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A Journey Down the Slippery Slope to the European Crisis: A Theorist's Guide

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Abstract

We offer a theoretically based narrative that attempts to account both for the formation of the European Monetary Union and the challenges it has faced. Lack of commitment to policy plays a central role in this narrative.

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This paper is an attempt to develop a consistent intellectual framework to think about the forces that led to the formation of the European Monetary Union and the challenges it has faced. This intellectual framework has been more fully developed in a series of academic papers by Chari and Kehoe and by Chari, Dovis and Kehoe. Here we summarize the main points discussed in those papers. The central driving force of those papers, and the force reprised here, is that governments and government agencies such as central banks, lack commitment to future policies. This lack of commitment can make it desirable to set up institutions like the European Monetary Union, and precisely the same lack of commitment can create challenges for such unions.

We develop three themes in this paper. First, forming a monetary union can be desirable if central banks lack commitment, even when the monetary authority in the union cannot also commit. Second, absent commitment by the union's monetary authority, monetary unions create externalities in other policies including fiscal policy and bank supervision policy. Third, addressing these externalities requires union-wide cooperation in these other policy areas.

These themes allow us to develop a coherent and seamless narrative that ties together the forces that led to the formation of the European Monetary Union and the forces that led to the challenges the union has faced. We draw on Chari, Dovis and Kehoe (2016) to show that if benevolent central banks lack commitment, monetary unions can be a useful commitment device. We show that inflation rates in unions are less volatile than they would be with flexible exchange rates. This feature of our model is broadly consistent with the experience of the European Monetary Union. After the breakdown of the Bretton Woods system, European economies face stubbornly high and variable inflation rates. Viewed through the lens of our theory, the founders of the union perceived these outcomes as arising in part due to the inability of central bankers to commit to their policies, and saw that forming a union can be desirable. Indeed, inflation rates in Europe since the union was formed have been low and stable.

We draw on Chari and Kehoe (2007, 2008) to show that when the monetary authority in a union cannot commit to its policies, externalities arise in other policy areas. To understand these externalities, consider the optimal inflation rate chosen by a benevolent

monetary authority in a union when it has no commitment. This choice balances the costs of ex post inflation against the gains of reducing the real value of outstanding nominal debt. This balancing act implies that the ex post inflation rate is higher when the stock of nominal debt is greater. Governments of individual countries in a union have incentives to issue more debt than they would with flexible exchange rates, because in a union, the cost of ex post inflation is partly borne by other member countries. All countries are better off if they can restrict each others' fiscal policies.

From the perspective of the theory, the founders understood that commitment by the newly formed European Central Bank could not be taken as a given and that externalities, especially in fiscal policy, were likely to arise. The Maastricht treaty, and the Stability and Growth Pact imposed restrictions on fiscal policies, in particular on deficits and the level of government debt relative to output, in individual countries to address the externalities. After Germany and France violated the deficit limits in the early 2000s, it became more likely that the restrictions would not be enforced, and the stage was set for excessive deficits and debt issue by members of the union.

From our perspective, the founders seemed to underestimate the externalities in banking policy. Consider a situation in which a financial crisis is under way. If the monetary authority lacks commitment, it will engage in bailouts of bank debt holders financed by inflation. If debt holders of banks see bailouts of their debt as likely in the event of a banking crisis, bank equity holders have strong incentives to take on socially excessive risk, and financial crises are more likely to occur. Individual countries have weaker incentives to supervise risk-taking by banks if they perceive that the bailout will be conducted by the union as a whole. These factors, in our view, contributed to the severity of the recent European debt and financial crisis. The European Central Bank's expression of resolve "to do whatever it takes" may well have ameliorated the crisis, but it may also have reinforced beliefs by the public that future bailouts are now more likely. Such reinforcement of beliefs may well make future crises more likely.

A key aspect of the theories described so far is that the central bank is a Good Samaritan, in the sense that it is benevolent. A benevolent central banks that lacks commitment has strong incentives to engage in inflationary bailouts of governments of distressed countries in

financial crises, even if the inflation imposes costs on residents of less distressed countries. In this paper, we develop a simple model intended to illustrate the idea that the mere presence of a good samaritan may induce governments of less distressed countries to engage in bailouts in the form of debt forgiveness or fiscally financed transfers. Indeed, such fiscal bailouts may be large enough that the good samaritan ends up not engaging in any inflationary bailouts at all. Anticipations of such fiscal bailouts induces governments of countries in a union to borrow inefficiently large amounts from residents of other member countries in the union. In this sense, the mere presence of the good samaritan introduces externalities in other policy areas. The Good Samaritan may well end up seeming not to change its policies at all.

