CHAPTER THREE

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 for both 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.

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,

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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 faced 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 bank 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 induce 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 for 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 skeptical 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.

1.1. 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 lead 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 policymakers 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 policymakers 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).

1.2. Monetary unions can create externalities in other policy areas

Chari and Kehoe (2007, 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 imply 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 policymakers 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.

1.3. 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 to voluntarily 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.

1.3.1. 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 differentially 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.

1.3.2. 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

$$\mu_L T_L + \mu_H T_H = 0. \tag{1}$$

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

$$\begin{aligned} V_L(B_i, \{b_{ij}\}, T) = \max_{\delta_i} \; & y_L(\delta_i(B_i - T_L)) \\ & + \int \delta_j b_{ij} dj - \delta_i(B_i - T_L) - (1 - \delta_i) y_L \kappa(B_i). \end{aligned} \tag{2}$$

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

$$y_L((B_i - T_L)) - (B_i - T_L) \geq y_L(0) - y_L \kappa(B_i). \tag{3}$$

Let $B_L^\star$ be the critical value such that, absent transfers, country i does not default, that is, $B_L^\star$ is given by

$$y_L(B_L^\star) - B_L^\star = y_L(0) - y_L \kappa(B_L^\star).$$

Let $T_L^\star(B_i)$ denote the minimum offer that is accepted. If $B_i \geq B_L^\star$, this minimum accepted offer is set so that the government is indifferent between repaying and defaulting, in that (3) holds with equality. If $B_i < B_L^\star$, the minimum accepted offer is 0. Note from (3) that if $T_L \geq T_L^\star(B_i)$, the country gladly accepts and does not default. Thus, $T_L^\star(B_i)$ 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, $T_L^\star(B_i) \leq B_i$. To see this result, note that (3) holds with strict inequality at $T_L^\star(B_i) = B_i$.

Note, for later, that since $T_L^\star(B_i)$ is defined by (3) with equality, when $B_i \geq B_L^\star$, it follows that $B_i - T_L^\star(B_i)$ is increasing in B_i. We assume that

$$(y_L' - 1 + y_L\kappa') \leq 0. \tag{4}$$

This assumption implies that $T_L^\star$ 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 $B < B_L^\star$, the representative unlucky country will not default, regardless of the offer, and the optimal offer is 0. If $B \geq B_L^\star$, the representative unlucky country will default unless it receives an offer of at least $T_L^\star(B)$. Since $T_L^\star(B) \leq B$, the offer that maximizes the payoff of the lucky countries, $B - T_L$, is to set the transfer to the lowest acceptable level, namely, $T_L^\star(B)$:

$$\begin{aligned} V_H(B_i, \{b_{ij}\}, T) = \max_{\delta_i} \; & y_H + \int \delta_j b_{ij} dj - \delta_i B_i \\ & + T_H - (1 - \delta_i) y_H \kappa(B_i). \end{aligned} \tag{5}$$

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

$$B_i \leq y_H \kappa(B_i). \tag{6}$$

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

We summarize this characterization in the following lemma.

Lemma: Suppose that the debt level of the representative country satisfies $B \leq B_H^\star$. Then lucky countries do not default. All unlucky countries receive an offer of $T_L^\star(B)$, if $B \geq B_L^\star$, 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 $B \leq B_H^\star$, 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 $B_i \leq B_H^\star$. 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

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

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

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

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 in period 1, government consumption is sufficiently valuable in that

$$w'(\beta B_L^\star) \geq \mu_H + \mu_L[1 - y_L'(B_L^\star)]. \tag{9}$$

That is, the government would like to issue more debt than $B_L^\star$ if it could commit itself to not defaulting. 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

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

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.

1.3.3. 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 trans-

fer is not, it is optimal for the lucky countries to make a transfer $\overline{T}_L(B)$ such that $\overline{T}_L(B)$ satisfies

$$\tau_m = -y'_L(B - \overline{T}_L(B)).$$

Suppose that τ_m is sufficiently small in that

$$-y'_L(B_{\max} - T_{Lnd}) > \tau_m, \tag{11}$$

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

$$w'(\beta B) - \mu_H - \mu_L[1 - y'_L(B - \overline{T}_L(B))] \geq 0.$$

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

$$w'(\beta B) = \mu_H + \mu_L[1 + \tau_m]$$
$$\tau_m = -y'_L(B - \overline{T}_L(B)).$$

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 anticipation 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. Banks 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 about 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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DISCUSSION BY HARALD UHLIG

1. Introduction

This is an intriguing paper. According to the authors, it seeks to "develop a coherent and seamless narrative" and "a consistent intellectual framework to think about the forces that led to the formation of the European Monetary Union (EMU) and the challenges it has faced." This, of course, is a tall objective. Building on beautiful prior work of these authors or a subset, it emphasizes issues of commitment and issues of monetary-fiscal interaction. In essence, a monetary union can be an excellent commitment device, if national central banks are otherwise weak, even if the central bank in the monetary union also lacks commitment. Absent such commitment, there are externalities in fiscal policies and bank supervision policies, the solution of which requires union-wide cooperation. These are excellent and interesting points, and the authors are right in making them a central focus of their analysis.

