CENTRAL BANK CONSTITUTIONS FOR MONETARY UNIONS

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ABSTRACT

Central Bank Constitutions for Monetary Unions*

Historical experience suggests that the distribution of monetary policy authority among the members of a monetary union is a key aspect of the design of a central bank constitution. We analyse alternative institutional solutions to that problem with different degrees of centralization of monetary policy decisions. The degree of centralization required to facilitate credible, low-inflation policies depends critically on the political structure of the monetary union. Efficient monetary stabilization requires centralized decision-making rules. Whether or not stabilization can be improved by adding central appointees to member state representatives on the central bank council depends on the stochastic structure of the relevant economic disturbances.

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NON-TECHNICAL SUMMARY

A monetary union among a group of independent countries, such as a European Monetary Union in the EC, a rouble union among the former parts of the Soviet Union, or a monetary union among the members of a federal nation such as Canada, Germany or the United States requires an arrangement to distribute the power over monetary policy between the centre and the individual members of the union. Even in the absence of a central government, policy-makers in the monetary union will look at monetary policy from two different perspectives: a unified perspective, considering union-wide aggregates of output, employment and prices as the relevant targets of union monetary policy, and a regional or national perspective taking regional or national aggregates as targets and making monetary policy actions dependent on regional or national idiosyncrasies. One important aspect of the central bank constitution then is to define a balance between these two perspectives.

Historical experience points clearly to the importance of this aspect. The unsuccessful fate of the first two Banks of the United States in the nineteenth century was largely determined by regional conflicts over financial policies. A shift of power from the centre to the regions in the Federal Reserve System of the early 1930s was among the main sources of the Fed's failure to cope with the onset of the Great Depression. The post-1935 structure of the Federal Open Market Committee (FOMC) served to reconcile conflicting views about the inflationary stance of monetary policy between 'Westerners' and 'Easterners'. Germany provides further examples in the history of the Reichsbank and of the Bundesbank.

Federal states commonly seek a balance between regional and central interests by appointing representatives of the individual regions together with candidates chosen by the federal government to the central bank council. In those monetary unions, where no federal government exists, the central bank council includes country representatives and members chosen in a joint appointment procedure or otherwise representing a more global view of the union.

This paper evaluates alternative institutional arrangements to distribute the power over monetary policy in the central bank council of a monetary union. In contrast to other recent papers asking under what circumstances individual countries would want to join a monetary union not yet in existence, we assume that the decision to form the monetary union has already been made and that exit from the union is prohibitively expensive for all members. On this basis we ask what arrangement is preferable from the point of view of the representative household in the union, i.e. one whose views on monetary policy are defined in terms of union-wide aggregates of output, employment and prices. We assume

that council decisions are the outcome of a voting procedure with a simple majority rule, which is consistent with central bank laws in practice.

Our analysis is based on the standard model of monetary policy featuring a time-consistency problem and a macro stabilization problem. Monetary policy actions are the outcome of decisions in the central bank council of the monetary union, whose members are appointed officials. We distinguish between two types of appointees. The first type are council members chosen by the federal administration or through an appointment procedure in which all member states participate simultaneously, if, as in the EC, no federal government exists. Borrowing from US practice, we call these members governors. The second type are state representatives chosen by the individual member governments. We assume that the different appointment (and possibly, re-appointment) procedures create different mandates and responsibilities. Governors see their responsibility primarily to stabilize union employment and prices, while state representatives consider prices and employment in their home state as important targets. For simplicity, we assume that both types take the most extreme views and care only about their own states or only about the union.

Furthermore, the appointment creates an agency problem, i.e. the members of the central bank council do not necessarily pursue the best policy that the public sector wants. We assume that the members of the central bank council wish to stabilize employment around target rates exceeding the natural rate, resulting in an inflation bias.

Our model shows that leaving the decision over monetary stabilization policies to the state representatives always leads to inefficient monetary stabilization. The two reasons for this are that state representatives will want to use the common monetary policy to stabilize regional shocks, and that they face a greater degree of policy uncertainty making their response to aggregate shocks inappropriately small.

The long-run inflation performance of the monetary union depends critically on its political structure. With a council of state representatives, long-run price stability demands adjustments in the national electoral systems. If little political power is allocated at the centre, such as currently in the EC, the union fares best with monetary policy conducted by a council of governors. If the power allocated at the centre is large, the union fares best with a council dominated by state representatives. Decentralizing monetary policy decisions enhances monetary stability in the presence of partisan politics. Whether or not appointing governors and state representatives together to the council improves the monetary performance of the union depends critically on the stochastic structure of the shocks hitting the union economy.

If price stability is served better by a council of state representatives, a conflict between efficient stabilization and long-run price stability arises. It may be addressed by separating the decisions over monetary policy into one that determines its long-run course and is determined by the state representatives, and one that determines short-run stabilization and is dominated by the governors. One way to implement that would be to let the council of state representatives meet only at long intervals and determine the average money growth rate. Between council meetings the governors would then conduct stabilization policy under the constraint that the council's target be met on average. This would resemble the set-up of the predecessor of the Bundesbank. Obviously, such an arrangement requires that the governors can be held accountable by the state representatives, e.g. by the provision that the state representatives can dismiss the governors if their target is repeatedly violated.