Bulow and Rogoff (2015) argue that Greece received substantially more funds during its crisis from the troika, consisting of the European Monetary Union, the European Commission and the International Monetary Fund, than essentially any emerging market economy did from external sources during their crises. Our theory is consistent with this feature of the data. Viewed through the lens of our model, the troika rationally acted to forestall the European Central Bank from acting on its own. We view this consistency with the data as an attractive feature of our theoretical work.

Our perspective leads to policy implications for redesigning the European Monetary Union. Some economists advocate that the union should simply be dissolved. This advocacy misses the essential point that the founders of the union, with good reason, thought that forming a monetary union would help solve the problems of high and variable inflation. Indeed, arguably, the union has been successful in this regard. Others (see, for example, Baldwin and Giavazzi (2016) in a volume for the Centre for Economic Policy Research (CEPR)) have advocated policies that maintain the union but alter some of its practices. Sixteen economists who wrote policy papers for the CEPR volume advocate a variety of institutional changes. Our reading is that the vast majority are pessimistic about the prospects of setting binding limits on fiscal policy, agree that bank regulation should be conducted in substantial part at the union-wide level, and argue that Europe needs a lender of last resort with substantially greater resources and more latitude to act than the European Central Bank currently possesses.

We too are pessimistic about the prospects for binding limits on fiscal policy though,

for reasons outlined below, we think constraints on the maturity structure of debt, while leaving the aggregate amount of debt unconstrained, are desirable, and, perhaps, enforceable. We agree that a common supervisory framework for bank supervision is desirable. We are sceptical that enlarging the bailout powers of the union by creating a giant lender of last resort is a desirable policy. In our view, a strong supervisory system can reduce the probability of financial crises more effectively and the moral hazard problems created by expectations of bailouts will likely be enhanced by a bailout authority with increased access to bailout funds.

1. The Journey Begins

When are monetary unions desirable? The traditional criterion for the desirability of forming a union weighs the benefits, from increased trade and financial integration associated with a union against the costs from the loss of independence in monetary policy. The classic analyses of Friedman (1953) and Mundell (1961), point out that when each country pursues an independent monetary policy, each country can tailor its policies to its own idiosyncratic shocks. When policy is set in common, it cannot be tailored to every country's idiosyncratic shocks. The implicit assumption in these analyses is that the monetary authority can commit to its policies. Thus, the classic analyses imply that, in terms of monetary policy alone, monetary unions only have costs and no benefits.

A. Monetary Unions Can Confer Commitment Benefits

In Chari, Dovis, and Kehoe (2016), we revisit the classic analyses using simplified versions of standard sticky price models. We assume that both in a union and under flexible exchange rates, monetary policy is influenced by all countries in the union. Specifically we assume that policy is chosen either cooperatively or by majority rule. When countries have commitment, forming a union is costly and a flexible exchange rate regime is preferred by all member countries. Thus, this analysis confirms the key message of the classic analyses. The reason that forming a union is costly is that, with sticky prices, it is optimal for policy to react to idiosyncratic shocks. With a union, it is impossible to have monetary policy react to every country's idiosyncratic shocks. Interestingly, it turns out that monetary policy should respond only to a subset of shocks, labeled *Mundellian shocks.*

Without commitment to monetary policy, policymakers have incentives to deviate

from the commitment plan to generate surprise inflation. These incentives are particularly strong when shocks, labeled *temptation shocks,* affect the economy. Private agents anticipate that the monetary authority will react to such shocks, and alter their price-setting behavior. In equilibrium, it turns out that inflation is higher and more variable than it would be under commitment, but the reactions of private agents leads output to be just as variable as under commitment. Since monetary policy in the union cannot react to every country's idiosyncratic shocks, the monetary authority in the union ends up reacting to neither idiosyncratic Mundellian shocks nor idiosyncratic temptation shocks. Forming a union is, in this sense, a commitment device. A union has costs, because policy does not react to Mundellian shocks, and it has benefits because it does not react to temptation shocks either. Thus, forming a union is desirable if temptation shocks are sufficiently large relative to Mundellian shocks.

