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FISCAL POLICY COORDINATION WITH DEMAND SPILLOVERS AND UNIONISED LABOUR MARKETS*

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We explore the incentives for governments to cooperate by expanding expenditure. We have three countries: two are in a monetary union (the EMU). The labour markets of both the EMU countries are unionised, and there is involuntary unemployment in equilibrium. We explore the intra and intercountry effects of changes in bargaining power. We then examine optimal government expenditures in each EMU country; we find that there is a positive spillover, and that expenditures are strategic complements. The coordinated equilibrium involves higher expenditure than the uncoordinated equilibrium.

> European governments will be asked this month to spend more in order to break out the 'prison of stagnation and unemployment', Poul Nyrup Rasmussen, the Danish Prime Minister [then President of the European Council] said yesterday. The key to his plan is a co-ordinated push for growth which encourages all governments to increase spending together: 'We can make everybody better off than if each acts on his own' says Mr. Rasmussen.
>
> *The Independent*, London (April 1994)

As countries in the European Union head towards closer monetary union, what are the implications of this for fiscal policy? Clearly, the rigours of closer monetary union imply limitations on the public debt of individual countries, and hence reduce the possibility of debt-financed expenditure as an instrument of economic stabilisation. In this paper, we examine the welfare aspects of fiscal policy within a two-country monetary union framework with a balanced budget.[1] Other studies have tended to focus on the negative spillovers of fiscal policy across countries in the context of a two-country policy game. Thus, for example, a fiscal expansion in one country might raise interest rates or wages and prices in all countries (cf. e.g. Andersen and Sørensen, 1995 and Levine and Brociner, 1994). The conclusion of these studies is that uncoordinated fiscal policy (i.e. each country acting in its own interest) yields excessive fiscal expenditure: coordination (i.e. the countries behaving cooperatively) leads to a reduction in the level of fiscal expenditure.

Policy-makers, however, see things differently. At times of high unemployment, they tend to see the problem of coordination in terms of the need to coordinate expansion. This flies in the face of the notion of negative spillovers, and indicates that policy-makers may perceive positive spillovers to

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[1] This differentiates our paper from Svensson (1987) and van der Ploeg (1993). Whilst their papers are richer in other dimensions, they do not explore optimal government policy or the two-country game. They explore the effects of a given change in expenditure (the 'international transmission mechanism').

fiscal expansion. The common-sense interpretation of this is that there is a demand spillover: expansion in one country stimulates the other countries, which in turn may generate a positive welfare spillover (cf. the opening quote). This effect has been largely overlooked in the recent literature of fiscal policy coordination. More recent studies (Rogoff, 1985; Turnovsky, 1988; Devereux, 1991) assume that there is a competitive labour market with full employment. In the absence of unemployment, the effects of a demand spillover can certainly be negative (leading to higher nominal wages and prices). Whilst the classic studies of Mundell (1968) and Hamada (1985) (see Frenkel and Razin (1994, ch. 2) for a recent textbook treatment) consider fiscal policy coordination in a fix-price framework with positive demand spillovers, their approach is *ad hoc* in that there is no explanation of wages and prices, and there is no welfare analysis. Svensson (1987) and van der Ploeg (1993) find that a positive demand externality is possible: however, their framework is one with floating exchange rates, and the positive demand externality relies upon some nominal inertia.

We consider a model with two countries, which constitute an Economic and Monetary Union (EMU): for poetic convenience, they are Germany and France. The DM/FF exchange rate is irrevocably fixed at unity, and an independent European Central Bank controls the money supply. The Rest of the World (Japan) is not modelled in detail. In each EMU country, there is equilibrium unemployment, unions bargain over nominal wages, and the unemployed would prefer to be working in the unionised sector (there is 'involuntary unemployment'). Balanced trade within the EMU occurs through a 'specie flow' mechanism, while the DM/Yen exchange rate ensures trade balance between EMU and Japan.