In general, the optimal design of a central bank council depends on the preferences of the member states and on the stochastic structure of the shocks hitting the individual regions. It follows that central bank constitutions should not be written before the members of the monetary union have been identified. In contrast, the central bank constitution included in the Maastricht Treaty was written without knowing the members of the future European Monetary Union. Furthermore, since neither preferences nor stochastic structures are likely to be fixed over time, constitutions should have a provision for amendments. If the central bank constitution is a simple law. such amendments can be enacted by the national parliaments. In contrast. the constitution of the European central bank is part an international treaty. that is difficult to amend. For both reasons, there is a substantial risk that the distribution of power will be inadequate in the European Central Bank and that this will make European monetary policies unsatisfactory.

I. Introduction

A monetary union among a group of independent countries, such as a European Monetary Union in the EC or a rouble union among the former parts of the Soviet Union, or among the members of a federal nation such as the US, Canada, or Germany, requires an arrangement to distribute the power over monetary policy between the center and the individual members of the union. Even in the absence of a central government, policy makers in the monetary union will look at monetary policy from two different perspectives: A unified one considering union-wide aggregates of output, employment, and prices as the relevant targets of union monetary policy, and a regional or national one taking regional or national aggregates as targets and making monetary policy actions dependent on regional or national idiosyncrasies. Evidence from the voting patterns of members of the Federal Open Market Committee (Chappell et al 1993, Havrilevsky et al 1990, 1993) and from the German Bundesbank Council (Vaubel, 1992) suggests that the views on optimal policy actions can differ widely between council members appointed by the federal government and those representing the district or state central banks, as well as among the district or state representatives. One important aspect of the central bank constitution then is to define a balance between these two perspectives.

Historical experience points clearly to the importance of this aspect. The unsuccessful fate of the first two Banks of the United States in the 19th century was largely determined by regional conflicts over financial policies (Temin, 1969). Friedman and Schwartz (1963) identify the shift of power from the New York Federal Reserve Bank representing the center of the US financial system to a Board of twelve regional bank presidents, all committed to following instructions by their directors, as one of the main sources of the Fed's failure to cope with the onset of the Great Depression. In turn, the 1935 Banking Act resulted in another power shift within the Federal Reserve System by creating the Federal Open Market Committee composed of seven members of the Federal Reserve Board in Washington - all appointed by the President - and only five members from the regional banks. The by-laws of the new FOMC even excluded that the latter be instructed by their banks or serve as their representatives.[1] Eichengreen (1990) explains that the particular structure of the FOMC served to reconcile conflicting views about the inflationary stance of monetary policy between 'Westerners" and 'Easterners'.[2]

Germany provides further historical examples (Geisler, 1953). Conflicts of interest among the German states delayed the creation of the Reichsbank for several years after 1871. When the Bank was finally erected, it was controlled entirely by the central government, making it an easy prey of the Reich's war finances. In contrast, the Bank Deutscher Länder, the predecessor of the West German Bundesbank from 1948 to 1957, was governed by a council of representatives of the federal state banks chaired by the Bank's president who was elected by the council members. As explained by Geisler and Vaubel (1991), the federal government fought hard, though only with limited success, to expand the power of the Bundesbank Council in Frankfurt in the writing of the 1957 Bundesbank Act. Specifically, the Adenauer government feared that a central bank council dominated by state representatives would be too reluctant to follow its demands for easing monetary policy. The 1992 reform of the bank reduced the number of state banks and produced another shift of power towards the center.

Federal states commonly seek a balance between regional and central interests by appointing representatives of the individual regions together with candidates chosen by the federal government to the central bank council. In the East Caribbean Monetary Union[3], where no federal government exists, the Regional Council of Ministers appoints the managing director of the central bank, while the individual governments share the right to appoint three more members of the central bank council. The two African monetary unions[4], which also involve politically independent states, have councils of country representatives and French government officials (Hahn, 1968). Coming from the former colonial power, the latter likely represent a more supra-national perspective than the former. Other possibilities include the appointment only of council members with a unified perspective, but with participation of the member states in the appointment process. This is how the EC today appoints the president of the European Commission.

This paper evaluates alternative institutional arrangements to distribute the power over monetary policy in the central bank council of a monetary union. Recent papers by Alesina and Grilli (1993), and Casella (1992) look at similar issues, asking under what circumstances individual countries would want to join a monetary union not yet in existence. In contrast, this paper assumes that the decision to form the monetary union has already been made and that exit from the

union is prohibitively expensive, in economic or political terms, for all members. On this basis we ask what arrangement is preferable from the point of view of the representative household in the union, i.e., one whose views on monetary policy are defined in terms of union-wide aggregates of output, employment, and prices.

Waller (1992a) and Casella (1992) assume that monetary policy in the monetary union is run by a unified central bank council maximizing a joint welfare function. Implicitly, their analysis assumes that council decisions are the outcome of a Nash bargaining game or, equivalently, a vote taken under an unanimity rule. This paper, in contrast, assumes that council decisions are the outcome of a voting procedure with a less demanding majority rule. In view of the fact that all existing central bank laws stipulate that decisions be taken by simple majority of the council members, with the exceptional possibility of veto powers of some council members, this seems a more realistic and relevant alternative. (Aufricht, 1965, p. 34 sq).

Much of the recent central bank literature focuses on the relationship between the central bank and the national government. For the purposes of our analysis, we need not consider this relationship explicitly. We assume that the central bank is able to carry out the policy its council wishes to implement. Of course, these policies may well depend on the relationship between the central bank and the government, but we can take this dependence as given.

