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10 Fiscal Constraints and Incentives with Monetary Coordination: Implications for Europe 1992

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1. INTRODUCTION

Recent plans by the member countries within the European Community (EC) to create a single integrated market by 1992 have raised questions concerning the appropriate conduct of fiscal policy in interdependent, open economies. There is little disagreement that this increased integration will necessitate coordination of monetary policies if European countries are to move closer to a longer-run goal of full monetary union, possibly with a common currency. However, the possible need to establish a community-wide fiscal policy stance through fiscal policy "harmonization" or coordination has only recently received much attention.

In order to progress smoothly toward an European Monetary Union (EMU), a greater degree of convergence in inflation rates, as well as closer coordination of monetary policies would appear desirable. This has important implications for fiscal policy. Most directly, it is clear that a reduction in monetary autonomy will affect the extent to which deficits can be financed via the creation of base money (seigniorage revenue). In addition, coordinated monetary policies may affect the magnitude and pattern of fiscal policy transmission across countries. Finally, coordination of monetary policies may affect the incentives fiscal policy makers face in setting policy. That is, given a new set of external constraints and institutional arrangements associated with a monetary union, governments may choose to alter the absolute level and time pattern of fiscal spending, as well as the choice between tax and debt finance.

A major issue concerning progress towards an EMU is the extent to which fiscal policies of member nations need to be aligned in order to allow smooth coordination of monetary policies and maintain exchange rate stability. It has been forcefully argued by some that fiscal convergence among the member states of the EC is desirable, and perhaps even necessary, if stability in exchange rates is to be established and a monetary union successful (Thygesen, 1989; CEC, 1989; Delors Committee, 1989).

Thygesen (1989), for example, states two concerns. First, widely divergent budget deficits or debt-to-income ratios in individual countries could threaten the fixity of exchange rates. This could arise because of the incentive individual countries face to

lower the real value of these debts from additional inflation, and the recognition by the market that these incentives exist, at least until the credibility of the EMU is firmly established. Second, the creation of an EMU without explicit constraints on budget deficits could encourage an excessively lax aggregate fiscal stance. Since the need to be concerned with exchange rate pressures or large international reserve flows presumably would be reduced, the incentive for greater reliance on debt finance of existing budgetary deficits might increase. From this perspective, present divergences among EC countries in their existing fiscal deficit and debt positions, as well as in the extent to which monetization is relied upon in the financing of government expenditures, pose a concern.

For this reason the Delors Committee report, sponsored by the EC and issued in April 1989, suggests that certain binding rules should be imposed limiting the size of budget deficits in individual EC countries, as well as the degree upon which monetary financing can be relied.[1] More recently, the Governor of the Bank of France stated that monetary union implies strongly convergent fiscal policy (de Larosière, 1990). Moreover, a report by the Commission of the European Communities warns that "...prospective budgetary developments in most of the high deficit and public debt member countries contrast sharply with the needs arising from making a good start to the first stage of Economic and Monetary Union..." (CEC, 1989; p. 1), and goes on to urge countries towards greater coordination in fiscal policy and convergence of budgetary deficits to a lower level.

In contrast, other observers reject the view that a smooth transition to an EMU, and its functioning, require binding rules and procedures for budgetary policies. For example, in its study on a monetary order for the single European market, Germany's Board of Academic Advisers to the Federal Ministry of Economics states that "...in itself, a European monetary union does not require any formal restrictions on national autonomy in fiscal policy beyond the ban on central bank financing of state expenditure" (Watrin, 1989). The study argues that market pressures for fiscal convergence may be induced by the institutional shift to a monetary union. "The fact that one must pay interest and debts with money one cannot create oneself is the prime mover of discipline; it creates informal pressures towards a convergence in the form of sound fiscal conduct" (Watrin, 1989). This suggests that market discipline will be imposed on government borrowers, much as in a private setting. In support of this view, Eichengreen (1990) concludes that U.S. experience suggests that individual U.S. states, though implicitly members of a monetary union, still face rising costs of debt finance. Moreover, Fratianni and von Hagen (1990) and von Hagen (1990) argue that U.S. experience also indicates that formal fiscal restraints have done little to constrain the fiscal activities of individual states.

To shed light on these issues this paper explores the fiscal linkages between countries under different institutional economic policy arrangements. We begin by considering a two-country model where real and financial markets are completely integrated (a broad objective of the moves toward European economic integration), and nominal exchange rates are perfectly flexible. In this model linkages between the two countries are established through real interest rate equality and purchasing power parity. We then investigate the implications of institutional arrangements roughly corresponding to the increasing degree of monetary integration being proposed within the EC: (i) "irrevocably" fixed nominal exchange rates which tightly link price levels, and (ii) monetary policy coordination that constrains money growth rates. In the first case both monetary and fiscal policy instruments may be coordinated to achieve the price level (and exchange rate) target. In the second case, only the fiscal instrument is available for use. We show

explicitly how these monetary arrangements affect the degree of fiscal independence as well as the behavioral incentives facing policy makers when setting fiscal policy, defined in terms of the level and time pattern of spending, and financing of expenditures. We do not dwell on the process through which these arrangements are achieved. Rather we treat them as given constraints on behavior. The results of this analysis provide insights into how the feasibility and desirability of pursuing divergent fiscal policies will change as monetary integration proceeds in the EC. Moreover, they shed light on the issue of whether the new incentives associated with institutional monetary arrangements would help to accomplish fiscal policy convergence in the EC.

Our analytical framework highlights the role of intertemporal budget constraints and maximizing private and public sector behavior in the context of a two-period, two-country framework. Following Frankel and Razin (1985, 1987), Greenwood and Kimbrough (1985), Djajic (1987), among others, we emphasize that private and public sector spending decisions are not independent events with a one-time outcome, but are multiperiod decisions linked across time through borrowing and lending. This framework considers policies in a general equilibrium setting with rational, forward-looking households and governments. Similarly to Tabellini (1988) and Masciandaro and Tabellini (1988), we incorporate monetary considerations by assuming real money balances enter household utility functions because of the liquidity services that they provide. Also, following the approach of these papers, we assume that fiscal policy is determined within the constraint of institutionally-given monetary arrangements. Unlike the latter papers, however, we focus on the interactions between institutional arrangements and policy in a two-country setting - the appropriate paradigm for economic integration among the larger countries in the EC.

The remainder of the paper is organized as follows. Section 2 presents an overview of existing fiscal policy stances, government debt positions, and the extent of monetary finance of fiscal deficits in the EC. Section 3 presents the two-country model and discusses the linkages between the two countries and the interdependence of fiscal policies. Section 4 considers the implications of institutional constraints associated with monetary integration for "feasible" fiscal policy. We show that the ability to maintain fiscal independence is reduced. In Section 5 we analyze "optimal" fiscal policy and discuss how monetary integration affects the incentives to pursue divergent fiscal policies. We demonstrate within our model that the incentive for fiscal divergences lessens with greater monetary policy coordination. A concluding section completes the paper.

2. FISCAL DIVERGENCES AND MONETARY FINANCE IN THE EC

Large divergences in budgetary deficit positions and marked differences in the extent to which EC countries rely on monetary finance of government deficits could pose a problem to the process of monetary integration. A number of measures may be employed to assess the extent of fiscal convergence and whether progress has been made in the consolidation of public finances. Perhaps the three most common measures are the trend in gross public debt, developments in actual budget balances, and developments in the budget balance emanating from changes in economic activity. As Tables 1 and 2 demonstrate, the existing fiscal divergences among the EC countries are in fact quite large and, by several measures, have increased in recent years.