We emphasize that, in making this argument, we assume that the monetary authority in the union faces exactly the same commitment problem as do policy makers in individual countries. The monetary authority in the union does react to aggregate shocks that affect all member countries. In particular, it does react to aggregate temptation shocks. The reason that the monetary authority does not react to idiosyncratic shocks is that while some countries would like to see a positive surprise inflation, other countries would like to see a negative surprise inflation. When policy is set cooperatively or by majority rule, the desires of these countries on optimal policy offset each other and the union ends up not reacting to idiosyncratic shocks affecting its members.

From this perspective, forming the European Monetary Union was a sensible response by policy makers in Europe to the volatile inflation rates they experienced in the wake of the collapse of the Bretton Woods system. One measure of this success is that inflation rates in Europe became less volatile after the union was formed. The standard deviation of inflation in the 19 years prior to the formation of the union was 3.7% and it's been 1.2% in the years since. Of course, the union cannot be credited or blamed entirely for this observation. Other factors were surely at play. Nevertheless, it is comforting that this observation is consistent with the theory laid out in Chari, Dovis, and Kehoe (2016).

B. Monetary Unions Can Create Externalities in Other Policy Areas

Chari and Kehoe ((2007) and (2008)) argued that if the monetary authority in a union cannot commit to its policies, then externalities can be created in other policy areas. One area we highlighted is fiscal policy. The basic idea in those papers is that the monetary authority's incentives to engender surprise inflation are stronger when the outstanding stock of nominal debt is larger. Such surprise inflation reduces the real amount of debt and reduces the distorting taxes needed to service or retire the debt. Surprise inflation, ex-post, can be welfare enhancing for the residents of the country. A monetary authority without commitment will balance the costs of surprise inflation against the costs of distorting taxes needed to service or retire the debt. When the stock of existing nominal debt is larger, the ex post optimal inflation rate is higher.

Private lenders understand these incentives. If the fiscal authorities issue a lot of debt in the first place, the nominal interest rate rises in anticipation of the future inflation, and real rates are not affected. The fiscal authorities understand these incentives on the part of the monetary authority too. With flexible exchange rates, they see that if they issue a lot of debt, future inflation will be higher. The costs of this inflation will be borne by the residents of the country. The fiscal authority appropriately balances the tax smoothing gains of debt issue against the costs of resulting inflation.

In a union, however, a free-rider problem arises. If an individual country increases its current debt issue, in the future the benevolent monetary authority has a stronger incentive to engender inflation. With a union, part of the cost of the future inflation is borne by other member countries. Thus, in a union debt issue is inefficiently larger than it would be with flexible exchange rates. As with other classic free-rider problems, all countries would gain if they could set fiscal policy cooperatively. Also, as with other classic free-rider problems, an individual country would like restraints on the fiscal policies of other countries, while being permitted to have an unrestricted policy for itself.

When paired with our results on optimal currency areas, we see that lack of commitment can create benefits to forming a union in terms of monetary policy, but can lead to spillovers which lead to poor outcomes in terms of other policies. These spillovers make cooperative arrangements in other policy areas valuable. The theory provides one rationale

for the limits on fiscal policy that were enshrined in the Maastricht Treaty and the Stability and Growth Pact. Arguably, the founders of the European Monetary Union understood these economic issues very well. They saw that by using the commitment device of forming a union, they would gain in terms of reduced volatility of inflation. They understood, furthermore, that this lack of commitment created externalities, and they enshrined restrictions on the fiscal policies of member countries to limit those externalities. We may be giving them too much credit, but certainly their attempts to address these problems are consistent with the theoretical framework outlined here.

The theory also explains why some countries were tempted to violate the constraints if they could get away with such violations. The founders did not, however, understand that there might be incentives to bail out banks, and that is something we turn to next.