The themes emphasized by the authors certainly resonate with me. This is a good point to shamelessly cite my own research within this context. The authors emphasize that externalities of fiscal choices imply the necessity to impose constraints on the latter. Beetsma and Uhlig (1999) likewise emphasize this point in their analysis of the Stability and Growth Pact. The authors argue that the failure of the Maastricht Treaty is a failure of bank regulation. Likewise, I consider the issue of bank regulation and its issues for sovereign default risk to be central in a monetary union (see Uhlig 2013). In Roch and Uhlig (2016) we find that central bank interventions and guarantees lead to higher debt levels, just as the au-

I have an ongoing consulting relationship with a Federal Reserve Bank, the Bundesbank, and the ECB.

thors here do. Finally, Uhlig (2016) agrees with the authors that an ECB intervention is likely to precipitate fiscal bailouts.

Despite the authors' intentions, though, it needs to be recognized that the European Monetary Union exists for reasons beyond the purely economic advantages and the role of commitment problems. A brief history of the European Monetary Union would start with the initial dominance of the Bundesbank in the late 1980s and in the system of European central banks and currencies, outside the control of other affected countries. That dominance was not always appreciated. Thus, as a price to be paid by Germany for German reunification, a European Central Bank was created, effectively replacing the leadership position of the Bundesbank, within the context of a single currency, and creating a degree of control by all countries over this central portion of European macroeconomic policy. Put differently, EMU can be thought of as providing an avenue to commit the Bundesbank to the desires of all other countries, that is, to commit to a strong national central bank. The European Monetary Union was also a piece within the agenda of the visionaries who dreamt of a "United States of Europe." The question at the time was not so much whether this was a desirable objective (there was wide agreement about that), but rather whether monetary union should come as the last step ("crowning theory") or as an early step to push other developments forward ("locomotive theory"). Is the framework by Chari, Dovis, and Kehoe suitable for answering such questions as, Why does German chancellor Merkel seeks to keep Greece in the EMU? Is a breakup of the Eurozone into northern and southern portions, with the North introducing a new Euro or "NEuro," a good or a bad idea, and why? Finally, what is different about EMU versus the United States, and what is similar? Put differently, what would be bad about introducing a separate currency in California? Once one begins thinking more about these questions, one

realizes that monetary unions exist for more, and probably more important, reasons than as costly commitment devices for weak national central banks. There are important questions and analyses about the EMU to be pursued beyond the framework offered by the authors here.

Furthermore, there may not be a strong case that the EMU was truly instrumental as a commitment device for weak national banks. Examine figure 3.1. It compares the inflationary developments in the Eurozone countries to those of the United States. The general patterns look remarkably similar (though perhaps not on the same time scale): initially high inflation was gradually declining to lower and stable inflation rates. There was the introduction of a European Monetary Union some time within the sample for the EMU countries, but obviously not for the United States. The juxtaposition of this position does not strongly suggest a special role for the introduction of the European Monetary Union, though I shall concede that I tend to rather believe that it did. It may be worth investigating this matter more and with a more open mind.

All these remarks are not meant to take away from this truly fine paper, but rather they are meant to put its contributions and insights into some perspective.

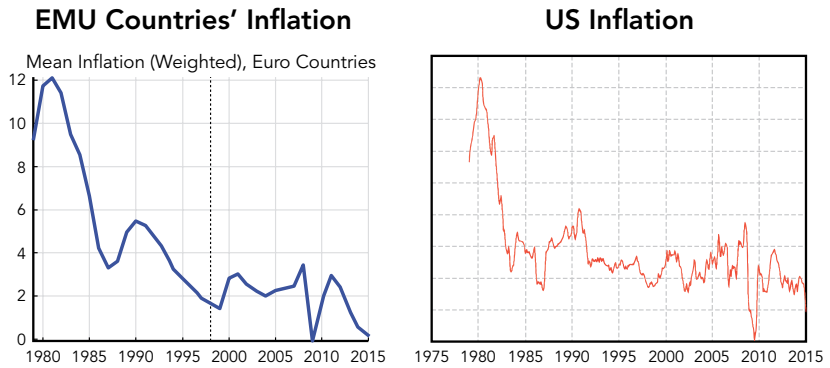

FIGURE 3.1. Inflation in Europe vs inflation in the United States.