Table 1
Gross Public Debt in Ten European Community Countries[1]
(Percentage of Nominal GNP/GDP)

	1982	1983	1984	1985	1986	1987	1988	1989	1990
Countries with debt below European Average in 1990									
Germany	39.5	40.9	41.5	42.2	42.4	43.8	44.2	43.1	44.6
France	40.1	41.4	43.8	45.5	45.7	47.5	47.4	46.9	46.7
United Kingdom	53.0	53.2	54.8	53.1	51.7	49.2	42.6	38.6	36.1
Spain	29.0	35.0	41.8	47.3	48.1	48.5	43.9	43.1	43.2
Denmark	53.0	62.6	67.0	65.7	59.3	56.9	55.7	54.9	55.3
Countries with debt above European Average in 1990									
Belgium	102.3	113.4	118.6	122.7	127.2	131.7	133.7	130.8	129.3
Greece	36.1	41.2	49.5	57.9	58.6	64.6	72.1	79.6	83.4
Netherlands	55.5	61.9	66.1	69.6	71.3	75.2	78.1	80.9	83.0
Italy	66.4	72.0	77.2	84.1	88.5	93.0	95.6	98.4	99.9
Ireland	92.2	104.7	113.4	117.5	132.8	135.2	134.1	125.1	117.7
European Average Debt	48.8	51.8	54.5	56.7	57.7	58.8	58.1	57.3	57.4

Source: OECD *Economic Outlook*, December 1990, Table 34.

[1]Figures for 1988 and 1989 partially estimated, figures for 1990 partially forecast. European average debt calculated at 1987 GNP/GDP weights and exchange rates.

The upper panel of Table 1 shows the gross public debt time profile of EC countries with debt below the European average in 1990, while the lower panel shows the remaining countries with much greater public debt levels. In the first group of countries, which includes Germany, France and the United Kingdom and represents some 70 percent of EC GDP, the gross public debt ratios in 1990 either were lower than previous years or roughly stable.[2] In contrast, the second group of countries has had less success in stabilizing debt ratios. Although the two countries with the highest debt ratios, Ireland and Belgium, have reduced their debt position somewhat in recent years, the other countries display continued rapid growth. Particularly rapid growth rates are evident in Italy and Greece. By this measure, divergences in debt positions generally have increased in recent years.

Table 2 shows the development of general government financial balances in ten EC countries between 1986 and 1990. The five countries in the upper (lower) panel correspond to those in Table 1 with relatively low (high) debt/GNP ratios. Financial balance levels and changes are reported.

Table 2
General Government Financial Balances in 10 European Community Countries[1]
(Percentage of Nominal GNP/GDP)

	Level			Changes	
	1986	1988	1990	1986-88	1988-90
Germany	-1.3	-2.1	-3.1	-0.8	-1.0
France	-2.7	-1.8	-1.2	0.9	0.6
United Kingdom	-2.2	1.0	0.1	3.2	-0.9
Spain	-6.1	-3.2	-3.2	2.9	0.0
Denmark	3.4	0.3	-1.3	-3.1	-1.6
Average[2]	-2.2	-1.3	-1.8	0.8	-0.4
Belgium	-8.9	-6.4	-5.9	2.5	0.5
Greece	-10.6	-15.3	-18.3	-4.7	-3.0
Netherlands	-6.1	-5.1	-5.5	1.0	-0.4
Italy	-11.7	-10.9	-10.0	0.8	0.9
Ireland	-11.6	-5.1	-1.7	6.5	3.4
Average[3]	-10.3	-9.4	-8.9	0.9	0.5
Average[4]	-4.5	-3.6	-3.7	0.9	-0.1

Source: OECD Economic Outlook, December 1990, Table 9

[1] Net lending (+) or net borrowing (-). 1990 values partly estimated. Average values calculated at 1987 GNP/GDP weight and exchange rates. Authors' calculation.
[2] Weighted average of Germany, France, U.K., Spain and Denmark
[3] Weighted average of Belgium, Greece, Netherlands, Italy and Ireland
[4] Weighted average of 10 countries listed above

Table 3
Monetary Finance in the EC

	Outstanding loans from central bank to general government[1]	Counterparts to changes in broad money stock[2]					
		Lending to public sector	Net lending to private sector	Banks' non-monetary liabilities	Change in net external position	Other counterparts	Total money creation
Belgium							
1985	5.2	16.3	3.4	-7.2	-6.3	0.7	6.9
1986	5.5	16.5	5.7	-4.2	-4.6	-0.6	12.8
1987	3.7	11.6	6.8	-3.6	-4.2	0.9	11.5
1988	3.2	7.1	10.3	-3.6	-7.5	0.2	6.5
Greece							
1985	12.4	26.5	12.9	-2.4	-11.3	1.1	26.8
1986	11.5	20.7	10.2	-4.3	-5.8	-1.8	19.0
1987	10.1	17.9	6.3	1.5	-1.4	0.9	25.2
1988	7.8	16.1	8.4	-1.0	2.1	-3.2	22.4
Spain							
1985	7.8	8.2	7.2	-2.2	0.5	-0.8	12.9
1986	5.0	5.8	8.3	-1.6	0.9	-1.2	12.2
1987	3.5	4.3	11.1	-3.6	2.9	-1.1	13.6
1988	2.4	3.2	12.7	-4.9	0.9	-1.6	10.3
Ireland							
1985	--	11.4	3.5	--	-11.0	1.5	5.4
1986	--	10.9	7.2	--	-18.8	-0.3	-1.0
1987	--	9.9	5.0	--	-1.1	-2.9	10.9
1988	--	0.5	13.3	--	-5.9	-1.6	6.3
Italy							
1985	6.6	7.8	6.8	--	-1.7	-1.8	11.1
1986	6.2	4.9	5.2	--	-0.5	-0.2	9.4
1987	6.7	5.0	4.1	--	0.2	-1.0	8.3
1988	6.4	2.8	7.5	--	0.1	-1.8	8.6
Portugal							
1985	--	13.6	17.1	-7.9	5.4	2.2	30.4
1986	--	12.3	16.8	-3.3	-0.7	-0.1	25.0
1987	--	12.0	3.8	-2.3	7.1	-2.8	17.8
1988	--	8.3	5.2	-2.2	6.9	-4.7	13.5

Source: CEC (1990, Table 2).

[1]As percent of GDP.

[2]As a percentage of broadly defined money stock outstanding at the beginning of the period. *Source:* CEC (1990, Table 3).

A tendency towards fiscal consolidation is clearly evident over the period 1986-1988 in both "high-debt" and "low-debt" countries. This process continued into 1989 as rapid growth in Europe and some structural reforms allowed declines in deficits as a percentage of GNP/GDP. Nonetheless, over the period 1986-1988 the improvement in the high-debt EC countries deficit positions was roughly the same as low-debt EC countries as a percent of GNP/GDP in absolute terms, at 0.9 and 0.8, respectively, and much lower when calculated relative to the level of the deficit. Over the period 1988-1990, the deficit positions of high-debt countries improved somewhat, while the low-debt countries deteriorated following a slowdown in growth in 1990 in the United Kingdom and the sharp rise in government expenditures in Germany associated with the unification and restructuring process.

On balance, however, no clear tendency toward a decline in the average budget deficit of the high-debt/high-deficit countries *relative* to the low-debt/low-deficit countries is discernable. In 1986, the weighted average deficit of the high-debt countries was 4.7 times greater than the low-debt countries, and was 4.9 times larger in 1990. Moreover, a recent study by the European Commission estimates that all of the improvement in overall deficit positions of EC countries with deficits greater than the EC average during the past five years is attributable to the impact of strong economic growth rather than significant budget reforms (CEC, 1989). The only notable exception in this respect is Ireland.

By these measures, relatively little progress toward fiscal convergence in the EC is discernable. As Dornbush (1989) points out, however, a measure of the budgetary position net-of-interest payments (the primary budget) suggests that EC fiscal deficits have declined and converged in recent years. The primary budgets of Belgium and Ireland were in substantial surplus in 1989, for example, following a sustained period of budget deficit reduction. Nevertheless, the actual financing demands of government are more closely related to actual government deficit positions than to the primary budget.

Monetary financing of fiscal deficits and how convergence in this area may be essential for further progress towards monetary integration in the Community is another important concern. Quantitative indicators of the importance of existing monetary financing policies are shown in Table 3 for the EC countries where this seems particularly relevant. The first column in the table shows that the share of outstanding loans from the central bank to the public sector as a percentage of GDP has fallen significantly in recent years. While it reached a low level in Belgium and Spain in 1988, it remained more substantial in Italy and Greece. The remaining columns, showing data on the development of the counterparts of the money supply, suggest that monetary financing of the public sector is still important, particularly in Belgium, Greece and Portugal. In addition, financing of the public sector via the banking sector is still important though its relative contribution to total money creation has declined since 1987.