Chari and Kehoe (2008) showed that exactly the same kinds of free riding problems in fiscal policy show up when it comes to supervisory policy of banks. The basic argument here is very similar. In the event of a run, or in the event of a financial crisis, central banks ex-post have an incentive to bail out bank debtors. Anticipations of such bailouts implies that debtors have reduced incentives to monitor the riskiness of bank portfolios. The interest rate on debt becomes less sensitive to the riskiness of bank portfolios. Owners and managers of banks have increased incentive to make their portfolios riskier. Note that this incentive remains even if policy makers bail out only debt holders and do not rescue equity holders at all. This well-known moral hazard problem goes back at least to Kareken and Wallace (1978). One way to address this moral hazard problem is to supervise and regulate bank portfolios closely. In a monetary union, national supervisors have weak incentives to engage in close monitoring and supervision because part of the costs will be borne by other countries, and the same kind of free rider problem emerges in bank supervisory policy as in fiscal policy.

C. Bailouts and the Good Samaritan Problem

In Chari and Kehoe (2008) we assumed that bailouts are financed by the central bank. Here we develop a simple model in which lack of commitment by the monetary authority can induce members of a union voluntarily to engage in tax financed bailouts. These bailouts act to forestall inflationary bailouts by a monetary authority. The point of this model is

that when a benevolent monetary authority lacks commitment, it will act to redistribute resources if it finds it optimal to do so. In this sense, the monetary authority is a Good Samaritan without commitment. This threat that the monetary authority will act induces fiscal authorities to bail out unlucky countries by forgiving debt or making their own transfers to prevent the monetary authority from acting. In our model, it turns out that in equilibrium, the monetary authority never responds.

Expectations of such bailouts create a free-rider problem by inducing governments to issue too much debt relative to an environment with commitment by the monetary authority. At the end of the day these bailouts have to be paid for by countries who turn out to be lucky. Thus, the excessive debt issue, from an ex-ante perspective, only has costs, and no benefits. All countries are better off if they could restrain each other from issuing too much debt. Furthermore, policies which make it easier for the monetary authority to engage in inflationary bailouts worsen the free-rider problem.

Environment

Consider a two-period model with a continuum of identical countries labeled by i. In period 1 each country receives an endowment y_1 and needs to issue debt to finance a public good of size g. This public good yields a utility in period 1 of $w(g)$. We assume that the government must finance this public good by issuing debt that matures in period 2.

The endowment in period 2 is random and is determined both by exogenous uncertainty and the taxes needed to repay the debt. The exogenous uncertainty is described by a random variable which can take on one of two values, denoted s_L and s_H. The probabilities of these shocks are given by μ_L and μ_H respectively. By the law of large numbers, the fraction of countries with state s is μ_s. We refer to countries with realizations of s_H as "lucky" countries, and countries with realizations of s_L as "unlucky" countries.

After the endowment is realized, the government in, say, country i decides whether or not to repay its debts to foreigners. If it chooses to repay its debt, it must raise revenues through distorting taxes. We model the tax distortions as directly reducing output. Specifically, the endowment is given by $y_s(\tau)$ where τ denotes the tax revenues needed to pay off debt. We assume that $y_H(\tau) > y_L(\tau)$. We have in mind that taxes are particularly distorting

in low output times, and less distorting in high output times. For simplicity, we model these differential distorting effects by simply assuming that taxes are not distorting at all in good times. Specifically, we assume that in the lucky state, s_H, y_H is independent of τ and, in the unlucky state, s_L, y_L is a decreasing and concave function of τ.

We follow the sovereign default literature in assuming that defaults have direct costs. In particular, if the country defaults on foreign debt b then its endowment is reduced by $y_s(0)\kappa(b)$ where s denotes the exogenous state and κ is an increasing function.

Households are risk neutral and discount period 2 consumption at a rate β. We assume for simplicity that households will hold only foreign debt. (This assumption emerges as a result in a more elaborate model in which governments can default in a discriminatory fashion on domestic and foreign debt holders, and in which defaulting on foreign debt is costly but defaulting on domestic debt is costless. Then domestic households hold no domestic debt.) The budget constraint for the representative household in country i in period 1 is

$$c_{1i} + \int_j Q_j b_{ij} dj = \omega_1.$$

where b_{ij} denotes the amount of country j debt held by country i households, Q_j denotes the price of debt issued by country j, and ω_1 denotes the endowment of households in period 1. The price Q_j of debt is determined by country j's default decision, which, in turn, will depend on the amount of debt issued by country j.