The remainder of this paper proceeds as follows. Section II sets up a model of monetary policy in a monetary union. Section III evaluates alternative institutional arrangements for the central bank council on this basis. Section IV summarizes the main conclusions.

II. A Model of Monetary Policy in a Monetary Union

Our analysis is based on the standard model of monetary policy featuring a time-consistency problem and a macro stabilization problem (Barro and Gordon, 1983; Rogoff, 1985). It is extended for a monetary union composed of $k > 1$ states or countries, all indexed with $i = 1, \ldots, k$. For simplicity, we refer to these members as states or regions although they may be independent nations. We assume that k is odd. Subsequently, capital letters refer to union aggregates, small letters to state-specific variables. For simplicity, we drop time subscripts. A

superscript 'e' denotes a rational expectation based on information available at the end of the previous period. All stochastic shocks have expectations of zero.

Consider the aggregate economy of the monetary union, first. Output is produced according to the logarithmic production function

$$Y = Y_0 + (1-\frac{1}{\alpha})N + \frac{1}{\alpha}E \tag{1}$$

where Y denotes the logarithmic level of union output, Y_0 normal output, N the logarithmic level of employment, and E a serially uncorrelated, aggregate supply shock to the monetary union with expectation zero and variance σ_E^2. We assume that nominal wages are fixed in one-period standard contracts throughout the monetary union. Wages are set such that the expected real wage is constant, while employment within a period is determined by the demand for labor derived from profit maximization. This gives rise to equilibrium employment as

$$N = N_0 + \alpha(P - P^e) + E \tag{2}$$

where N_0 is the normal rate of employment, and P is the union-wide rate of producer price inflation. For simplicity, we normalize normal employment in the union to zero in logs, $N_0 = 0$.

We assume that the monetary union is a closed economy, so that producer prices and consumer prices, Q, are identical at the union level.[3] Consumer price inflation in the monetary union depends on the union money growth rate, M, the aggregate supply shock, E, and a union-wide, serially uncorrelated aggregate demand shock, Φ, with variance σ_Φ^2,

$$Q = M - \gamma E + \Phi \tag{3}$$

Expected inflation then equals the expected money growth rate, $P^e = Q^e = M^e$. This yields the following solution for union employment,

$$N = \alpha(M - M^e + \Phi) + (1 - \alpha\gamma)E \tag{4}$$

The member states of the monetary union may differ in size, but they have similar economic structures. Outputs produced by the individual countries are imperfect substitutes. Employment in state i is

$$n_i = \beta_i + \alpha(p_i - p_i^e) + E + \epsilon_i \tag{5}$$

where p_i is its producer price inflation rate, ϵ_i is a regional supply shock, and β_i denotes the difference between normal employment in state i and normal employment in the monetary union.

State i's producer price inflation differs from the union-wide inflation for two reasons. First, regional supply shocks, ϵ_i, and demand shocks, ϕ_i, cause exogenous deviations of the relative price of state i's output. These shocks may, in general, be serially correlated, so that their conditional expectations need not be zero. Furthermore, their cross-correlation may be non-zero. Second, we assume that a monetary expansion in the union may cause temporary relative price effects, due to, e.g., information imperfections or regional differences in the real balance elasticity of the demand for output.[6] Thus, relative producer inflation in state i is $p_i - P = \delta_i M + \phi_i - \gamma \epsilon_i$, where δ_i is a serially uncorrelated, stochastic shock with expectation zero and variance σ_δ^2.

The consumer price index in state i is a weighted average of the prices of domestic goods and imported goods from the rest of the union. We model this by making CPI inflation, q_i, a weighted average of the domestic and union producer price inflation, $q_i = \tau p_i + (1-\tau)P$. The weight, τ, $0 < \tau < 1$, reflects the share of domestic goods in the domestic consumers' goods basket. This yields the relative consumer price inflation rate for state i, $q_i - Q = \tau(\delta_i M + \phi_i - \gamma \epsilon_i)$. This gives solutions for employment and inflation in each state,

$$
\begin{aligned}
n_i &= \beta_i + \alpha \lceil \delta_i M + \phi_i - \phi_i^e) \rceil + (1-\alpha\gamma)(e_i - e_i^e) + e_i^e \\
q_i &= (1+\tau\delta_i)M + \Phi + \tau\phi_i - \gamma(E + \tau e_i)
\end{aligned}
\tag{6}
$$

Finally, let μ_i, $0 < \mu_i < 1$, be the relative size of state i's economy compared to the union economy. To make the state models consistent with the union model, we have the following adding-up constraints:

$$
\sum_{i=1}^{k} \mu_i = 1 \ , \quad \sum_{i=1}^{k} \mu_i n_i = N \ , \quad \sum_{i=1}^{k} \mu_i p_i = P \ , \quad \sum_{i=1}^{k} \mu_i q_i = Q \ , \quad \sum_{i=1}^{k} \mu_i e_i = \sum_{i=1}^{k} \mu_i \phi_i = \sum_{i=1}^{k} \mu_i \beta_i = 0
\tag{7}
$$

The public in each member state evaluates monetary policy performance in terms of the variance of employment around natural employment and the squared deviation of CPI inflation from zero, i.e., price stability. For the residents of state i, this is expressed by the following

loss function:

$$L_i = \frac{1}{2}q_i^2 + \frac{b_i}{2}(n_i - \beta_i - \epsilon_i^e)^2, \tag{8}$$

where $b_i > 0$ is the relative weight of employment stability.

