its current form in the long run.

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Appendix

Figures

Figure 1: The timing