Estimates of the degree of seigniorage - the degree to which current government expenditures are financed via the creation of base money (the issue of non-interest-bearing, or below-market interest-bearing, currency plus bank reserves) - vary widely within the EC. Table 4 presents recent "cash flow" estimates of seigniorage by Gros (1989), which shows that during the 1979-81 period it ranged from more than five percent of GDP for Portugal to zero percent for Germany. Together with the reduced monetary expansion and fall in inflation rates associated with participation in the EMS, however, the discrepancies in the shares of GDP that the fiscal authorities command through seigniorage has already been considerably reduced. Four of the five countries with the

largest seigniorage in 1978-81 have substantially reduced this source of revenue as a percent of GDP by 1987.

Table 4
Seigniorage in the EC[1]
(Percentage of Nominal GDP/GNP)

	Average 1979-81	1982	1983	1984	1985	1986	1987
Portugal	5.29	5.86	2.70	0.63	1.07	1.62	2.74
Greece	2.28	3.39	-0.02	3.48	0.56	0.22	2.99
Italy	1.37	1.45	1.49	1.39	1.81	0.60	0.63
Spain	1.32	1.87	2.01	7.51	0.59	0.88	1.18
France	0.64	1.32	0.52	0.82	0.06	-0.25	0.33
Denmark	0.31	0.08	0.22	0.31	4.58	-2.39	-1.09
Belgium	0.22	0.00	0.32	0.06	-0.08	0.38	0.21
United Kingdom	0.19	0.19	0.12	-0.45	0.22	0.33	0.06
Ireland	0.10	0.20	0.52	0.16	0.24	0.08	0.56
Netherlands	0.07	0.48	0.78	0.41	0.28	0.26	0.73
Germany	0.00	0.48	0.50	0.35	0.30	0.56	0.83

Source: Gros (1989, Table 1)

[1] The figures represent a "cash flow" definition of seigniorage, i.e. the command over real resources obtained by the government by increasing the supply of currency in circulation plus increases in required reserves less interest paid on total required reserves

Nonetheless, significant differentials in the relative importance of seigniorage revenues remain and greater convergence will presumably be necessary if a smooth transition to the EMU is to be realized. In particular, inflation rates - and hence monetary growth rates and seigniorage revenues - will decline in several high-inflation countries. In this regard, Gros (1989) estimates seigniorage changes under assumptions that all EC members participate fully in the EMS by 1992, i.e., push down inflation rates to a common low level so as to maintain exchange rate parities fixed, and adopt common reserve requirements. Using this assumption and 1987 as a base year, he finds that government revenue from seigniorage will be reduced by 2 to 3 percentage points of GDP in Greece and Portugal and 1 to 2 percentage points in Italy and Spain by 1992.

Finally, Table 5 presents some comparative statistics on the relative size of base money in individual EC countries. Spain, Greece, Italy, and Portugal are the four countries for which the monetary base is largest as a percentage of GDP, with ratios ranging from 13.5 percent to 20.4 percent. These countries have a GDP share equal to roughly one-quarter of the EC total, but monetary base shares equal to almost double that amount. Again,

it appears that considerable divergence exists among the EC countries in their reliance on monetary finance. The concern over EC divergences in this aspect of policy, as well as in budgetary deficit and debt positions, appears well founded.

Table 5
Monetary Base and GDP in the EC, 1988 (percent)

	Monetary Base/GDP	Share of GDP in EC	Share of Monetary Base in EC
Belgium	7.5	3.2	2.6
Denmark	3.7	2.3	0.9
France	5.8	20.0	12.5
Germany	9.9	25.3	26.9
Greece	14.9	1.1	1.8
Ireland	10.1	0.7	0.7
Italy	14.6	17.5	27.4
Netherlands	8.1	4.8	4.2
Portugal	13.5	0.9	1.3
Spain	20.4	7.2	6.0
United Kingdom	3.3	17.0	6.0
Total	9.3	100.0	100.0

Source: Padoa-Schioppi (1990)

3. MONETARY AND FISCAL LINKAGES IN A TWO-COUNTRY SETTING

This section develops a simple two-period, two-country model to explore the effects of increased integration and monetary policy coordination on the conduct of fiscal policy. This framework allows us to capture the flavor of international and intertemporal linkages within the simplest possible setting.

Households in each country are price takers in international goods and capital markets. It is assumed they produce and consume the same perfectly substitutable good. All borrowing and lending commitments are assumed to be fulfilled, ruling out defaults. Real interest rate equality links the capital markets, and purchasing power parity links nominal prices in goods markets internationally. Nominal money balances are assumed to be held only by local households.

The specification of the model below focuses on the domestic economy. The analogue expressions for the foreign country are introduced when appropriate.

3.1 Specification of the Model

The representative private household of the domestic country produces an exogenously given quantity of output Y_t and pays T_t lump-sum units of taxes in each period t ($t=1,2$). In addition, at the beginning of the first period ($t=0$) it holds exogenously given levels of nominal money balances, M_0, real domestic government assets, B_0, and real foreign assets, F_0. What is left over in the first period is consumed, lent to the domestic government or abroad, or spent on real money balances. In the second period, all lending is repaid and available resources are allocated to consumption or money holdings.

Accordingly, the household's first and second period budget constraints are:

$$C_1 + M_1/P_1 = Y_1 - T_1 - B - F + M_0/P_1 + (B_0 + F_0), \tag{1a}$$

$$C_2 + M_2/P_2 = Y_2 - T_2 + (1+r)(B+F) + M_1/P_2^e. \tag{1b}$$

where B and F denote (real) lending in period 1 to the domestic government and foreigners, respectively, that is repaid in full in period 2 at the same associated (real) interest rate r; C_t denotes consumption, M_t, nominal money balances, and P_t the price level in period t; and P_2^e, the expected price level for period 2 as of period 1. For simplicity of notation we do not time subscript lending variables and the associated interest rate in period 1 (B,F,r). The implied intertemporal budget constraint for the household is:

$$C_1 + RC_2 + (M_1/P_1)(1 - R\pi_2^e) + R(M_2/P_2) = Y_1 + RY_2 - (T_1 + RT_2) + M_0/P_1 + (B_0 + F_0) \equiv W, \tag{2}$$

where $R \equiv 1/(1+r)$ is the period 1 present value factor, $\pi_2^e \equiv P_1/P_2^e$ is the *inverse* of the expected inflation rate in period 2, and W denotes lifetime household real wealth as of period 1.[3]

While government spending, taxes, and money creation are given from the point of view of households, they are linked together by the following period government budget constraints:

$$G_1 + B_0 = T_1 + B + M_1/P_1 - M_0/P_1, \tag{3a}$$

$$G_2 + (1+r)B = T_2 + M_2/P_2 - M_1/P_2. \tag{3b}$$

It is assumed that the government faces the same interest rate as the private sector. The corresponding government intertemporal budget constraint is

$$G_1 + RG_2 + B_0 = T_1 + RT_2 + M_1/P_1 - M_0/P_1 + R(M_2/P_2 - M_1/P_2). \tag{4}$$

To restrict the degrees of freedom in setting monetary and fiscal policies, it is assumed that the (gross) rate of money supply growth in the first period, M_1/M_0, is exogenously given at the level , and that a fixed proportion θ of government debt, $0<\theta<1$, is monetized in period 2:

$$R(M_2/P_2 - M_1/P_2) = \theta B, \tag{5a}$$

$$R\left(G_2 - T_2\right) = -(1-\theta)B. \tag{5b}$$

The parameter θ may be interpreted as an institutional parameter reflecting the degree of fiscal "dominance," i.e. the extent to which the burden of satisfying the government's budget constraint falls on the monetary authorities (see Tabellini, 1988; Masciandaro and Tabellini, 1988). Thus a high value of θ indicates a high degree of debt monetization undertaken by the monetary authorities. It is assumed that θ is set exogenously either by domestic institutional conditions or, as we discuss below, by external institutional monetary arrangements.