In what follows, we wish to evaluate alternative rules of decisionmaking in the central bank council of the monetary union. The principal concern of this evaluation is the design of union institutions and, therefore, proceeds from a union perspective rather than the perspective of an individual state. For this purpose, we use a loss function defined in terms of union employment and union CPI inflation, i.e.,

$$L = \frac{1}{2}Q^2 + \frac{b}{2}N^2 , \tag{9}$$

with $b = \Sigma_{i=1,k} \ \mu_i b_i$. Since every household must be located somewhere in the union, one might argue that this loss function is meaningless in view of the assumption behind equ. (9). However, the institutional design stage of the monetary union involves a veil of ignorance behind which monetary institutions are evaluated: households do not know ex ante where in the union they will be located in the long run. Invoking this veil of ignorance, relative price effects of monetary policy are ignored at the institutional design stage, and, assuming that the probability of being in state i is equal to state i's relative size, makes (10) the appropriate measure of monetary performance for the monetary union.'

Monetary policy actions are the outcome of decisions in the central bank council of the monetary union, whose members are appointed officials. We distinguish between two types of appointees. The first type are council members chosen by the federal administration or through an appointment procedure in which all member states participate simultaneously, if, as in the EC, no federal government exists. Borrowing from US practice, we call these members *governors*. The second type are state representatives chosen by the individual member governments. We assume that the different appointment (and, possibly, re-appointment) procedures create different mandates and responsibilities. Governors see their responsibility primarily to stabilize union employment and prices, while state representatives consider prices and employment in their home state as important targets. For simplicity, we assume that both types take the most

important targets. For simplicity, we assume that both types take the most extreme views and care only about their own states or only about the union.

Furthermore, as in Persson and Tabellini (1993), the appointment creates an agency problem, i.e., the members of the central bank council do not necessarily pursue the best policy that the public sector wants. We assume that the members of the central bank council have preference functions which give employment and price stability the same weights as the public. However, for reasons discussed below, they wish to stabilize employment around target rates exceeding the natural rate. Governors have the loss functions

$$V = \frac{1}{2}Q^2 + \frac{b}{2}(N - N^*)^2 \tag{10}$$

and the state representatives have the loss functions

$$V_i = \frac{1}{2}q_i^2 + \frac{b_i}{2}(n_i - \beta_i - \epsilon_i^e - n_i^*)^2 \tag{11}$$

where N^* and n_i^* represent the union and the state target employment rates.

III. Monetary Policy with Alternative Central Bank Councils
III.1. A Council of Governors

We begin with the benchmark case of a union central bank council that consists entirely of governors. Money growth is chosen by the council after the supply and demand shocks have been revealed. The rational expectations solution for the money supply yields

$$M_G^e = Q_G^e = \alpha b N^* , \quad M_G = M_G^e - \Phi + (\gamma - \frac{\alpha b}{1+\alpha^2 b})E \tag{12}$$

The optimal monetary policy of the governors offsets the union aggregate demand shock fully and the union supply shock partially. The expected money supply depends positively on the employment target and the weight of the employment goal in the loss function. Equilibrium union employment and inflation are

$$Q_G = \alpha b N^* - \frac{\alpha b}{1+b\alpha^2}E , \quad N_G = \frac{1}{1+b\alpha^2}E . \tag{13}$$

This yields the expected loss for the public in the monetary union

$$L_G^e = \frac{\alpha^2 b^2}{2}(N^*)^2 + \frac{b}{2(1+b\alpha^2)}\sigma_E^2 \quad . \tag{14}$$

III.2. A Council of State Representatives

Consider now a union central bank council where all council members are state representatives. There is one representative for each member state and all members have one vote. Once the demand and supply shocks have been revealed, each member may propose a money growth rate for the council. A proposal is accepted if it wins the majority of the votes. Each period the median proposal is adopted.

We assume that the state representatives are unable to predict the short-run relative price effects of monetary policy among the regions, $\delta_i M$. Therefore, they face a greater degree of policy uncertainty when they make their decisions than the governors, Formally, each state representative wishes to minimize

$$E_{\delta_i} V_i = \frac{1}{2}(M-\gamma(E+\tau e_i)+\Phi+\tau\phi_i)^2$$

$$+ \frac{b_i}{2}(\alpha(M-M^o+\Phi+\phi_i-\phi_i^o)+(1-\gamma\alpha)(E+e_i-e_i^o)-n_i^*)^2 + \frac{\sigma_\delta^2}{2}(\tau^2+\alpha^2 b_i)M^2 \tag{15}$$

where E_δ denotes the expectation with respect to the distributional shock δ_i.

The optimal choice of a state representative differs from the governors' choice in four basic aspects. First, the expected money supply depends on her regional preferences and targets, second, the expected money supply depends on expected relative price changes between her state and the monetary union, third, the reaction to union supply and demand shocks is affected policy uncertainty and regional preferences, and, finally, the union money supply reacts to regional in addition to union supply and demand shocks. For analytical convenience, we consider four special cases highlighting each of these differences separately.