If country i does not default then the budget constraint in the second period in state s is

$$c_{2i}(s) = \int_j \delta_j b_{ij} dj + y_s(\tau_i) - \tau_i$$

where $\delta_j = 0$ denotes a default by country j and $\delta_j = 1$ denotes a repayment.

If country i does default, then the period 2 budget constraint is

$$c_{2i}(s) = \int_j \delta_j b_{ij} dj + y_s(0) - y_s(0)\kappa(B_i)$$

where B_i denotes the amount of debt issued by country i.

Characterizing Equilibria without a Monetary Authority

Here we assume that the monetary authority is not present, or equivalently, that it can commit to its policies. Consider the default decision in the second period. Since taxes are undistorting for lucky countries and distorting for unlucky countries, unlucky countries have stronger incentives to default. Indeed, in our model only unlucky countries will threaten to default. In this economy, as in most sovereign default models, lenders have an incentive to renegotiate their contracts ex post when faced with the prospect of a default. Such renegotiation can make the borrower better off by avoiding the output costs of default and can ensure that lenders receive some repayment rather than none. Individual lenders have incentives to hold out in such renegotiation creating a collective action problem. We think of this collective action problem as being solved by transfers, or forced debt forgiveness, by governments. Let $T = (T_H, T_L)$ denote the vector of transfers to lucky and unlucky countries. Obviously, T_H will be negative and T_L will be positive in equilibrium.

Specifically, the timing of actions in period 2 is as follows. After the state is realized, lucky countries make a take it or leave it offer $T_L \geq 0$ to each unlucky country. If the offer is accepted by a particular country, it cannot default. If the offer is rejected, the country may default. We assume that the offer T_L does not depend on the amount of debt issued by an individual country. In a related bailout paper, Chari and Kehoe (2016) provide a rationale for this assumption. The basic idea is that monitoring the ex post debt levels of individual countries is costly, and often imperfect, and, in equilibrium unnecessary. So, the best decision of the countries making the offer is to make a take it or leave it offer rather than engaging in the messy task of determining whether an individual country has deviated from the equilibrium. Note that the prices of debt issued will depend on the amount of debt issued by a given country. This asymmetry seems natural to us, because private agents have stronger incentives to monitor the amount of debt than do governments.

Given the vector of inherited debts for each country, B_i, an *equilibrium of the offer game* consists of offers T_L, T_H for each unlucky and lucky country such that the countries optimally decide whether or not to accept the offer and whether or not to default if they reject the offer, the lucky countries choose their offer, and markets clear in that

(1) $\mu_L T_L + \mu_H T_H = 0.$

We now characterize the equilibrium of the offer game. Consider the problem of an unlucky country i which has received the transfer offer T_L. Since T_L is nonnegative, the country will reject the offer only if it plans to default. Thus, the decision on whether to accept the offer can be combined with the default decision. Thus, country i solves

(2) $V_L\left(B_i, \{b_{ij}\}, T\right) = \max_{\delta_i} y_L\left(\delta_i\left(B_i - T_L\right)\right) + \int \delta_j b_{ij} dj - \delta_i\left(B_i - T_L\right) - (1-\delta_i) y_L \kappa\left(B_i\right).$

The solution to this problem is to accept the offer and not default by setting $\delta_i = 1$ if and only if

(3) $y_L\left(\left(B_i - T_L\right)\right) - \left(B_i - T_L\right) \geq y_L\left(0\right) - y_L \kappa\left(B_i\right).$

Let B_L^* be the critical value such that absent transfers country does not default, that is, B_L^* is given by

$$y_L\left(B_L^*\right) - B_L^* = y_L\left(0\right) - y_L \kappa\left(B_L^*\right).$$

Let $T_L^*\left(B_i\right)$ denote the minimum offer that is accepted. If $B_i \geq B_L^*$, this minimum accepted offer is set so that the government is indifferent between repaying and defaulting, in that (3) holds with equality. If $B_i < B_L^*$, the minimum accepted offer is 0. Note from (3) that if $T_L \geq T_L^*\left(B_i\right)$, the country gladly accepts and does not default. Thus, $T_L^*(B_i)$ is the minimum offer the unlucky country will accept. Also, note that countries do not need their debts to be completely forgiven to induce them not to default. That is, $T_L^*(B_i) \leq B_i$. To see this result, note that (3) holds with strict inequality at $T_L^*(B_i) = B_i$.