Fully-informed, rational agents "see through" the government budget constraints and thereby recognize the dependence between the levels of government spending, and the implied tax liabilities and seigniorage revenue. The resulting consolidation of the household and government, (2) and (4), together with (5a) implies:

$$W \equiv Y_1 + RY_2 - \left(G_1 + RG_2\right) + M_0/P_1 + \theta B + F_0. \tag{6}$$

Observe that, given the pattern of government spending, domestic public debt affects real private wealth because of the perception that the fraction θ of this debt will be monetized in the second period.[4]

3.2 Optimal Domestic Household Behavior and Equilibrium

The domestic household is assumed to maximize lifetime utility with respect to its consumption and real money balance holdings in periods 1 and 2, subject to the intertemporal budget constraint, (2), and its initial money and asset holdings. Lifetime utility is defined as the following log-linear function[5]:

$$V = \ln C_1 + D\ln C_2 + \ln m_1 + D\ln m_2, \tag{7}$$

where $m_t \equiv M_t/P_t$ denotes real domestic money balances held at the end of period t; $D = 1/(1+d)$, $0 < D < 1$ denotes the subjective discount factor; and d denotes the corresponding subjective rate of time preference. Real money balances are assumed to affect household utility because of the liquidity services that they provide. This specification is functionally equivalent to alternatives such as cash-in-advance constraints or money appearing in the budget constraint through liquidity costs (see Feenstra, 1986). Note that only domestic money provides liquidity services; this rules out currency substitution.

The solution to this optimization problem implies that the domestic household will choose consumption and real money balances which satisfy:

$$C_1 = \frac{W}{2(1+D)}, \tag{8a}$$

$$C_2 = \frac{DW}{2R(1+D)}, \tag{8b}$$

$$m_1 = \left[\frac{1}{1 - R\pi_2^e}\right] \frac{W}{2(1+D)}, \tag{8c}$$

$$m_2 = \frac{DW}{2R(1+D)}. \tag{8d}$$

The wealth coefficients represent the marginal (and average) propensities to consume or hold money out of wealth in each period. Observe that these propensities are all less than 1. Note also that these demands depend on household real wealth, the price structure, and the interest rate.

To determine the equilibrium price structure, we utilize the equilibrium money market conditions, (8c), (8d), and (5a), and assume rational expectations, that is $\pi_2 = \pi_2^e$. In particular, we rearrange (5a) and substitute for m_1 with (8c):

$$\begin{aligned} \theta B/R &= m_2 - m_1\pi_2 \\ &= m_2 - \left[\frac{1}{1 - R\pi_2^e}\right] \frac{W\pi_2}{2(1+D)}. \end{aligned} \tag{9}$$

Substituting in for m_2 with (8d) and equating π_2 and π_2^e yields:

$$\pi_2 = \pi_2^e = \frac{WD - 2\theta(1+D)B}{R(1+D)(W - 2\theta B)}. \tag{10}$$

By taking partial derivatives of (10), it can be established that π_2 is increasing in W and decreasing in θ, B, and R. Thus greater government debt to be repaid or a higher proportion of debt to be monetized in the second period raises the inflation rate. In addition, a higher interest rate or a rise in private real wealth, by increasing the demand for real balances in period 2, reduces the inflation rate (i.e. raises π_2).

To solve for the equilibrium price level in period 1, P_1, note that the definitions $m_1 \equiv M_1/P_1$ and $\equiv M_1/M_0$, and condition (8c) imply

$$\frac{1}{P_1} = \left[\frac{1}{1 - R\pi_2^e}\right] \frac{W}{2(1+D)\,M_0}. \tag{11}$$

Substituting for π_2^e with (10) gives

$$\frac{1}{P_1} = \frac{W - 2\theta B}{2\,M_0}. \tag{12}$$

Solving (12) for W and equating with (6) implies:

$$W/2 = Y_1 - G_1 + R\left(Y_2 - G_2\right) + F_0. \tag{13}$$

Substituting back in (12) gives the inverse of the price level in terms of fiscal and monetary policy variables:

$$\frac{1}{P_1} = \frac{Y_1 - G_1 + R\left(Y_2 - G_2\right) + F_0 - \theta B}{M_0}. \tag{14}$$

Observe that P_1 is increasing in , θ, B, G_1, and G_2; it is decreasing in Y_1, Y_2, and F_0. Thus a more expansionary monetary policy in the first period increases the first-period price level. Issuing more debt in the first period or monetizing a greater proportion in the second period also are inflationary in the first period since the private sector realizes that this will lead to future inflation, thereby inducing lower real money demand in the current period. Given output levels, greater government spending in either period has the same effect. Increases in output or initial asset holdings raise private real wealth, increase money demand, and lead to lower current prices.

The government intertemporal budget constraint may be expressed solely in terms of policy variables by substituting (14) along with (5a) and the definition $M_1/M_0 =$ into (4):

$$G_1 + RG_2 = T_1 + RT_2 - B_0 + \frac{-1}{2\ -1}\left[Y_1 - T_1 + R\left(Y_2 - T_2\right) + \left(B_0 + F_0\right)\right] + \frac{\theta B}{2\ -1}. \tag{15}$$

The righthand side of (15) may be interpreted as the present value of government resources. These resources come from three sources: (i) tax receipts, (ii) seigniorage in the first period (if $\mu > 1$), and (iii) monetization of debt in the second period (if $\theta > 0$).

A rise in first-period money supply growth, μ, or in monetization of debt, θ, both allow greater government expenditures by generating more seigniorage revenue.[6] Moreover, present-value neutral budget changes, i.e. $\Delta\left(G_1 + RG_2\right) = \Delta\left(T_1 + RT_2\right)$, will generally violate the budget constraint if $\mu \neq 1$. The reason is that households know the rate of nominal supply growth and anticipate the effects of government expenditure and tax changes on the changes on the price level and hence on seigniorage revenue. Thus, for example, in the case of a current balanced budget change, i.e. $\Delta G_1 = \Delta T_1$, the increase in government spending raises the first-period price level and reduces the real seigniorage revenue associated with the existing nominal money supply growth rate. This implies that the government will need to increase taxes further or raise more seigniorage revenue in the future by increasing borrowing or monetizing a greater proportion of the existing debt.

3.3 World Equilibrium and Interest Rate Linkages with Flexible Exchange Rates

Analogous results for private consumption and money demand as well as the price structure can be obtained for households of the foreign country. Since the good produced and consumed by the two economies is assumed identical, purchasing power parity holds i.e., nominal price level differences are offset by nominal exchange rate flexibility. In equilibrium the world supply of the single good, defined to include current output and the

initial endowment of foreign real assets, must equal demand in each period. Thus, in period 1

$$Y_1 + F_0 + Y_1^* + F_0^* = \left[\frac{1}{2(1+D)}\right]W + \left[\frac{1}{2(1+D^*)}\right]W^* + G_1 + G_1^*, \tag{16}$$

where (8a) has been used to substitute for C_1, and the foreign variables, denoted by asterisks, are defined analogously to those for the domestic country.[7]

Upon substituting the definition for domestic wealth W, (13), and the analogous one for W^* into (16) and assuming real interest equality, we obtain an equation that relates the equilibrium interest rate factor, R, to government spending levels, G_t and G_t^*; output levels, Y_t and Y_t^*; and subjective time preference factors, D and D^*:

$$R = \frac{\left(Y_1 - G_1 + F_0\right)D(1+D^*) + \left(Y_1^* - G_1^* + F_0^*\right)D^*(1+D)}{\left(Y_2 - G_2\right)(1+D^*) + \left(Y_2^* - G_2^*\right)(1+D)}. \tag{17}$$

We will discuss the determinants of the equilibrium interest rate below. Before doing so, we note that the home country's trade balance surplus in period 1, TB_1, is given by the difference between its income and absorption, $TB_1 = Y_1 + F_0 - G_1 - C_1$.[8] Substituting with (8a), (13), and (17) yields the following expression:

$$TB_1 = \frac{D\left(Y_2^* - G_2^*\right)\left(Y_1 - G_1 + F_0\right) - D^*\left(Y_2 - G_2\right)\left(Y_1^* - G_1^* + F_0^*\right)}{\left(Y_2 - G_2\right)(1+D^*) + \left(Y_2^* - G_2^*\right)(1+D)}. \tag{18}$$

Observe that in the special case of balanced growth, fiscal spending, and initial foreign asset positions across countries and time (i.e. $Y_1 - G_1 = Y_2 - G_2 = Y_1^* - G_1^* = Y_2^* - G_2^*$ and $F_0 = F_0^*$), equation (18) reduces to $TB_1 = (D - D^*)(Y - G + F_0)/(2 + D + D^*)$ which is negative if $D < D^*$, that is, if $d > d^*$. Thus the home country runs a trade deficit in the first period if it has a higher rate of time preference and is more "impatient" than the foreign country.