2. The model

Let me therefore reflect on the theoretical framework that the authors provide. After all, that is what they consider to be their key contribution. Allow me to present a simplified version of their model. I shall do so by building up from an even simpler structure towards a version of the structure that these authors employ.

For the simpler structure, consider two countries, N or "North" and S or "South." There are two periods and one consumption good each period. Suppose S borrows some amount B from N in period $t = 1$, where B is chosen by S. For the resources thus obtained, S experiences period-1 utility $w(B)$. In period 2, S has some income y and two choices. It may either pay some amount x to N, where x is chosen by N. Or it may choose to not pay that amount, experiencing instead a debt-level-dependent resource loss of $\kappa(B)$ for some given function $\kappa(\cdot)$. The latter choice may best be thought of as S defaulting on N and the demanded repayment x, with $\kappa(B)$ the resulting damage to the economy from default. S then experiences linear utility in the resources c_2 remaining, after either paying x or $\kappa(B)$. Overall, the utility of S is

$$U = w(B) + c, \text{ where } c = y - x \text{ or } c = y - \kappa(B).$$

For N, we just need to know that they prefer more resources to fewer resources. Figure 3.2 provides an overview of what is going on. Let us solve for the resulting choices by proceeding backwards in time. First, in period 2, N will choose x to equal $\kappa(B)$: it is basically a take-it-or-leave-it (TIOLI) offer by N to S for avoiding the cost $\kappa(B)$, and N will choose that it be as large as possible subject to the participation constraint that $x \leq \kappa(B)$. We can therefore write the utility for South as

$$U = w(B) + y - \kappa(B)$$

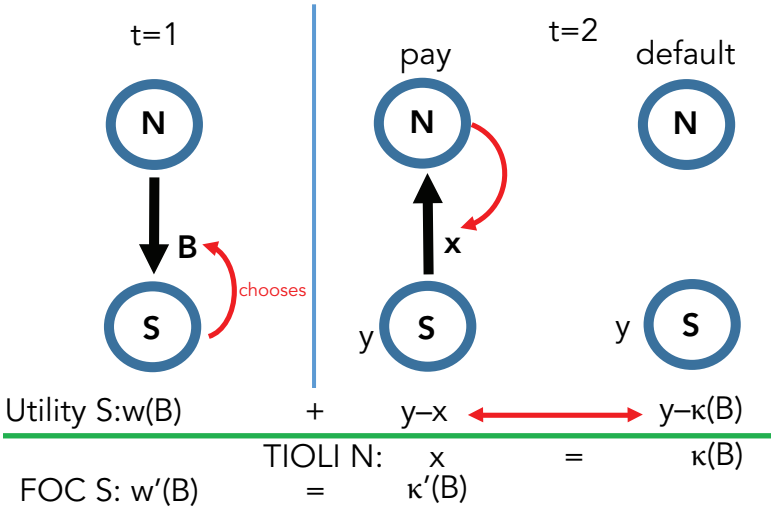

FIGURE 3.2. A simpler structure: one country, one choice of repayment.

regardless of the choice. The first-order condition

$$w'(B) = \kappa'(B) \tag{1}$$

then determines B.

There is an equivalent way of rewriting this simpler structure (see figure 3.3). Replace x by the difference between a full repayment from S to N of the initial debt B, and a transfer T to the South,

$$x = B - T.$$

We still obtain the same first-order condition (1). The only difference is notation. The participation constraint from the TIOLI offer by N now is

$$B - T = \kappa(B).$$

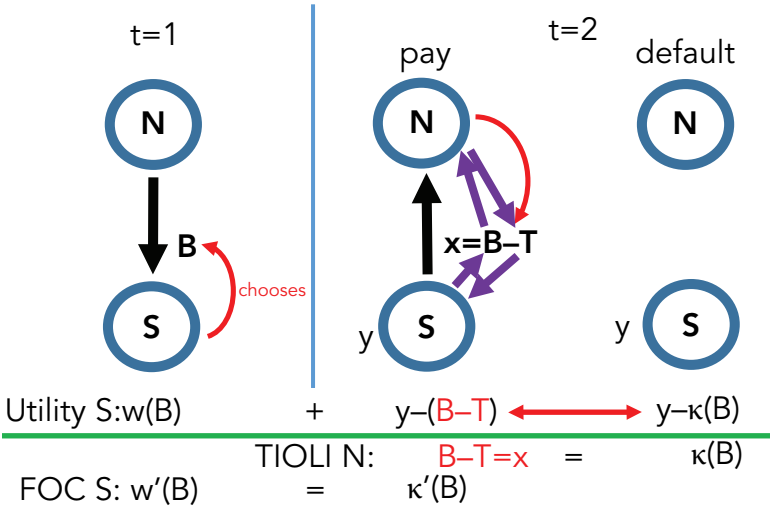

FIGURE 3.3. A simpler structure: one country, one choice of repayment, expressed with debt repayments and transfers.