Case I: Regional preferences

To focus on the impact of regional diversity in preferences, let all regional shocks be zero, $\delta_i = \varsigma_i = \phi_i = 0$. The only state differences then are in the employment targets, n_i^*, and the weight of employment in the loss function, b_i. The expected loss from a central bank council of state representatives is

$$L_m^e = \frac{\alpha^2}{2}b_m^2 n_m^{*2} + \frac{\sigma_\delta^2}{2}[\frac{b_m^3}{1+\alpha^2 b_m} + \frac{b^2-b_m^2}{(1+\alpha^2 b_m)^2}] \tag{16}$$

where m denotes the median representative. If the target employment rates are all the same, $N^* = n_i^*$, (16) leads to conclusions similar as in Rogoff (1985): If the median council member has a lower weight on employment than the governors, the inflation bias is reduced, which yields a loss reduction. This, however, comes at the expense of less stabilization of supply shocks, which increases the expected loss. Therefore, the union is better off with a council of state representatives if the median council member is relatively 'conservative' in the Rogoff sense and the variance of aggregate supply shocks is relatively small.

More interesting conclusions emerge if we let $b_m = b$ and allow for different employment targets. The union would be worse off with a council of state representatives, if the median employment target is larger than the average target. This raises the question of what determines the employment targets. Here, we follow Barro and Gordon, Alesina (1988), Giovannini (1993), and Fratianni et al. (1993), who suggest that the employment targets reflect political pressures arising from political business cycle incentives or partisan politics.

Consider political business cycles first. Target employment rates change predictably over time, being large in periods when elections occur and small otherwise. With a central bank council of state representatives, the inflation bias can be held down by protecting the median council member against political business cycle incentives. Elections should not occur in more than half of the member states at a time. To achieve this, election dates in the member states should be staggered and electoral periods equalized.[8] Thus, to protect the union against political business cycle incentives in a council of state representatives requires significant adjustments in the political constitution.

The extent to which the governors are exposed to political business cycle considerations will depend on the relative amount of political power allocated at the center of the union.[9] Two extreme scenarios span the range of possibilities. In one scenario, the union is governed by a strong central administration whose political fate depends significantly on the overall economic performance of the union. In contrast, voters in state elections pay little attention to aggregate monetary developments. Governors will then be exposed to demands for expansionary policies around federal elections. State representatives, in contrast, will be relatively unaffected by electoral considerations. Thus, $N^* > n_m^*$.[10]

policies around federal elections. State representatives, in contrast, will be relatively unaffected by electoral considerations. Thus, $N^* > n_m^*$.[10]

In the other scenario, the center of the union is void of political power and governors face no demands for politically motivated monetary expansions. In contrast, the state governments' political fate depends significantly on macro-economic performance. In this case, the governors will have the smaller employment targets and a smaller inflation bias than state representatives.

The implication is that the choice between a council of governors and a council of state representatives is conditional on the political structure of the monetary union. We summarize this conjecture in the

COUNTER-CENTRALIZATION PROPOSITION: A monetary union with a weak political center is better of with a council of governors, whereas a union with a strong political center is better off with a council of state representatives.

Turning to partisan effects, we follow Alesina (1988) and assume that there are, in each member state, two parties, D and R, with different employment targets $n_D > n_R$. Let π be the probability of the event that the less inflationary party R wins an election. The expected employment target prior to the election is $n^e = \pi n_R + (1-\pi)n_D$. Elections are held at the beginning of a period after wage contracts have been signed, so this expectation enters the nominal wage contract. Once the electoral outcomes are revealed, these expectations are falsified. The political process then creates fluctuations in inflation and employment.

To compare a central bank council of governors with a council of state representatives, assume that there are elections each period both at the union level and at the state level.[11] For analytical convenience, let all exogenous shocks be zero. With a council of governors, then, inflation follows a binomial distribution with the expectation $Q^e_G = \alpha b n^e$ and variance $var_G(Q) = \alpha^2 b^2 \pi (1-\pi)(n_R - n_D)^2$. Governors select the inflation rate $Q_{Gj} = Q^e_G + \alpha b(n_j - n^e)/(1+ \alpha^2 b)$, $j = R, D$, depending on the electoral outcome. The expected loss then is $L_G^e = (Q^e_G)^2 + \alpha^2 b \, var_G(Q)/(1+\alpha^2 b)$. With a council of state representatives, in contrast, inflation follows a binomial distribution with expectation $Q^e_m = \alpha b(\pi_m n_R + (1-\pi_m)n_D)$ and variance $var_m(Q) = \alpha^2 b^2 \pi_m(1-\pi_m)(n_R-n_D)^2$, where π_m is the probability that the median council member is of party R[12], and selects $Q_{mj} = Q^e_G + \alpha b(n_j - n^e)/(1+ \alpha^2 b)$, $j = R, D$; the expected loss in this case is $L_m^e = (Q^e_m)^2 + \alpha^2 b \, var_m(Q)/(1+\alpha^2 b)$.

The properties of the binomial distribution imply, that for $p > 0.5$, $p_m >$ p, and increases with the number of member states, while for $p < 0.5$, $p_m < p$ and decreases with k. Thus, unless there is complete political uncertainty ($p = 0.5$), the variance of inflation and, consequently, employment, is lower with a council of state representatives. Decentralizing monetary policy decisions adds monetary stability.

At the same time, expected inflation is lower with a council of state representatives than with a council of governors, if the low-inflation party is politically strong ($p > 0.5$), and is higher otherwise. Thus, in the presence of partisan politics at the union and the state level, the union is always better off with a council of state representatives if the low-inflation party is politically dominant. If the other party dominates politically, the choice between a council of governors and a council of state representatives involves a trade-off between inflation and employment variability on the one hand and expected inflation on the other. In this case, a council of state representatives is preferable, if $(1+\alpha^2 b)(n_D - n_R)^2(\pi_m(1-\pi_m)-\pi(1-\pi))< n_R(\pi_m-\pi)(2n_D + (\pi-\pi_m)n_R)$. Both sides of this expression are negative. A council of state representatives will still be preferable if the difference between the expected inflation rates under either party is large relative to the expected inflation rate under party D, so that the benefit from reducing the variance of inflation dominates.