Equation (17) indicates that fiscal policy shifts will be transmitted across countries through changes in the interest rate. The multiplier effects of fiscal policy changes on the equilibrium foreign interest rate $1 + r = 1/R$ may be determined from (17). For example, an increase in first-period domestic government expenditures leads to a rise in the real interest rate r (fall in R).[9] Intuitively, the fiscal spending increase leads to an excess demand for goods in the first period. To eliminate this excess demand, the relative price of present goods in terms of future goods, i.e. the interest rate, must rise.[10]

Observe from (8a) and (8b) that the resulting increase in r and corresponding decline in R imply the substitution away from current consumption and towards future consumption in *both* countries. Thus an increase in first-period domestic government spending crowds out not only current domestic consumption, but also current foreign consumption. Part of the rise in domestic government spending is "financed" through the crowding out of foreign consumption. Thus in an interdependent world, fiscal spending in one country is financed by higher interest rates and the crowding out of private spending in both countries. From (18), it may be discerned that even though home

consumption is crowded out, on balance the home country's trade balance worsens in response to the fiscal stimulus.

Fiscal policy shifts also affect the price structure. The particular effects depend on the manner in which the increased spending is financed. Equation (14) implies that an increase in either current or future fiscal spending has an inflationary effect on current prices.[11]

3.4 World Equilibrium and Price Level Linkages

The assumption that domestic and foreign goods are perfect substitutes implies that their nominal price levels are linked by the purchasing power condition $P_t = E_t P_t^*$, where E_t is the domestic currency price of foreign exchange. Solving for E_1 and substituting for P_1 with (14) and analogously for P_1^* implies[12]

$$E_1 = \frac{\mu M_0\left[Y_1^* - G_1^* + R\left(Y_2^* - G_2^*\right) - \theta^* B^* + F_0^*\right]}{\mu^* M_0^*\left[Y_1 - G_1 + R\left(Y_2 - G_2\right) - \theta B + F_0\right]} \tag{19}$$

As long as the nominal exchange rate is flexible, there is considerable scope for the independent conduct of monetary and fiscal policies in the two countries. In fact, as long as price level divergences are allowed through exchange rate flexibility, the transmission of fiscal policy between the two countries occurs only through the real interest rate. Observe that the domestic price level rises and domestic currency depreciates (E_1 rises) in response to domestic money supply expansion (higher μ or M_0), fiscal policy stimulus (higher G_1 or G_2), decline in domestic supply (lower Y_1 or Y_2), or a rise in debt monetization (higher θ or B). The effects of foreign shifts are symmetric.

These effects abstract from any impact on R. To the extent that changes in output or government spending in one country affect the equilibrium interest rate there will be additional effects on the nominal exchange rate. Thus, for example, an increase in G_1 raises the equilibrium interest rate (see equation (17)) as well as raises the domestic price level (see equation (14)).[13] The rise in r, i.e. fall in R, implies that the domestic fiscal spending increase will be transmitted to the foreign economy in the form of higher foreign prices as well. Thus, this model displays the well-known property that flexible exchange rates do not insulate an economy from foreign real disturbances.

In contrast, as long as R is unaffected, nominal disturbances will not be transmitted. An increase in μ or M_0, for example, that does not require any fiscal spending adjustments by the domestic government to satisfy its budget constraint, implies that only the domestic price level will rise. The nominal value of the domestic currency falls; the foreign price is unaffected.

4. IMPLICATIONS OF FIXED EXCHANGE RATES AND MONETARY INTEGRATION

We now turn to analyzing the implications of increased monetary integration for the feasible configurations of fiscal policy. We focus first on the case where monetary integration involves a perfectly fixed nominal exchange rate. Subsequently we address the

implications of convergence in the money supply growth through policy coordination in the two countries.

4.1 Fixed Exchange Rates

Assume that a fixed exchange rate regime requires E_1 is constant, and, for simplicity, equal to unity. This implies nominal price levels are tightly linked, and in our framework must be equalized across the two countries. According to (19), such a regime then implies an additional constraint on the configuration of monetary and fiscal policies in the two countries:

$$\frac{Y_1 - G_1 + R(Y_2 - G_2) - \theta B + F_0}{\mu M_0} = \frac{Y_1^* - G_1^* + R(Y_2^* - G_2^*) - \theta^* B^* + F_0^*}{\mu^* M_0^*}. \tag{20}$$

If, for example, current monetary policy in the domestic country is more expansionary than the foreign country, i.e. $\mu M_0 > \mu^* M_0^*$, the following constraint is implied on the possible divergence of fiscal policies (in present value terms):

$$G_1 + RG_2 - (G_1^* + RG_2^*) < (Y_1 + RY_2) - (Y_1^* + RY_2^*) + (\theta^* B^* - \theta B) + (F_0 - F_0^*). \tag{21}$$

Condition (21) implies that if both countries are endowed with similar output levels $(Y_1 + RY_2 = Y_1^* + RY_2^*)$, monetize to an equal extent $(\theta B = \theta^* B^*)$, and have equal initial foreign asset positions $(F_0 = F_0^*)$, then the domestic country must follow a *less* stimulative fiscal policy than the foreign country. To the extent that domestic and foreign monetary policy parameters, as well as foreign fiscal variables, are set exogenously, the domestic fiscal authority is faced with a more binding constraint when fixed exchange rates are introduced. This constraint is mitigated the relatively greater is the domestic country's present value of output, the greater the extent to which the foreign country engages in debt financing, or the greater the initial foreign asset position of the domestic country relative to the foreign country.[14]

Analogously, if current fiscal policy is more expansionary in the domestic country than in the foreign country, i.e., $G_1 > G_1^*$, a corresponding constraint is implied for the divergence of monetary policies between the two countries. In this case, in order to generate a matching increase in its price level and sustain the fixed exchange rate, the foreign country will need to adopt relatively higher money supply growth. The extent to which this is necessary is dampened the greater its willingness to engage in more debt finance.[15] This example illustrates that fixing exchange rates in this context necessitates the targeting of a common price level in both countries, thereby forcing the coordination of monetary and fiscal policies. If foreign policies and the foreign price level are taken as given, domestic monetary and fiscal instruments together must be coordinated to achieve the price level target. Further, if domestic fiscal policy is also set independently, domestic monetary policy is the only instrument available to achieve the price level target and must therefore be set accordingly if a fixed exchange rate is to be maintained.

To put this analysis in an EC context, assume that money supply growth in Italy, the domestic country, exceeds that in Germany, the foreign country, i.e. $\mu M_0 > \mu^* M_0^*$. Given that Italy also has a smaller output level than Germany $(Y_1 + RY_2 < Y_1^* + RY_2^*)$, tends to monetize more debt $(\theta B > \theta^* B^*)$, and has a smaller net initial foreign asset position $(F_0 < F_0^*)$, a more expansionary Italian monetary policy suggests greater upward pressure

on its price level. Condition (21) correspondingly implies that a commitment to exchange rate fixity on the part of the Italian fiscal authorities under these circumstances with unchanged German policies (i.e., both a "dominant" domestic monetary policy with foreign monetary and fiscal policies given exogenously), will necessitate relatively greater restraint on Italian government expenditures.

Analogously, consider the case with a "dominant" domestic fiscal policy, monetary policy in Italy adjusts to maintain exchange rate stability, and the present value of Italian government spending (relative to output) is large compared to Germany. This divergence in fiscal position would place relatively greater pressure on the Italian price level and, with unchanged German policies, necessitates a correspondingly tighter domestic monetary position ($\mu M_0 < \mu^* M_1^*$) to maintain exchange rate stability.