We consider balanced budget fiscal policy, and find that there is indeed a positive demand and welfare spillover. Optimal fiscal expenditures in France and Germany are strategic complements. The non-cooperative (uncoordinated) policy involves too low fiscal expenditure, and the cooperative (coordinated) policy leads to higher fiscal expenditure. We are also able to trace out the effects of union bargaining power and of firm market power on the optimal fiscal policy of each country individually, and on the resultant equilibrium: increases in both of these power parameters tend to reduce the optimal level of government expenditure.[2]

I. THE MODEL

There are three countries: Germany and France constitute the EMU, Japan represents the rest of the world. There are two exchange rates; taking the Deutschmark as the numeraire, the DM/FF exchange rate is unity; the DM/Yen rate is R. We assume that the two currencies within the EMU are perfect substitutes, so that in effect there is a single currency. There are two

[2] In this paper, we take the existence of unemployment as given and explore the implications of this for the optimal government expenditure game. In this paper, we do not consider the full range of policy options to reduce or eliminate unemployment.

consumption goods. First, there is the international traded good I: this is produced in all three countries, and EMU firms are price takers on the world market. Second, there is the European traded good E. This is an aggregate derived from a unionised monopolistically competitive industry. There is intra-industry trade between the two countries: Germany produces a proportion s of the E-outputs, and France $1-s$; consumers in each country consume the outputs of firms in both countries.

I.1 *Households*

The model is symmetric, in the sense that consumers in France and Germany are identical, and their behaviour differs only insofar as national aggregates differ. We consider one aggregate household in each country. Its utility depends on: (i) consumption; (ii) labour, which is supplied with a constant disutility θ, (iii) real money balances, and (iv) government expenditure in the home country. The household in country i ($i = G, F$) has utility function u_i:

$$u_i = \frac{1}{\delta}\left\{\left[\left(\frac{c_i^E}{c\alpha}\right)^{\alpha}\left(\frac{c_i^I}{c\beta}\right)^{\beta}\right]^{c}\left[\frac{M_i}{P_i(1-c)}\right]^{1-c} - \theta n_i\right\}^{\delta}\frac{(g_i)^{1-\delta}}{1-\delta}. \tag{1}$$

$(c, \alpha, \beta, \delta)$ lie between $(0, 1)$; c can be interpreted as the overall marginal propensity to consume, α and β as the expenditure shares of the two goods E and I (with $\alpha+\beta = 1$); δ captures the weight of public consumption in utility. c_i^E is a consumption index for country i, defined over a continuum of brands $v \in [0, 1]$, where proportion s is produced in Germany, and $1-s$ in France. It can be viewed as a subutility function with constant elasticity of substitution $1/\mu$

$$c_i^E = \left[\int_0^s c_{iG}^E(\nu)^{1-\mu}\, dv + \int_s^1 c_{iF}^E(\nu)^{1-\mu}\, dv\right]^{1/(1-\mu)}, \tag{2a}$$

where $c_{ij}(v)$ denotes the consumption of good v produced in country j and consumed in country i. The corresponding price index (the cost-of-living index) for c_i^E is defined as

$$P_i^E = \left[\int_0^s P_{iG}^E\,(v)^{(\mu-1)/\nu}\, dv + \int_s^1 P_{iF}^E(v)^{(\mu-1)/\mu}\, dv\right]^{\mu/(\mu-1)}, \tag{2b}$$

where P_{ij}^E is the price set for a brand produced in country j and sold in country i (the same brand can be sold in both EMU countries). c_i^I represents country's i consumption of the homogeneous international traded good I. Its Yen price P^* is exogenously given by the world markets. The DM price is then RP^*. The overall cost-of-living index for Germany is therefore: $P_G = (P_G^E)^{\alpha}(RP^*)^{\beta}$ (analogously for France). The German aggregate budget constraint is

$$P_G c_G^E + RP^* c_G^I + M_G \leqslant Y_G + M_G^0 - T_G \equiv \Omega_G. \tag{3}$$