Under both arrangements, the union can seek additional institutional measures to mute the influence of partisanship. Waller (1992b) shows that staggering the appointment terms of the council members reduces the incentive for partisan appointments and induces convergence to an average inflation bias.

The impact of partisanship can be further reduced by cutting central bank districts across state borders and letting council members be appointed jointly by the governments whose states are part of a district.[13] In this case, a council member will vote for Q_R or Q_D only if the majority of her appointing governments is of one party. Assuming that she votes for $Q = Q^e_m$ otherwise, this would stabilize the voting behavior of the median council member, since the probability that the median member votes for R or D is the lower, the more states are included in each central bank district.

Case II: Regional Policy Uncertainty

shocks, $\epsilon_i = \phi_i = 0$. This yields the following solutions

$$M = M^* - (1-\frac{\kappa}{K})\Phi + (\gamma(1-\frac{\kappa}{K}) - \frac{\alpha b}{K})E \ , \quad M^* = \frac{\alpha bN^*}{K} \qquad (17)$$

for money growth, where $K = 1+\alpha^2 b+\kappa$, and $\kappa = 2\sigma_d^2(r^2+\alpha^2 b)$ represents the impact of regional policy uncertainty. The solutions for prices and employment are then

$$Q = M^* + \frac{1}{K}(\kappa\Phi - (\gamma\kappa+\alpha b)E), \quad N = \frac{1}{K}(\alpha\Phi + (1+(1-\alpha\gamma)\kappa)E \ . \qquad (18)$$

We can see from (17) that regional policy uncertainty makes state representatives more 'conservative' in the use of the monetary policy instrument than the governors. However, this is not the same as choosing a representative who is 'conservative' in the Rogoff (1985) sense, i.e., one with a lower preference for the employment target. Regional policy uncertainty implies not only a reduction in the expected money supply, but also that both aggregate shocks are incompletely stabilized, in particular, the state representatives allow aggregate demand shocks to have some price and employment effects.

The difference in expected losses from a council of governors and a council of state representatives is

$$EL_c - EL_d = (1-\frac{1}{(1+\kappa)^2})\frac{\alpha^2 b^2 N^{*2}}{2} - \frac{\sigma_\phi^2}{2}\frac{\kappa^2(1-\kappa)}{K^2} - \frac{\sigma_E^2}{2}\frac{\kappa^2}{K^2}((\gamma-\alpha b)^2+(K-\kappa)\alpha^2\gamma^2 b) \qquad (19)$$

The first term shows that the state representative performs better to the extent that the inflation bias is smaller. The second and third terms show that the state representatives perform worse to the extent that he responds too little to demand and supply shocks.

This result has two main implications. First, in a relatively stable macro economic environment, where the variance of aggregate demand and supply shocks is small, regional policy uncertainty has the positive effect of reducing the temptation for monetary surprises. In such an environment, a central bank council of state representatives is preferable. However, if aggregate demand and supply shocks are very volatile, a council of governors is preferable.

This aspect of our model generates an interpretation of Federal Reserve politics in the 1930s. The Great Depression marks a period of extreme aggregate shocks to the US economy. In this situation, the deficiency of stabilization policies conducted by a council of state representatives was fully brought to

shocks to the US economy. In this situation, the deficiency of stabilization policies conducted by a council of state representatives was fully brought to bear. From this perspective, the assignment of more power to the governors in the Banking Act of 1935 was the correct answer to the problem.

The second implication is that empirical evidence showing that regional Federal Reserve presidents tend to vote conservatively in FOMC meetings (e.g. Havrilevski et al. 1993) does not imply that shifting power from the board to the regional presidents would make the US better off. This would only be true if the regional presidents' conservativeness truly reflects preferences rather than a response to policy uncertainty. Thus, the source of their voting behavior needs more careful analysis.

Case III: Transitory regional shocks

Next, we turn to the case of purely transitory, asymmetric demand and supply shocks, ϕ_i and ϵ_i, with $\phi_i^e = \epsilon_i^e = 0$. Here, we assume $\delta_i = 0$, $b_i = b$, $n_i^* = N^*$. The solution for the median state representative then is

$$
\begin{aligned}
M_m &= \alpha b N^* - \Phi + (\gamma - \frac{\alpha b}{K})E + r_m , \\
r_i &= (\gamma - \frac{\alpha\beta + \gamma(1-\tau)}{K})\epsilon_i - (1 - \frac{1-\tau}{K})\phi_i .
\end{aligned}
\tag{20}
$$

The median state representative's optimal policy deviates from the governors' policy by a reaction to a composite regional relative shock, r_m. This reaction affects the union price level and union employment. Thus, the difference in expected losses is, in this case,

$$
L_G^e - L_m^o = - \frac{var(r_m)}{K} .
\tag{21}
$$

Here, $var(r_m)$ denotes the conditional variance of the median of relative shocks.