These examples illustrate that the commitment to maintain fixed exchange rates places an additional constraint on the configuration of feasible monetary and fiscal policy in each country beyond that imposed through the intertemporal budget constraint. In addition to real interest rate linkages associated with capital and goods mobility, in a fixed exchange regime nominal price levels are also linked across countries. A fiscal policy shift in one country is now transmitted to the other through both real interest rates and pressure on the nominal exchange rate. In the former case, the intertemporal budget constraint is directly affected; in the latter, adjustment in the price level is needed as well. Both effects necessitate fiscal and/or monetary policy adjustment. The addition of the exchange rate constraint reduces the degree of freedom countries face in setting independent monetary and fiscal policies, and magnifies the international impact effects of fiscal policy shifts.

4.2 Money Supply Coordination

We now investigate the implications arising from coordination of money supply policies. In particular, assume that the initial money supply levels and growth rates are equated across countries each period, i.e. $M_0 = M_0^*$, $M_1/M_0 = M_1^*/M_0^*$ and $M_2/M_1 = M_2^*/M_1^*$. The first condition requires $\mu = \mu^*$. Note that the second condition together with (5a) requires $\theta B P_2 = \theta^* B^* P_2^*$. The assumption that fixed exchange rates prevail in both periods implies that, if $E_2 = 1$, then $P_2 = P_2^*$ and hence $\theta B = \theta^* B^*$. Thus seigniorage revenue in the second period must be equalized between the countries. Note that the latter condition does not necessitate that either the degree of debt monetization or government debt levels in the two countries be the same, i.e. θ need not equal θ^* and B need not equal B^*.

Upon imposing these conditions, (20) implies

$$\left(G_1 + RG_2\right) - \left(G_1^* + RG_2^*\right) = Y_1 + RY_2 - \left(Y_1^* + RY_2^*\right) + \left(F_0 - F_0^*\right) \tag{22}$$

Thus exogenously determined and coordinated money supplies limit the scope for fiscal divergence beyond what is necessary to maintain a fixed exchange rate. The present value of fiscal expenditures can differ only to the extent that output levels and initial foreign asset positions differ.

In the European context, three implications of the above analysis stand out. First, monetary coordination together with a commitment to fixed exchange rates considerably narrows the ability for countries to monetize deficits, and will necessitate much greater convergence in this area. If those countries with relatively high inflation rates and high

debt monetization attempt to attain the norms set by Germany, for example, considerable adjustment will be necessary in these countries. This is consistent with the empirical analysis of Gros (1989), the concerns expressed in the Delors report (1989), and analysis by the Commission of the European Community (CEC, 1990).

Second, convergence in monetary positions combined with a commitment to fixed exchange rates will necessitate a significant narrowing of the existing budgetary divergences among the EC countries. To the extent that the norms of the largest countries are established for the EC as a whole (small deficit or surplus positions of Germany, France, and the United Kingdom), this implies large fiscal contractions for a number of the smaller countries if the credibility of their commitment to exchange rate stability and monetary integration is to be established.

Third, a contraction in fiscal policy need not imply an immediate decline in expenditures (G_1), but rather a fall in the present discounted value of these expenditures. Hence, there remains considerable scope for differences in the time pattern of policies, although in discounted terms the overall stance of policy is considerably constrained.

5. OPTIMAL FISCAL POLICY AND MONETARY INTEGRATION

It is clear from the analysis of feasible fiscal policy configurations above that a significant convergence in budgetary policies will be required to establish monetary integration and exchange rate fixity. This is consistent with the view expressed by Thygesen (1989), the Delors committee (1989), and others. However, it stands in contrast with one part of the statement by Germany's Board of Academic Advisors to the Federal Ministry of Economics (quoted in Section 1) that in itself monetary union does not require any formal restrictions on national autonomy in fiscal policy beyond a ban of monetization of deficits. The analysis above suggests that convergence in budget policy will be necessary, in effect limiting national autonomy in fiscal policy. The Board of Advisors goes on to note, however, that informal pressures towards smaller deficit positions, and hence towards convergence at a lower level, would face countries as they commit themselves to monetary integration.

To address this issue, we now turn to the analysis of optimal fiscal policy within our framework. This will shed light on how monetary integration, viewed as a shift in the institutional monetary environment faced by fiscal authorities, affects the incentives of policy makers to spend and finance, and how changes in incentives may induce fiscal policy shifts.[16] Before proceeding, we point out that the assumption of real interest rate parity implicitly presumes that domestic and foreign assets are perfect substitutes. This precludes the existence of any risk premium mechanism through which excessive spending and borrowing in any given country generates differentially greater borrowing costs for that country in the world capital market. Nevertheless, we show below that greater monetary policy coordination affects the equilibrium world interest rate in a manner that enhances the incentive for fiscal policy convergence.

Following Tabellini (1988) and Masciandaro and Tabellini (1988), we assume that the money supply parameters, μ and θ, as well as the tax levels, T_1 and T_2, are given institutionally. This leaves the domestic government with three choice variables: G_1, G_2, and B. To model the government's decision problem in the simplest possible way it is assumed that it cares only about public expenditures and maximizes

$$V_g = \ln G_1 + D\ln G_2, \tag{23}$$

where it is assumed that it has the same rate of time preference as local households. This problem is subject to the two constraints (5b) and (15). Assuming for simplicity that the government treats the interest rate as given in its optimization problem, the associated first-order conditions imply

$$\frac{1}{G_1} = \frac{\phi D}{G_2 R}, \tag{24}$$

where $\phi[\theta, \mu] \equiv \dfrac{(2\mu-1)(1-\theta)}{2\mu(1-\theta)+2\theta-1}$, $\phi_\mu > 0$, $\phi_\theta < 0$, $1 > \phi > 0$, if $\mu > 1$.

Condition (24) represents an equilibrium intertemporal government spending relation that takes account of financing considerations.

The lefthand side of (24) is the marginal utility of current government spending. The righthand side discounts the marginal utility of future government spending (since $\phi < 1$) by the extent to which spending is financed by issuing public debt. Lower levels of seigniorage revenue or a higher degree of debt monetization, as parameterized by μ and θ, induce more borrowing and hence lower future relative to current government spending. If $D = R$ and $\theta = 0$ then (24) implies $G_1 = G_2$; i.e., it is optimal to balance expenditures across time.

We may solve for the optimal value of G_1 in terms of exogenous tax and financing variables as well as R by substituting out for G_2 and B in (15) with (24) and (5b), and by using the definition of ϕ:

$$G_1(1+D) = T_1 + RT_2 - B_0 + \frac{(\mu-1)}{2\mu-1}\left[Y_1 + RY_2 - (T_1 + RT_2) + (B_0 + F_0)\right] + \frac{\theta R T_2}{(1-\theta)(2\mu-1)}. \tag{25}$$

It can be established that the optimal level of current fiscal spending increases with greater tax receipts (higher T_1 or T_2), output (higher Y_1 or Y_2), and initial foreign assets (higher F_0). Most importantly for our purposes, it can also be shown that G_1 rises with θ or μ.[17] Intuitively, greater monetization of debt repayment in the second period reduces the cost of borrowing and spending by the government in the first period. Similarly, greater current money supply growth generates greater seigniorage revenue and permits more fiscal spending. Lastly, we note that it can be shown that G_1 rises with R (assuming $Y_2 > T_2$ and $\mu > 1$), implying that a fall in the interest rate induces greater current spending.

The results above imply that, given R, lower levels of θ and/or μ associated with monetary policy coordination will tend to reduce the desired level of current fiscal spending. We now turn to take into account the endogenous response of R in the determination of optimal fiscal policy.[18] To obtain an expression for R in terms of G_1 and G_1^* substitute out in (17) for G_2 using (24) and for G_2^* with the foreign analogue, and solve for R:

$$R = \frac{\left[Y_1 - G_1(1-\phi) + F_0\right](1+D^*)D + \left[Y_1^* - G_1^*(1-\phi^*) + F_0^*\right](1+D)D^*}{Y_2(1+D^*) + Y_2^*(1+D)}, \tag{26}$$

where it should be recalled $\phi < 1$, $\phi^* < 1$. Equations (25), its foreign analogue, and (26) constitute a system of three expressions in the three endogenous variables, G_1, G_1^*, and R. The solution of this system and comparative statics are presented in an appendix. It can be shown, under reasonable conditions, that the comparative statics results obtained for G_1 when R was held constant also hold when R is treated endogenously. That is, G_1 rises with θ or μ.