That should not surprise. The interpretation is interesting, though. One can think of T as debt relief provided to the South. That debt relief is chosen by N as small as possible, subject to the constraint of S not defaulting. For that interpretation, one may wish to impose that $T \geq 0$.

The authors, though, pursue a somewhat different structure. They assume that there are many identical southern countries: perhaps many northern countries, too, though that is of less relevance. Additionally they assume that N commits to the same level of transfers $T \geq 0$ to all southern countries in such a way that the TIOLI indifference condition is satisfied for all other countries, choosing some level of debt $\overline{B}$. Consider then a particular southern country S, which now takes the variables chosen by N and all other southern countries as given (see figure 3.4). In effect, the aggregate choice $\overline{B}$ now imposes an upper limit of debt in period 2, given the

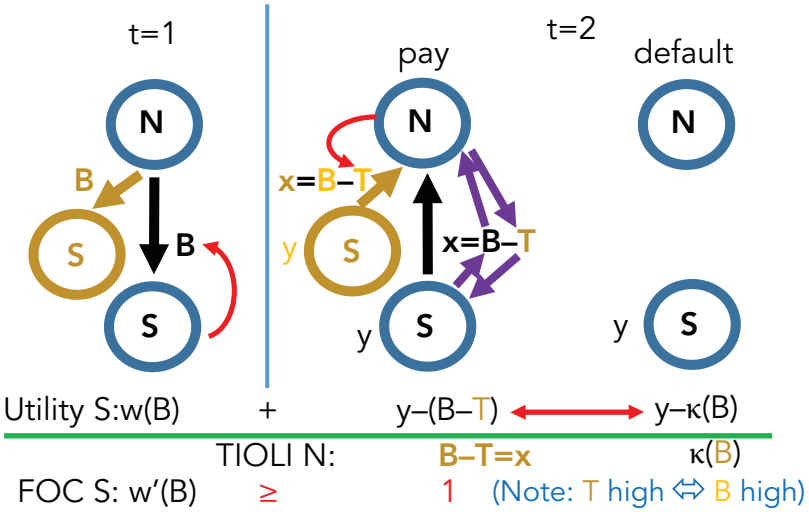

FIGURE 3.4. The model: many southern countries, holding transfers fixed across them. Note the multiplicity of equilibria.

choice of $\overline{T}$ as fixed across all countries. Since $\overline{T}$ is now treated as fixed by S, the first-order condition (1) is no longer correct. It is replaced instead by

$$w'(B) \geq 1. \tag{2}$$

S needs to compare the benefit of obtaining an additional unit of resource in period 1 to the costs of exactly repaying that unit in period 2. It is clear that it cannot be the case that $w'(B) < 1$: in that case, S would simply borrow a bit less, improving its overall situation. Since the same logic applies to all other southern countries, too, the aggregate choice $\overline{B} = B$ cannot be too high. However, it can be the case that $w'(B) > 1$. In that case, S desires to increase its debt level beyond the imposed limit B. But if it were to borrow more, it would end up defaulting in period 2, given the fixed transfer $T = \overline{T}$: thus N does not allow S to proceed with these higher

debt levels. One way of reading this is that N first fixes $T = \overline{T}$. Given $\overline{T}$, the TIOLI condition then determines $B = \overline{B}$. There are obviously lots of pairs (B,T), resulting in the same value $x = B - T$, even when one imposes (2). Thus, one can easily see that the model has multiple solutions or equilibria, without further considerations of the choice problem for N. For N, note that they cannot possibly obtain more than $x = \kappa(B)$. If $\kappa'(B) < 1$, as is reasonable, and if N only cares about total consumption, then N would rather prefer lower to higher levels of T and thus B. Any such analysis needs more assumptions about N, though.

Thus, let us introduce some more elements here. Let N fix $\overline{T}$ as the maximal bailout payment to private lenders (banks) from the North, who at the same time decide on the resources B to be lent to S. Suppose that N is desperate to avoid default by a positive fraction of private lenders, while lenders care about total resources (and perhaps a bit more about second period resources). If lenders expect some level $\overline{T}$, then their lending B will satisfy $B - \kappa(B) \leq T$, and equality, with $\kappa'(B) < 1$ and a slight preference for period 2 consumption. Conversely, if the government of N sees private lenders all lending some amount B, it will pick transfers T satisfying $B - T = \kappa(B)$ in order to avoid defaults. This generates a multipilicity of equilibria.