Note, for later, that since $T_L^*\left(B_i\right)$ is defined by (3) with equality, when $B_i \geq B_L^*$, it

follows that $B_i - T_L^*(B_i)$ is increasing in B_i. We assume that

(4) $\quad (y_L' - 1 + y_L\kappa') \leq 0.$

This assumption implies that T_L^* is increasing in B_i.

Next, consider the offer decision of the lucky countries. In the equilibrium of the two period model, all countries will choose the same level of debt. The lucky countries take the debt levels of the representative unlucky country, denoted by B, as given and choose their offer. If $B < B_L^*$, the representative unlucky country will not default, regardless of the offer, and the optimal offer is 0. If $B \geq B_L^*$, the representative unlucky country will default unless it receives an offer of at least $T_L^*(B)$. Since $T_L^*(B) \leq B$, the offer that maximizes the payoff of the lucky countries, $B - T_L$, is to set the transfer to the lowest acceptable level, namely, $T_L^*(B)$.

(5) $\quad V_H(B_i, \{b_{ij}\}, T) = \max_{\delta_i} y_H + \int \delta_j b_{ij} dj - \delta_i B_i + T_H - (1-\delta_i) y_H \kappa(B_i).$

As long as T_H is negative, this country set $\delta_i = 1$ if and only if

(6) $\quad B_i \leq y_H \kappa(B_i).$

Let B_H^* denote the value of B_i such that (6) holds with equality. Thus, if $B_i \leq B_H^*$, lucky countries do not default.

We summarize this characterization in the following lemma.

Lemma: Suppose that the debt level of the representative country satisfies $B \leq B_H^*$. Then, lucky countries do not default. All unlucky countries receive an offer of $T_L^*(B)$ if $B \geq B_L^*$, and an offer of 0 otherwise. An individual unlucky country accepts the transfer if its debt level $B_i \leq B$, and rejects the transfer and defaults if $B_i > B$.

This lemma immediately implies that, if the representative country has a debt level $B \leq B_H^*$, private lenders anticipate no default in period 2 by lucky countries. If an individual unlucky country has a debt level $B_i \leq B$, private lenders anticipate bailouts and no default. Thus if $B_i \leq B$, the price of debt $Q_i = \beta$. If an individual country has a debt level $B_i > B$,

private lenders anticipate default in the unlucky state, and the price of debt is given by $Q_i = \beta\mu_H$.

Next, we turn to the decision on how much government spending to finance in period 1 and how much debt to issue given the pricing function. We assume that this decision satisfies $B_i \leq B_H^*$. It is straightforward to provide sufficient conditions on $w(g)$ for this assumption to be satisfied.

Taking as given the debt issues by other countries, and therefore the representative debt level B, the payoffs of a country i if it chooses a debt level $B_i \leq B$, ignoring irrelevant constants, are given by

$$(7) \quad w\left(\beta B_i\right) - \beta\mu_H B_i - \beta\mu_L y_L\left(\left(B_i - T_L^*(B)\right)\right) - \left(B_i - T_L^*(B)\right),$$

noting that the price of debt is β. Its payoffs if it chooses a debt level $B_i > B$ are given by

$$(8) \quad w\left(\beta\mu_H B_i\right) - \beta\mu_H B_i - \beta\mu_L(y_L\left(0\right) - y_L\kappa(B_i),$$

noting that the price of debt is, in this case, $\beta\mu_H$.

Country i's problem is to choose a debt level, B_i that maximizes its payoffs, given the representative debt level B. Let $B_i(B)$ denote the best response function that solves this problem.

An *equilibrium for the two period model* consists of a best response function $B_i(B)$ that maximizes each country's payoffs given the future transfer vector T, and satisfies the fixed point condition, $B_i(B) = B$, and a transfer vector T that is an equilibrium of the offer game.

Next, we claim that in any equilibrium, the best response function $B_i(B)$ must maximize (7). The argument is by contradiction. Suppose this best response function maximized (7). Note that the maximized value of debt is independent of B, and is the same for all countries. In the second period, given the level of inherited debt associated with solving (7), lucky countries would find it optimal to engage in bailouts. Thus, the price of the debt cannot

be $\beta\mu_H$ and must be β.