While this difference is always negative, its evaluation requires some assumption about the covariance structure of the relative shocks. Assume, first, that $k-1$ of the relative shocks are independently, normally distributed with variance $\sigma_r^2 = K^2\{((\alpha b + \gamma(\alpha^2 b + \tau))^2 \sigma_r^2 + (\alpha^2 b + \tau)\sigma_\phi^2)\}$. Then, the variance of the median shock can be approximated by $\pi\sigma_r^2/2(k-1)$.[14] The inferiority of the performance of a central bank council of state representatives increases in the variance of regional demand and supply shocks and declines in the number of states with

Below, we refer to this scenario as case IIIA.

Alternatively, assume that the monetary union consists of one large state i=1, and k-1 small states, where k > 2. To simplify the argument, let the shocks to the small states be all the same and be offset entirely by the shock to the large state, $\Sigma_{i-2}\mu_i r_i = -\mu_1 r_1$. Such an center-periphery scenario could be a simplified description of the relationship between Germany and her smaller neighbors in a European monetary union, or, indeed, of the West and the East of the US.[15] This implies that the median voter in the central bank council always comes from the small states, and $var(r_m) = (1-\mu_1)^2\sigma_r^2$. The performance then depends on the size of the large state relative to the small states in the union. Adding more states located at the periphery worsens the performance of the union governed by state representatives. We refer to this scenario as case IIIB.

Case IV: Persistent regional shocks

Finally, we let regional shocks be persistent, such that $\epsilon_i^e \neq 0$ and $\phi_i^e \neq 0$ in general. In the context of this model, a persistent, negative supply shock, $\epsilon_i^e < 0$, or a persistent, positive demand shock create upwards pressure on the regional price level. This lowers the incentive for surprise inflation for the state representative and reduces her inflation bias. Thus, with persistent relative price movements the expected money growth rate becomes

$$M_m^e = \alpha b N^* + s_m^e ,$$ (22)

where $s_m^e = r(\gamma\epsilon_m^e - \phi_m^e)$ is a composite expected relative price change in the median state.[16] Since this translates automatically into the expected loss through the inflation bias, equation (22) shows that a central bank council of state representatives performs better (worse) than a council of governors, if the median state is exposed to persistent negative (positive) supply or positive (negative) demand shocks relative to the rest of the union. If the union consists of states with systematic differences in the economic growth, this suggests that the union should be governed by state representatives if demand grows persistently faster and productivity increases persistently slower in the median state of the union.[17]

III.3. Mixing Governors and State Representatives on the Council

III.3. Mixing Governors and State Representatives on the Council

Consider now a central bank council to which both governors and state representatives are appointed. Obviously, the mix between the two types is now critical. If the council is rigged in favor of the governors, giving them more seats or votes than the state representatives, the governors always prevail and the role of the state representatives is reduced to a mere status of advisors, as indeed expressed by Governor Eccles referring to the FOMC after 1935.[8]

More interestingly, assume that there are k state representatives and $K < k$ governors on the board and let K be even for simplicity. In order to derive a decision on this council, we can think of the voting procedure as one in which the governors seek to construct the minimal coalition with state representatives necessary to win a majority. That is, they are willing to deviate from their most preferred money growth rate in the smallest possible way to attract enough votes for a majority. This implies that the marginal state representative in this coalition determines the money growth rate for the union.

The minimal coalition on the council has $C = (k+1-K)/2$ members. Consider an ordering of the state representatives' desired money growth rates in the council, and let $M^*(j)$, $j = 1, \ldots, k$, be the desired growth rate of order j. The council vote has the following three possible outcomes:

$$
M = \left\{
\begin{array}{ll}
M^*(C) & if \ M_G > M^*(C) \\
M_G & if \ M^*(k-C) > M_G > M^*(C) \\
M^*(k-C) & if \ M_G > M^*(k-C)
\end{array}
\right\}
\tag{24}
$$

where M_G is the governor's preferred rate.

We can use this result to reconsider our earlier cases. If the only source of idiosyncrasy is preference weights and employment targets, governors strengthen the average relative to the median. Therefore, if the union consists of a large state and several small ones and the large state is more (less) inflation averse than the small countries, the union will be better (worse) off with a larger number of governors on the council. If the distribution of employment targets is very skewed to the right, mixing the council improves the performance in a monetary union with a weak political center.

Regional policy uncertainty cannot be addressed successfully by mixing the council. Unless the council is rigged in favor of the governors, stabilization

policies are always inefficient. Whether or not mixing the council improves the
performance of monetary policy in the presence of regional shocks depends, again,
on the covariance structure of these shocks. Consider scenario IIIA, again. In a
mixed council, monetary policy will be chosen to offset the c-percentile or the
$(1-c)$-percentile composite regional shock, f_c or f_{1-c}, instead of the median shock,
where $c = C/k$. If the shocks are symmetrically distributed, the excess loss due
to the reaction to regional shocks is proportional to $\text{prob}(r_t < 0)(\text{var}(r_t)+(r_t^c)^2)$,
where

$$var(r_g) \;=\; \frac{g(1-g)}{n-1}\,\frac{1}{f(r_g)} \tag{24}$$

and $f(.)$ is the probability density of the regional shocks (Cramer 1966). Note
that the variance and the expected value of the g-percentile increase with
decreasing g, while the probability that the governors have to give in falls. For
a normal distribution, this second effect dominates, so that the excess loss
declines as the number of governors on the council increases.

In contrast, in scenario IIIB, monetary policy is only improved if the
council has at least $(k+1)/2$ governors so that the state representatives are
always outvoted.