Finally then, introduce a central bank as a Good Samaritan (see figure 3.5). To proceed, let me drop the notational distinction between $\overline{T}$ and T. The central bank chooses the final, overall level of common transfers $T^* \geq 0$ to the southern countries, unless N chooses an even higher level. Given that choice, N then picks T provided directly by N, with $T^* - T$ provided indirectly by the central bank, if that amount is nonnegative. These indirect transfers are assumed to be less efficient than if N had chosen that higher level of transfers in the first place: it is assumed that these additional transfers result in costs $(T^* - T)(1 + \tau)$ for some $\tau > 0$ rather than $T^* - T$ for the North, for a total cost of

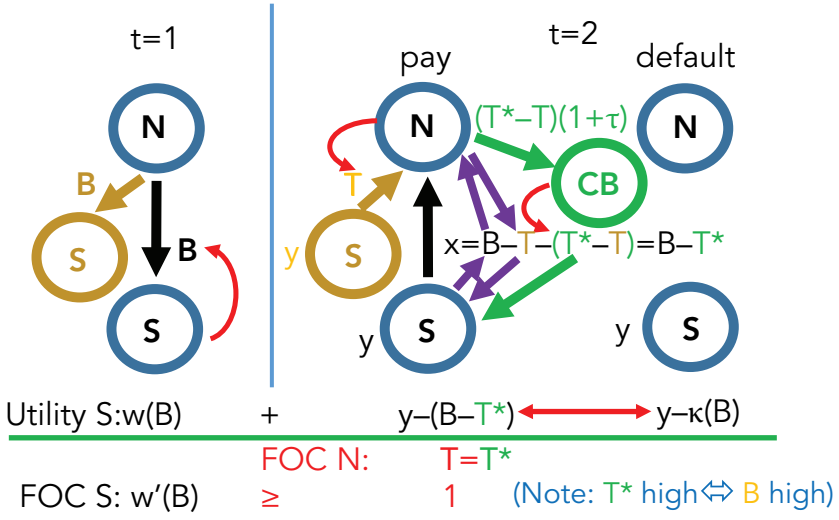

FIGURE 3.5. The model: introducing the common central bank as a Good Samaritan.

$$\begin{aligned} costs &= \max\{T^* - T; 0\}(1+\tau) + T \\ &= \max\{T^*; T\} + \tau \max\{T^* - T; 0\}. \end{aligned} \tag{3}$$

Despite the presence of a central bank, note that there is no "money" here. Everything is expressed in real terms, and the central bank is an additional fiscal player, with its own set of tools and objectives. However, one should think of $T^* - T$ as additional transfers resulting effectively from the various policies of leniency by the European Central Bank, per their Long-term Refinancing Operations or Outright Monetary Transactions (OMT) policies or their emergency lending procedures. This does strike me as a reasonable simplification, cutting to the essence of the final fiscal consequences, and the authors ought to be applauded for that.

As far as the South is concerned, the discussion for figure 4 applies here as well, using $\max\{T^*;T\}$ in place of T. There still is the first-order condition $w'(B) \geq 1$. With the additional elements of private credit markets and coordination, there still is the multiplicity of equilibria. What is new here now, compared to figure 4, is that

we get some action regarding the choice of T by N. Since N cannot do anything about T^*, they can only seek to minimize the costs of equation (3). Among all T in the range $T \in [0, T^*]$, the solution is then rather obviously to set $T = T^*$. Put differently, the implicit threat of the common central bank to bail out the South leads the North to do it already, so that the common central bank will not carry out that bailout itself.

I think that this is really a beautiful insight. It reminds me of the self-congratulation of Draghi and the ECB leadership, that its announcement of the OMT program brought down yields in Europe, without ever purchasing anything. Draghi called it the most successful program ever. This analysis here shows that indeed the announcement of T^* alone may avoid a default on certain debt levels B, on which we otherwise might see defaults. But the analysis also shows that this comes at considerable costs to taxpayers in the North, who will now have to pony up the level T^* forced upon them by the central bank. If the northern countries weren't willing to go there, had it not been for the intervention by the central bank, then there is little to congratulate the ECB and Draghi for, other than playing Robin Hood, stealing from the North to give to the South, without ever having to come out of the woods themselves.

The North could decide to be even more generous from the start in terms of these transfers, but it has to be at least as generous as the level envisioned by the central bank. These higher transfer levels then result in higher debt levels B, as discussed for figure 4. With $\kappa'(B) < 1$, getting dragged there by the central bank, it appears, is bad for the North but good for the South. In the extreme case that $\kappa'(B) = 0$, an increase of T^* by one unit increases B by one unit and thus an additional unit of resources for the South in the first period, courtesy of the North, without changing anything about the total repayment $x = B - T = \kappa(B) \equiv \bar{\kappa}$ in the second period.

One can view the readiness of the central bank to provide these funds as resulting from some lack of commitment. Therefore the authors find that lack of commitment by the common central bank

or perhaps merely the presence of such a common central bank leads to overall higher debt levels in the southern countries.