Suppose next that period 1 government consumption is sufficiently valuable in that

$$(9) \quad w'(\beta B_L^*) \geq \mu_H + \mu_L [1 - y_L'(B_L^*)].$$

That is, the government would like to issue more debt then B_L^* if it could commit itself not to default. Then it turns out that the two period model has a continuum of equilibria. Any value of B which satisfies the first order condition associated with maximizing (7) subject to $B_i \leq B$ is part of an equilibrium. The first-order condition is given by

$$(10) \quad w'(\beta B) \geq \mu_H + \mu_L [1 - y_L'(B)].$$

Of particular interest is the *maximal debt equilibrium* in which the level of debt $B_{\max}$ is such that (10) holds with equality at $B_{\max}$. We summarize this discussion in the following Proposition.

Proposition 1: (Multiplicity of equilibria) Any debt level B that satisfies (10) is part of an equilibrium.

In what follows we focus on the maximal debt equilibrium.

Characterizing Equilibrium with a Benevolent Monetary Authority

Now we introduce a monetary authority that lacks commitment. With this authority, the timing in period 2 is that shocks are realized, then the lucky countries make offers to the unlucky countries and then the monetary authority chooses a transfer R_H and R_L to the unlucky countries. We require that these transfers must satisfy the resource constraint

$$\mu_H R_H + \mu_L R_L = 0.$$

We assume that the monetary transfer imposes a cost of τ_m per unit of transfer to the lucky country. One interpretation is that the monetary authority taxes lucky countries R_H each and makes transfers R_L to unlucky countries, and that these transfers impose an extra cost

of τ_m on lucky countries. An alternative interpretation is that a monetary transfer of R_L raises inflation in all countries and imposes a cost $(1+\tau_m)R_H$ on each lucky country. The assumption that monetary transfers are distorting is meant to capture the idea that, at the margin, inflation is more distorting than a fiscal transfer. Inflation is more distorting if fiscal transfers are a form of debt forgiveness. Such forgiveness often does not impose additional ex post distortions.

The problem for the monetary authority given B and transfers T is to choose R to maximize the sum of utilities of residents in all countries. Ignoring irrelevant constants, and substituting in from the resource constraint, this problem reduces to

$$\max_R \left[\mu_H (1+\tau_m) R_H + \mu_L \left(y_L \left(B - T_L + \frac{\mu_H}{\mu_L} R_H\right) - \frac{\mu_H}{\mu_L} R_H\right)\right].$$

The first-order condition for this problem is

$$\tau_m = -y_L' (B - (T_L + R_L))$$

This first-order condition yields a striking result. Given the level of debt, B, fiscal transfers completely crowd out monetary transfers.

Lemma. (Complete crowding out) For each level of B, total transfers to the unlucky countries $R_L + T_L$ are independent of T_L. Furthermore the total amount repaid to the foreigners, $B - (T_L + R_L)$, is independent of B.

Now consider the union transfer problem. Since the transfer made by the monetary authority is distorting and the direct transfer is not, it is optimal for the lucky countries to make a transfer $\bar{T}_L(B)$ such that $\bar{T}_L(B)$ satisfies

$$\tau_m = -y_L' \left(B - \bar{T}_L(B)\right).$$

Suppose that τ_m is sufficiently small in that

$$(11) \quad -y_L' (B_{\max} - T_{Lnd}) > \tau_m,$$

then $R_L > 0$ at $(B_{\max}, T_{\max})$. This assumption implies that at the maximal debt equilibrium, the monetary authority will intervene.

Now we can consider the period 1 problem of choosing the optimal level of debt issue assuming that τ_m is sufficiently small. The first-order condition for the period 1 debt issue decision is

$$w'(\beta B) - \mu_H - \mu_L \left[1 - y_L' \left(B - \bar{T}_L(B)\right)\right] \geq 0.$$

We have the following proposition.