IV. Conclusions

This paper has analyzed alternative institutional arrangements to
distribute the authority over monetary policy decisions between the center and
the parts of a federal monetary union. Our model shows that leaving the decision
over monetary stabilization policies to the state representatives always leads to
inefficient monetary stabilization. The two reasons for this are that state
representatives will want to use the common monetary policy to stabilize regional
shocks, and that they face a greater degree of policy uncertainty making their
response to aggregate shocks inappropriately small.

The long-run inflation performance of the monetary union depends critically
on its political structure. With a council of state representatives, long-run
price stability demands adjustments in the national electoral systems. If little
political power is allocated at the center, such as currently in the EC, the
union is best off with monetary policy conducted by a council of governors. If

the power allocated at the center is large, the union is best off with a council dominated by state representatives.

In this case, a conflict between efficient stabilization and long-run price stability arises. It may be addressed by separating the decisions over monetary policy into one that determines its long-run course and is determined by the state representatives and one that determines short-run stabilization and is dominated by the governors. One way to implement that would be to let the council of state representatives meet only at long intervals and determine the average money growth rate. Between council meetings the governors would then conduct stabilization policy under the constraint that the council's target be met on average. This would resemble the setup of the predecessor of the Bundesbank. Obviously, such an arrangement requires that the governors can be held accountable by the state representatives, e.g. by the provision that the state representatives can dismiss the governors if their target is repeatedly violated.

In general, the optimal design of a central bank council depends on the preferences of the member states and on the stochastic structure of the shocks hitting the individual regions. It follows that central bank constitutions should not be written before the members of the monetary union have been identified. In contrast, the central bank constitution included in the Maastricht Treaty was written without knowing the members of the future European Monetary Union. Furthermore, since neither preferences nor stochastic structures are likely to be fixed over time, constitutions should have a provision for amendments. If the central bank constitution is a simple law, such amendments can be enacted by the national parliaments. In contrast, the constitution of the European central bank is part an international treaty, that is difficult to amend. For both reasons, there is a substantial risk that the distribution of power will be inadequate in the European Central Bank and that this will make European monetary policies unsatisfactory.

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ENDNOTES

1. Friedman and Schwartz (1963) p. 446 n. 26

2.The prevailing conflict between 'Westerners' and 'Easterners' raises the apparent puzzle, why the disagreement could be solved by a setting up an FOMC that was rigged in favor of the 'central' members from the Board instead of regional representatives. This puzzle is solved by reference to the historical circumstances of the creation of the Federal Reserve Districts. With only one district West of Kansas City, a board dominated by regional representatives was also necessarily dominated by Eastern and Mid-western interests.

3. The East Caribbean Monetary Union's currency, the East Caribbean Dollar, is the currency of Antigua and Barbuda, Anguilla, Dominica, Grenada, Montserrat, St. Kitts and Nevis, St. Lucia, and St. Vincent and the Grenadines.

4. The Central African Franc Zone, which includes Cameroon, the Central African Republic, Chad, the Congo, and Equatorial Guinea, and the West African Monetary Union, which includes Benin, Burkina Faso, Cote d'Ivoire, Mali, Niger, Senegal, and Togo.

5. For the subsequent analysis, this assumption is not restrictive as long as monetary policy in the rest of the world does not react strategically to the policy adopted by the union.

6. For information restrictions as a source of relative price effects of monetary shocks see Lucas (1973), and Neumann and von Hagen (1991) and Hammond (1993) for empirical evidence. For differences in the slope of the IS curve as a basis for such effects see Hammond (1993).

7. This assumption obviously assumes a sufficiently large degree of mobility among the regions of the union. Note that (13) can be derived as follows: Consider the first-order conditions for monetary policy from (12), $\partial L_i/\partial M = 0$ assuming $\sigma^2_\delta = 0$. Under the ex-ante condition that households ignore their location is the union, the condition for minimizing expected losses is $\Sigma \mu_i \partial L_i/\partial M = 0$, which is equivalent to the first-order condition for minimizing (13).

8. Even with staggered electoral terms, more than half of the member states may vote in the same period relatively frequently, depending on the number of members and the length of the terms. For example, in a union of four countries, two with electoral cycles of three years and two with cycles of four years, where the first election dates are all one year apart, one third of all periods will have two countries voting at the same time.

9. See Goodfriend (1993) for a similar argument.

10. See Gildea (1990) for empirical evidence for the US consistent with this scenario.

11. If the center of the monetary is void of political power, the counter-centralization proposition applies in the sense that the union is better off with a council of governors since these would not pay attention to partisan politics.

12. Note that this probability can be computed as

$$\pi_\square = 1 - \sum_{j=0}^{(k-1)/2} \binom{k}{j} \pi^j (1-\pi)^{k-j} \quad .$$

13.See Graboyes (1990) for a proposal to redistrict regional central banks in the European Community.

14. Note that the variance of the median of n-1 i.i.d. normal variables with zero expectation and variance σ^2 is $\pi\sigma^2/2(n-1)$.

15. Note that the San Francisco Fed is the only Federal Reserve Bank West of Kansas City.

16. Note that the median of (35) is not necessarily the same median from (33).

17. This result may be used to explain the breakdown of the European monetary system in 1992/93. Though not a monetary union, the system required some coordination of money growth rates to maintain fixed exchange rates. With Germany hit by a large positive demand shock due to unification, Germany opted for a very restrictive monetary policy which the partner countries were unwilling to follow. (see von Hagen, 1993).

18. Friedman and Schwartz (1963) p. 446, note 26.