Allowing R to vary endogenously, however, implies that the optimal level of G_1 will depend on foreign factors transmitted through changes in the equilibrium interest rate. In particular, an increase in μ^* or θ^* reduces the optimal level of current domestic fiscal spending. Intuitively, greater seigniorage revenue or monetization of debt abroad enables the foreign government to increase its current spending. This increased spending, however, pushes up the equilibrium interest rate (lowers R). The higher interest rate reduces the present value of resources available to the domestic country. Consequently, the domestic government must reduce its spending.

The configuration of optimal fiscal spending policies in the two countries depends on their financing parameters as well as on their respective output, tax, and initial asset levels. Treating the latter variables as constant across countries, it can be established that sufficient conditions for $G_1 > G_1^*$ are $D^* > D$ (i.e. $d^* < d$), $\theta > \theta^*$, and $\mu > \mu^*$. The last two conditions imply that the domestic country government generates relatively more resources for spending than the foreign government. The condition $d > d^*$ precludes the possibility that this relationship is reversed by an extreme preference for current spending by the foreign government.

Expression (21) implies that with fixed exchange rates and coordinated monetary policies ($E_1 = 1$, $\mu = \mu^*$, $\theta B = \theta^* B^*$) feasible divergences in fiscal policies will be correspondingly constrained. We next ascertain the implications of fixed exchange rates and coordinated monetary policies on the configuration of optimal fiscal policies in the two countries.[19] Note from (14) that P_1 depends on the present value of government expenditures, $G_1 + RG_2$ (as well as on debt monetization, θB, and initial foreign asset positions). It can be shown that under the conditions above a narrowing of the money supply growth differential between countries reduces any differential in the present value of their expenditures. Thus money supply coordination creates an incentive for optimizing governments to reduce the disruptive impact on the exchange rate of differences in spending policies.

These results support the argument by Germany's Board of Academic Advisers noted above that the institutional changes associated with monetary integration may create the appropriate incentives for fiscal adjustment. For example, assume that the relatively high inflation EC countries bring down their money growth rates, μ, and the degree of debt monetization, θ, to the levels set by Germany (μ^*, θ^*). In this instance, with monetary coordination around lower money growth rates, our results indicate that the optimal response in the high inflation countries would be to lower government expenditures and reduce budget deficits. This suggests the institutional change itself, i.e. a monetary regime shift created through the EMU, would create incentives for fiscal convergence. Because

the real cost of financing expenditures has increased, pressure automatically would be placed on the fiscal authorities to respond. To the extent that countries with higher than average money growth make the adjustment and decelerate monetary expansion, the present value of their optimal government expenditure stream will unambiguously decline, and create an incentive toward convergence in EC budget positions. It should be reemphasized, however, that these incentives are for fiscal convergence (at a lower average level of budget deficits) on a present value basis. This still leaves considerable scope for spending level differences between countries at any given point in time.

6. CONCLUSION

This paper explores the implications of EC exchange rate and monetary union for the conduct and transmission of fiscal policy. In particular, we investigate how the feasible mix of government expenditure and financing arrangements may change in the new institutional setting of a monetary union, and also how the incentives facing policy makers in their spending and financing decisions may be affected by institutional monetary arrangements. The objective is to provide some insight into the extent to which fiscal policy actions are constrained in a monetary union, and whether the associated constraints on monetary policies provide an incentive for countries to follow more or less divergent fiscal stances.

In this context, we employ a two-country, two-period framework which highlights the role of intertemporal budget constraints and maximizing private and public sector behavior. We preclude the possibility of default and focus on the implications for public sector behavior of commitments to fixed exchange rates and common money growth policies.

We first assume government authorities take as binding the nominal exchange rate and that their feasible mix of policies must be consistent with this commitment by maintaining stability in the price level. We show that a range of feasible monetary and fiscal mixes, and financing patterns, are consistent with this constraint, although it is significantly more binding than with a flexible exchange rate regime.

Second, we impose conditions consistent with tight coordination of monetary growth policies. In this case, the options facing the government are severely reduced: fiscal policy must now be set to fulfill the budget constraint with limited monetary finance as well as to maintain stability in the price level. We show that, although there may be variation across countries in the feasible time pattern of fiscal spending between the present and future periods, differences in the present discounted value of fiscal spending are more tightly constrained.

Third, we look at how the constraints associated with different institutional changes affect the incentives of fiscal policy makers in an optimizing framework. We find that an incentive exists to reduce large budget deficit positions if money growth and debt monetization is reduced to a lower common level. This increases the real cost of borrowing and hence reduces the optimal expenditure level of the government, both in the present and future periods. Hence the convergence of monetary policies provides a corresponding incentive for convergence in fiscal positions.

Our analysis should shed some light on the debate in the past year over the fiscal implications of the process of monetary integration in the European Community. The concern is that large existing divergences in government budget positions and levels of

outstanding debt in the EC, as well as marked differences in the extent to which seigniorage and debt monetization have been employed in financing expenditures, may conflict with the objective of coordinated monetary policy and the commitment to fixed nominal exchange rates. Our analysis suggests that governments that are sensitive to intertemporal budget constraints will naturally find the scope for independent fiscal policy reduced as monetary integration proceeds. Moreover, monetary integration should provide incentives for optimizing governments to further converge their fiscal positions.

FOOTNOTES

The views presented in this paper are those of the authors alone and do not necessarily reflect those of the Federal Reserve Bank of San Francisco, the Board of Governors of the Federal Reserve System, or the Bank for International Settlements. We would like to thank William Branson, Michele Fratianni, Linda Goldberg, Daniel Gros, Aris Protopapadakis, Niels Thygesen, Jürgen von Hagen, and Clas Wihlborg for helpful comments.

1. The Delors Committee report, released in April 1989, outlines the specific steps required to achieve the "final stage" of economic and monetary union in Europe. With respect to macroeconomic policy coordination, the final stage of economic and monetary union envisioned involves permanently fixed exchange rates and possibly, though not necessarily, a single EC currency. It also recommends the setting of a Community-wide fiscal policy position and close coordination of national budgetary policies. Specifically, the report recommends "binding rules" be adopted (i) to impose effective upper limits on budget deficits of individual member countries, (ii) to strictly limit monetary finance of budget deficits, and (iii) to limit external borrowing in non-EC member country currencies.

2. The costs associated with the unification of the eastern and western parts of Germany, of course, will modify this picture over the next several years. The rise in the German debt /GNP ratio in 1990, despite very strong output growth and following the debt ratio decline in 1989, reflects the rise in budgetary transfer to the eastern part of Germany.

3. It is also relevant to note that the intertemporal budget constraint implies $TB_1 + RTB_2 + F_0 = 0$, i.e., the discounted sum of trade balance surpluses plus initial foreign assets must equal zero. Thus a trade deficit in the first period must be followed by a surplus in the second.

4. A number of papers have modelled the circumstances under which the Ricardian non-equivalence between taxation and domestic bonds breaks down in an international setting. For example, Frenkel and Razin (1987, Ch. 11) develop a two-country version of Blanchard's (1985) uncertain-lifetime setup in which the relevant household discount rate is below that of the infinitely-lived government. Obstfeld (1989) analyzes the long-term dynamics of fiscal policy in a model with economic growth. In his paper, non-equivalence between domestic debt and taxation arises because new households are assumed to be unconnected with existing households. Since current debt holders do not value the consumption of unborn taxpayers, a fraction of public debt is perceived as net wealth by existing households. In our model, however, domestic debt has real wealth effects not because of Ricardian non-equivalence, but because the assumption that part of debt is monetized implies money is non-neutral. See Leiderman and Blejer (1988) for a survey of the modelling and testing of Ricardian equivalence.