Proposition 2. Under the assumption that τ_m is sufficiently small so that the monetary authority will intervene at the no-monetary authority equilibrium outcome, in that (11) is satisfied, the model with a benevolent monetary authority has an equilibrium in which the level of debt satisfies

$$w'(\beta B) = \mu_H + \mu_L [1 + \tau_m]$$

$$\tau_m = -y_L' \left(B - \bar{T}_L(B)\right).$$

In this equilibrium the level of debt issued by all countries is higher than in the equilibrium without the monetary authority.

This theory offers one rationale for Bulow and Rogoff's finding that Greece received larger transfers (including debt forgiveness) during its foreign debt crisis than did other economies during their foreign debt crises.

Note that if τ_m falls, debt issue rises. In this sense, making it easier for the monetary authority to respond worsens the debt overissue problem.

We have shown that lack of commitment by the monetary authority leads countries to issue too much debt. In equilibrium, the monetary authority does not respond. The threat that it might do so induces lucky countries to be more willing to bail out unlucky countries. This increased willingness worsens the debt overissue problem.

It is straightforward to extend the framework here to analyze how anticipations of bailouts of bank debtors by fiscal authorities aggravates the moral hazard problem of bank

risk, and to show that a Good Samaritan monetary authority worsens this problem even further. An interesting feature of such a model is that the Good Samaritan may well never have to actually engage in inflationary bailouts.

2. Down the Slippery Slope

The theoretical framework developed here is consistent with key observations regarding the European Monetary Union. It was formed to help solve commitment problems. Unions can create externalities, particularly in fiscal policy and bank supervision. Constraints on fiscal policy are desirable and were imposed, along with penalties for violating them. These constraints were violated, but no penalties were imposed. Governments had strong incentives to run deficits, anticipating bailouts by the union, if economic circumstances turned sour. Bank had incentives to take on excessive risk.

These forces made a financial crisis more likely. A crisis did occur. As in our Good Samaritan model, fiscal authorities in Northern European economies ended up bearing a disproportionate share of the bailout burden during the crisis, and as in that model, ex-post they rationally decided that such bailouts were preferred to actions by the European Central Bank. Also, as in that model, a benevolent monetary authority announced that it would "do whatever it takes" in a crisis. That is, indeed, the rational response given that a crisis was well under way.

In this sense, the framework developed here offers a coherent narrative for both the formation of the European Monetary Union, and the challenges it has faced. We have argued that both the formation and the challenges arise fundamentally from lack of commitment.

3. The Road Ahead

Given that this theoretical framework is arguably consistent with broad features of the European experience, we now use it to think about policy, in the sense of redesigning European institutions. We address three kinds of policy questions. The first is, how big should the role of the European Central Bank or the European stability mechanism be as effectively lenders of last resort—how big should the bailout fund be? The second is, what's the extent to which bank regulations should be centralized? And, the third is, what constraints on fiscal policy are desirable?

Interestingly enough, a volume of papers issued by the Centre for Economic Policy Research (CEPR) has collected the views of leading economists in Europe on these, and other policy questions. Our reading is that, first, the vast majority of economists who have written these papers think the European Monetary Union needs a lender of last resort with even larger resources than it currently has. Second, essentially all of them agree that bank regulations should be centralized. Third, given the historical experience, they are generally pessimistic on enforcing constraints on fiscal policy.

On the lender of last resort, for reasons we have outlined, the remedy may exacerbate the problems that it is intended to solve. On bank regulation, the externalities are real and centralization is desirable. The devil is in the details.

In terms of constraints on fiscal policies, we do offer one suggestion. The sovereign default literature suggests that excessive amounts of short term debt can exacerbate rollover crises (see Cole and Kehoe (2000)). Without a monetary union, countries balance this additional cost of short term debt against other benefits, as outlined for example, in Bocola and Dovis (2016), in determining the optimal maturity structure of debt. In a union, externalities could arise for reasons similar to those discussed here. If the authorities in a union lack commitment, they may find it optimal to engage in bailouts during a rollover crisis. Expectations of such bailouts can induce individual countries to be less concerned about rollover crises than they would be if they were not part of a monetary union. This reduced concern may lead individual countries to tilt the maturity structure of debt toward short term instruments to a greater extent than they would if they were not part of a monetary union. Given these externalities from lack of commitment, constraints on the maturity structure of debt are then desirable. Such constraints might well be enforceable even when constraints on the aggregate amount of debt are not.

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