3. Some remarks regarading the assumptions

This is a beautiful analysis indeed. With this presentation, it is not hard to notice that the authors made some crucial choices that surely deserve further debate. First, is it reasonable to assume that indeed the same transfer shall be given to all countries, regardless of their debt choice? I strongly believe that the answer to this question is no. The bailout of Greece and the transfers to Greece appear to be chosen to keep Greece in the union, at considerable protest on their side against the imposed "austerity" conditions, in order to keep other countries in check and in order to avoid paying transfers to these countries as well. It seems to me that this is a rather crucial difference between their model and a more refined analysis of the political game played in the European Monetary Union. Second, suppose the North has a linear utility for overall resources, summed across both periods. Then lending any positive amounts to the South in period 1 is a bad deal, unless $T^* = 0$: for any value $T^* > 0$, the North receives less resources in the second period than in the first. So, why does N allow any lending to S in period 1? At best, one may wish to interpret this as a failed bank regulation, when adding the elements of private creditors and coordination.

Conversely, it may be a bit extreme that the North can be bothered to only provide just that amount of transfers ex-post that would avoid a default by the South. In these political debates, there are many other matters at stake, too, though fine: perhaps this particular assumption is not too far off. As far as the transfers by the common central bank are concerned, note that bailouts in particular by the European Central Bank are very clearly ruled out by the Maastricht Treaty. I guess the authors take the perspective that many of the provisions of the Maastricht Treaty are nothing more

than black ink on a sheet of paper, and I am sympathetic to that. Others, in particular officials at the ECB, may strongly disagree with the notion that they have found lavish ways to circumvent these treaty provisions, though. Note, though, that the central bank actually never ends up making these transfers: it is just the threat of making them that forces the North to cough up these high transfers in the first place.

Finally, given that the North somehow has to come up with the transfer resources, it is not a priori obvious that doing it via the various programs of the ECB is particularly ineffective, thus justifying the positive tax rate $\tau > 0$ in the analysis above. It may well be that monetary means turn out to be a cheaper way to finance fiscal transfers, in which case the North would end up choosing $T = 0$, leaving it all to the central banks. One may then wish to treat the Maastricht Treaty violation arguments more seriously, and the resulting analysis would then look quite a bit different.

4. Conclusions

This is an intriguing paper on an important topic. Many themes and insights resonate, as I can credibly testify, given my own work. However, a number of key assumptions and details need a good defense: I still consider myself a skeptic on a number of them. Further, the model leaves out some key considerations, despite the claims of the authors to the contrary. It is always good to make sure that one is solving the relevant problem for the situation at hand. The authors make a good step in that direction and provide an important contribution, but the reader is advised to devote thought to the question as to whether the authors have indeed succeeded in picking the central issue.

Because these critiques of some details should not take away from the overall assessment that this is a fine analysis indeed. I particularly enjoyed the point that the implicit threat of the

common central bank to bail out the South leads the North to do it already, so that the common central bank will not carry out that bailout itself. It may be worth restating what was stated in the text already. The beautiful insights of the analysis offered here provide an important perspective on the self-congratulation of Draghi and the ECB leadership that its announcement of the OMT program brought down yields in Europe without ever purchasing anything. Draghi called it the most successful program ever. The analysis here shows that indeed the announcement of T^* alone may avoid a deafult on certain debt levels B, on which we otherwise might see defaults. But the analysis also shows that this comes at considerable costs to taxpayers in the North, who will now have to pony up the level T^* forced upon them by the central bank. If the northern countries weren't willing to go there, had it not been for the intervention by the central bank, then there is little to congratulate the ECB and Draghi for other than playing Robin Hood, stealing from the North to give to the South, without ever having to come out of the woods themselves. Should the ECB be allowed to play that role? It seems to me that this should be a crucial part of the debate on the future architecture of the European Monetary System. The analysis here offers an important guide to that debate.

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GENERAL DISCUSSION

GEORGE SHULTZ: I found this a fascinating discussion because it seems to me it fits into a broader framework. I'd like to state that framework and then see if you might comment on how the economic part fits it. It seems to me that the overriding problem of governance all over the world in this new age is the problem of how you govern over diversity in an age of transparency. With the information and communication age, people know what's going on pretty fast, and they communicate. They've all got cell phones, and they organize, and we've seen this over and over. Diversity is everywhere, so the trick is knowing how to govern over it so it can express itself but at the same time fit into a pattern, and economics plays a large part in this process. Take Europe: it's been a civilized place for a long time, but you have to start with the fact that these countries are *very* different from each other. Italians are not like Finns, and they never will be, and we shouldn't even want them to be, yet they are part of a similar economy. So what are the things that allow diversity to be expressed comfortably and at the same time be put into a framework that's going to enlarge it and make it better? I would say the open borders to trade and to movement have been very much in that vein. I was in a discussion in Berlin about three months before the euro was introduced, and everybody was saying, "What a dumb idea." Marty Feldstein took it apart at the seams, and most of the hard things that have happened, he predicted. So to a certain extent, it's an attempt to govern over diversity in a way that doesn't fit.