5. The log-linear specification of lifetime utility is employed for tractibility. It implies a constant unit elasticity of substitution between consumption and money at any two points in time. The results would not be affected

by including government spending levels in the utility function as long as preferences for the privately and publicly provided goods were separable.

6. A sufficient condition for the partical derivative of the righthand side of (15) with respect to μ to be positive is $Y_1 + RY_2 - B_0 > T_1 + RT_2 + 2\theta B$.

7. A corresponding condition pertains to equilibrium in period 2. It can be shown, however, that this conditon is redundant.

8. This relation is consistent with the summing of equations (1a) and (3a) which implies $Y_1 - C_1 - G_1 + F_0 = F = TB_1$, i.e. national savings (inclusive of initial foreign asset earnings) equal the capital account deficit, which, in turn, equals the trade balance surplus.

9. An increase in current foreign fiscal expenditures has the same effect on r. An increase in second-period fiscal spending in either country has the opposite effect. Inspection of (17) indicates that the effects of exogenous supply shocks are symmetrical.

10. In our benchmark model, output levels in the two periods are assumed fixed and given by endowments. Extending the model to allow real investment provides a richer "supply side" to the model by causing output growth to become endogenous. This would focus attention on production opportunities of each economy, as government policies influence private investment decisions and hence the future capital stock and output potential. This supply mechanism generally dampens the effects of exogenous changes, such as stimulatory fiscal policy, on interest rates. In addition, it implies that the net impact of fiscal stimulus on aggregate income and consumption could be positive, as suggested by typical Keynesian models. Another possible extension to the model involves introducing non-tradable goods anf focusing attention on the intratemporal terms of trade, i.e., the real exchange rate, defined as the inverse of the relative price of non-tradable goods to tradable goods. In this case the effects of government depend on the commodity composition and time pattern of the spending. See Ch. 9 of frenkel and Razin (1987) for a detailed exposition of the effects of fiscal policy in a two-country, two-period model with tradable and non-tradable goods.

11. It can be shown that a bond-financed increase in spending is more inflationary than one that is tax financed.

12. An analogous expression is obtainable for $E_2 = P_2/P_2^*$ through use of (10), (13), and (14).

13. Note that the "indirect" effect of a lower R in response to a higher level of G_1 reinforces the "direct" effect of G_1 on P_1.

14. Strictly speaking, the assumption that second period money supply growth is fixed as a proportion of government debt implies monetary and fiscal policies are not fully independent within each country.

15. This discussion implicitly assumes that the domestic country is "dominant" in a game theory sense.

16. Throughout this section we abstract from issues of time consistency in government policies. Since by assumption all lending and borrowing is in real terms, time consistency is not generally a problem that should affect the interaction of the household sector and government sector in each country.

17. These results are equivalent to those in Proposition 2 of Tabellini (1988) and Masciandaro and Tabellini (1988). The effect of θ on G_1 presumes μ on G_1 is $Y_2 > T_2 (1+\theta)/(1-\theta)$.

18. The assumption that each government takes R as given in its optimization problem implicitly implies that it takes the actions of the other country's government to be given as well. Thus the equilibrium derived below may be interpreted as a Nash-Cournot equilibrium.

19. In our analysis we have not formally made the constraint associated with monetary coordination part of the government optimization problem. In addition, we continue to abstract from game theory interactions among the two governments.

APPENDIX

To solve for the equilibrium G_1, G_1^*, and R we arrange (25), its foreign analogue, and (26) into the following matrix expression:

$$\begin{bmatrix} 1+D & 0 & -a_2 \\ 0 & 1+D^* & -a_2^* \\ (1-\phi)(1+D^*)D & (1-\phi^*)(1+D)D^* & y_2 \end{bmatrix} \begin{bmatrix} G_1 \\ G_1^* \\ R \end{bmatrix} = \begin{bmatrix} a_1 \\ a_1^* \\ y_1 \end{bmatrix} \tag{A.1}$$

where

$$a_1 = T_1 - B_0 + \frac{\mu - 1}{2\mu - 1}\left[Y_1 - T_1 + (B_0 + F_0)\right]$$

$$a_1^* = T_1^* - B_0^* + \frac{\mu^* - 1}{2\mu^* - 1}\left[Y_1^* - T_1^* + (B_0^* + F_0^*)\right]$$

$$a_2 = T_2 + \frac{\mu - 1}{2\mu - 1}(Y_2 - T_2) + \frac{\theta T_2}{(1-\theta)(2\mu - 1)}$$

$$a_2^* = T_2^* + \frac{\mu^* - 1}{2\mu^* - 1}(Y_2^* - T_2^*) + \frac{\theta^* T_2^*}{(1-\theta^*)(2\mu^* - 1)}$$

$$y_1 = (Y_1 + F_0)(1 + D^*)D + (Y_1^* + F_0^*)(1 + D)D^*$$

$$y_2 = Y_2(1 + D^*) + Y_2^*(1 + D)$$

Solving

$$\begin{bmatrix} G_1 \\ G_1^* \\ R \end{bmatrix} = \frac{1}{\Delta} \begin{bmatrix} y_2(1+D^*) + a_2^*(1-\phi^*)(1+D)D^* & -a_2(1-\phi^*)(1+D)D^* & a_2(1+D^*) \\ -a_2^*(1-\phi)(1+D^*)D & y_2(1+D) + a_2(1-\phi)(1+D^*)D & a_2^*(1+D) \\ -(1-\phi)(1+D^*)^2 D & -(1-\phi^*)(1+D)^2 D^* & (1+D)(1+D^*) \end{bmatrix} \begin{bmatrix} a_1 \\ a_1^* \\ y_1 \end{bmatrix} \tag{A.2}$$

where $\Delta = y_2(1+D)(1+D^*) + a_2(1-\phi)(1+D^*)^2 D + a_2^*(1-\phi^*)(1+D)^2 D^*$.

To establish specific results, we make the simplifying assumptions $a_1 = a_2 > 0$ and $a_1^* = a_2^* > 0$. These assumptions imply that in each country the profile of government resources from taxes, seigniorage, and monetization is "balanced" across time (see equation (25)). It follows from (A.2) that

$$G_1 = (y_1+y_2)(1+D^*)a_2/\Delta$$
$$G_1^* = (y_1+y_2)(1+D)a_2^*/\Delta \quad \text{(A.3)}$$
$$R = [y_1(1+D)(1+D^*) - a_2(1-\phi)(1+D^*)^2D - a_2^*(1-\phi^*)(1+D)^2D^*]/\Delta$$

To determine comparative statics results it is further assumed that a_2 and $a_2(1-\phi)$ are positive functions of u and ϕ. Sufficient conditions are $\mu > 1$ and $Y_2 > T_2(1+\theta)/(1-\theta)$. Analogous assumptions are made for a_2^* and $a_2^*(1-\phi^*)$. It is straightforward to show that G_1 is a positive function of μ and θ and a negative function of μ^* and θ^*. In addition, it can be shown that R is a negative function of μ, θ, μ^*, and θ^*.

Observe next that (A.3) implies

$$G_1 - G_1^* = (y_1+y_2)[a_2(1+D^*) - a_2^*(1+D)]/\Delta \quad \text{(A.4)}$$

Expression (A.4) implies that $G_1 > G_1^*$ if and only if $a_2/a_2^* > (1+D)/(1+D^*)$. If $Y_2 = Y_2^*$ and $T_2 = T_2^*$ sufficient conditions for this to be true are (i) $\theta > \theta^*$, (ii) $u > u^*$ and (iii) $D^* > D$, i.e. $d^* < d$.

An expression for $G_1 + RG_2$ solely in terms of R can be obtained by substituting appropriately with (24) and (25), using the matrix notation of (A.1) above:

$$G_1 + RG_2 = a_2(1+R)(1+\phi D)/(1+D) \quad \text{(A.5)}$$

where, as above, it is assumed that $a_1 = a_2$. Define $Z = G_1 + RG_2 - (G_1^* + RG_2^*)$. It can be shown that under the same conditions ensuring $G_1 > G_1^*$, $Z > 0$ as well. It can also be shown that Z falls with μ. This supports the assertion in Section V that a narrowing of money supply growth rate differences also induces the convergence of fiscal policy positions that is requisite for maintaining a fixed exchange rate.

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