V. V. CHARI: I think you're dead on, on this. So I'd point to a slightly different aspect of diversity that shows up in some of the models that we wrote down, which is not necessarily diversity in terms of ex-ante heterogeneity, but diversity in terms of how

different countries, regions, people are going to be affected by different circumstances—different shocks so to speak, using our lingo—to a different extent. And in those kinds of situations when people, even if in an ex-ante sense they're not that different, if they're exposed to different shocks, different circumstances, then Good Samaritans at the end of the day—I want to emphasize this—at the situation where they are confronted they will and they should attempt to try and narrow those differences. But the problem that I'm highlighting is those attempts, ex-post, to narrow those differences across people to create adverse economic incentives. So you're challenging question is, What do we do about this? The Germanic response, if you will, is just, "Nonsense! Commit to it, and do it." And I also think that it may also be an unwise policy prescription in the following sense: that in order for commitment to be valuable, it is not enough that you the policymaker are committed to a particular policy rule. It is critically important that people and markets *believe* that you are. The worst possible outcome is when private agents don't believe that you are committed, take on, for example, excessive risk, and then you take a moralistic position that says, "I won't do the bailouts." That is in some sense worse than going ahead and remedying the problem. So that's why what I've tried to argue throughout is that all of these kinds of things call for ex-ante, if you will, restraints and restrictions on a variety of policies, whether it's banks, whether it's governments, a variety of different ways, just as a way of addressing this problem.

GEORGE SHULTZ: Let me use as a contrast the emergence of North America. It's very different from Europe. There's no Brussels; there's no bureaucracy. But after NAFTA, it has kind of emerged. There are a million Canadians living in California, and people don't even know it. Our US imports from Mexico are 40% US content. People aren't aware of the way in which this has become a kind of integrated production process. And probably it works

because nobody's trying to run it. It's just happening as people respond to the incentives that are there.

KEN SINGLETON: I fully agree with Harald's comment about how EMU is more a political matter, part of the seventy-year transformation of Europe, instead of being motivated by economics. A better example of the model that you have, particularly with the large number assumption, is another monetary union, a much bigger one, and a much more durable one. That's the United States. The Federal Reserve is a hundred years old. Now that seems to fit your model in many ways better than the EU, particularly because the EMU has a couple of big players and a lot of small guys. Do you see anything in the past hundred years in the US that is predicted by your model?

V. V. CHARI: I tried as far as possible to keep myself within the confines of the academic papers that I have written. But let me offer a speculative observation. As I said earlier, the worst thing in the world that happens is people take on a lot of risk, a lot of exposure, and then believing that you're not committed, and then you think you're committed, and you don't do this. One, some admittedly very controversial—but I like—interpretation of what Friedman and Schwartz's account of the Great Depression, which I think contains the essence of the truth of the matter, is that had the Federal Reserve done what JP Morgan did in 1907, which is suspend convertibility. In effect, that is a bailout, if you will. Or, had we had deposit insurance, which is another form of bailout, the consequences of the Great Depression, the associate decline in the aggregate money stock, which is primarily not in the base—it was in the banking system—would have been much less severe. The climb out would have been much less severe. So that's one example of something I see in recent history, if you will. And most obviously, as far as the recent financial crisis is concerned, the markets were right. Investors in large financial enterprises, if you take their cumulative ex-post

return after the financial crisis, you got a modestly higher rate of return on average from that portfolio than you would have on Treasury bills. In other words, they were effectively bailed out. And so those are examples I can see in my analysis.

I just want to say a couple of things, and then maybe we'll have lunch or something? I agree. Monetary unions are more than costly commitment devices. And political scientists may be exactly right, it may be part of some other broader drive. I'm not an expert in those areas. I want to focus on one aspect. And it's a quantitative question, How big is it? I don't want to say that it is zero. Because people who have looked at ECB policy after the forming of the union have shown it is not the Bundesbank. That is, ECB policy seems to react to Euro-wide conditions, not merely to German conditions. Furthermore, it's not the case that Germany had dramatically low inflation rates before. Inflation rates in Germany have fallen.

Finally, this is related to an observation of Harald's. So I did—I should have put it up on the slides—I did compare US inflation to Japanese inflation. It's true the standard deviation fell. But it did fall by a lot more in Europe. So that's worthwhile remembering.

One last comment about the United States: if you think about a monetary union as a costly commitment device, I think that the formation of the United States, the Constitution of the United States in 1789, is what this paper at some level is also about. The Federalist Papers are very clear about the conflicts that were going on. They thought that having effectively 13 different monetary policies was a terrible idea, even though they understood the advantages of flexible exchange rates. You see it throughout the Federalist Papers. So the United States went through exactly the same kind of struggle and set it up for those kinds of reasons. And I agree, there may have been other motivations in Europe,

but there were other motivations in the United States also. And so people. . . . And Marty Feldstein is right, that forming the European Union is going to have costs. Right? But except I don't think he emphasized the key aspects of the costs that I have emphasized. Because there's a free-rider problem in a monetary union: individual countries have incentives to issue excessive debt. Individual countries have incentives to pursue excessively lax supervisory policies. Those are real. Those are important. You can't evade those. And so you have to confront them, and you have to design policies in such a way that you put yourself at a smaller threat of suffering a serious crisis. That reality is something we cannot escape.

SEBASTIAN EDWARDS: Great paper. Great discussion. I liked all those little circles, different colors. That was a great rendition of the model. So, Chari, at the heart of your presentation is what we've emphasized throughout this discussion. Monetary unions have costly commitment devices. So I want to ask you, does your model have anything to say about ways of getting the commitment in a less costly way? And what I have in mind is dollarization, just giving up your currency, which is something of course, Argentina considered in 2001. John Taylor and I wrote about those subjects. And it's an issue that has gone away in Latin America, but I can assure you that within our lifetime it's going to come back. To what extent can your model deal with that issue, which is, give up your currency? And what are the costs in that case?

V. V. CHARI: Dollarization is very different from a monetary union in one important respect. With dollarization or with euroization, you are ceding all control over monetary policy to an outsider. With a monetary union, the way most monetary unions are structured, you have a voice at the table. That makes a big difference.

SEBASTIAN EDWARDS: Do you think that Portugal is really heard at the ECB? When the Portuguese speak, do people pay attention?

V. V. CHARI: They do have a weighted majority voting scheme. I prefer to think about these as the way any parliament works, which is that people engage in some amount of horse trading. So the question is, is Germany's vote—and I think the population of Portugal is about ten million, the population of Germany is 80 million, so my guess is that Germany has probably eight times the weight in the deliberations. But I wouldn't argue that Portugal has zero. And that's what our model is meant to capture.

MICHAEL HUTCHISON: Chari emphasized the slippery slope, and that Germany and France, by violating the Stability and Growth Pact, may have started it. But in my view, it started much earlier. And that was with the entry criteria and the interpretation of the Maastricht Treaty—the interpretation of the criteria went from "static" to "dynamic." No longer did countries have to meet the debt level target, but rather simply be on a dynamic trajectory to approach that level. So I think in some sense that was really the beginning of the problem. Rather than North/South EMU, you started with one collective EMU with very different economies. So I'd like to ask you this: Who would be in the EMU if you the EC had rigorously enforced the Maastricht Treaty? Of all the weak countries, only Ireland would be an EMU member. Conceptualize a situation where the weaker countries, Portugal, Greece in particular, weren't in EMU. Would they be facing a financial crisis today? Would this not be simply another Greek financial crisis? They've had many. This is one more. The only difference is, it's harder for them to get out of it, and default becomes a European issue as opposed to just a Greek issue.

V. V. CHARI: Let me start with the last observation, because that's, I think, the key to all this. Sovereign governments borrow all the time, and default a decent fraction of the time. This happens to

Ecuador, Argentina, over and over again. And in every one of these cases, they bear the primary cost of the default; they bear the primary benefits of the borrower. What I've tried to highlight is once you are in a union, and you can imagine exiting, as Harald Uhlig emphasized, exit can be costly, not just because of default but it could also be costly because default requires that you exit the union. In all of these situations, part of the cost of the bailout, if you will, of the renegotiation, is going to be borne by someone else—by the Netherlands, by France, by Germany. If they're going to bear part of the cost, then that exacerbates my incentives. All right? And so that's why, to answer your question more directly, I don't know, but my guess is Greece would probably have been in trouble given the kinds of shocks that they were subject to. But lenders would have been much more reluctant ex-ante to lend to Greece as much as they did, in part because lenders were anticipating—an anticipation that turned out to be not too far off—at the end of the day, the private lenders were not quite made whole. They took a haircut. But they didn't take a huge haircut. A lot of that haircut got shifted over when the debt got shifted over to the SM and to other kinds of mechanism. And that's exactly what, I would argue, lenders were anticipating. And given those anticipations, Greece did the smart thing for Greece, which is: let's have a party. And they had a party. And the party had unfortunate consequences. That's part of the risks they ran into. I want to argue that everybody in this game was pursuing what they saw as their rational self-interests. Nobody was fooled into anything like that. They were surprised in the sense that the shocks hit. But they weren't surprised in the sense that they didn't think that these were positive probability events.