On the LHS we have total expenditure on consumption goods plus end of period money balances; on the RHS we have income, initial money balances and lump-sum taxes. We assume that Germans (French) receive wage and profit income only from German (French) firms. Therefore, German income is written: $Y_G = W_G^E n_G^E + \Pi_G^E + \Pi_G^I + W_G^I n_G^I = \int_0^s [W_G(v)\, n_G(v) + \Pi_G(v)]\, dv + RP^* x_G^I$, (analogously for France). The household maximises (1) subject to (3), yielding

$$
\begin{aligned}
M_i/P_i &= [(1-c)\,\Omega_i]/P_i \\
c_i^E &= \frac{c\alpha\Omega_i}{P_i} \\
c_{ij}^E(v) &= \left[\frac{P_{ij}(v)}{P_i}\right]^{-1/\mu} c_i^E, \quad v \in [0, s], \quad \text{for } j = G; \\
& \qquad\qquad\qquad\qquad\quad\;\; v \in (s, 1], \quad \text{for } j = F \\
c_i^I &= \frac{c\beta\Omega_i}{RP^*}.
\end{aligned}
\tag{4}
$$

We assume that the participation constraint is satisfied,[3] so that $W_i/P_i \geqslant \theta$.

I.2. *Government*

Each government formulates demands for the E good, buying from both EMU countries. The government is assumed to allocate its expenditure over the producers of E according to the same CES preferences as the household (this is easily relaxed).[4] Hence, given total nominal expenditure G_i, we have the demand for each brand produced in Germany (and similarly for French brands):

$$
\hat{g}_i^E(v) = \left[\frac{P_{iG}^E(v)}{P_i^E}\right]^{-1/\mu} \left(\frac{G_i}{P_i^E}\right), \quad v \in [0, s]. \tag{5}
$$

We assume that the government balances its budget, so that $G_i = T_i$.

I.3. *Wage, Price, and Employment Determination in the European Traded Sector*

There is no mobility of labour between France and Germany as reflects the current reality, at least as regards the major EC countries (cf. Begg, 1995, pp. 99–103). In the European traded sector, we assume that the nominal wage is bargained upon at the firm level between a firm and its enterprise union, with employment being unilaterally chosen by the firm (i.e. we adopt the 'right-to-manage' solution). In Germany (and France), there is a continuum of firms, each firm $v \in [0, s]$ ($v \in (s, 1]$) producing one of the brands in (2a) above. The typical firm behaves like a monopolist: it sets the price of its own brand while treating the general price index as given. There are constant returns to labour,

[3] The model is valid for parameters which enable this to be satisfied. Whilst this is not so for all parameters, it is not exceptional.

[4] Equation (5) below need not be interpreted as the government's demand for outputs. It can be interpreted as the demand for intermediate inputs for an industry producing the public good for the government: thus (5) would mean not that the French government buys directly from the German firms, but that German outputs are used as intermediates in producing the goods supplied by the French government. For this latter interpretation we need to assume that the production technology for the public good is directly equivalent to the utility function of the aggregate household.

$x_i(v) = n_i(v)$. The profit of a German (French) firm is given by the sum of consumer and government demands (4) and (5) in both countries: $\Pi^E_G(v) = [P^E_{GG}(v) - W^E_G(v)]\,[c^E_{GG}(v) + \hat{g}_G(v)] + [P^E_{FG}(v) - W^E_G(v)]\,[c^E_{FG}(v) + \hat{g}_F(v)]$. Given the nominal wage, the firm chooses the price in both markets in order to maximise profits, yielding

$$\frac{P^E_{GG}(v) - W^E_G(v)}{P^E_{GG}(v)} = \mu = \frac{P^E_{FG}(v) - W^E_G(v)}{P^E_{FG}(v)}. \tag{6}$$

The firm sets the same price in each market, because of our assumption that the elasticity of demand $1/\mu$ is the same. The nominal wage is bargained upon between the firm and its union before the determination of prices, and we assume an asymmetric Nash bargain solution

$$\begin{aligned} &W^E_G(v)\,\text{argmax} = [\Pi^E_G(v)]^{1-b_G}\,[S^E_G(v)]^{b_G}, \quad b \in (0, 1] \\ &\text{s.t. } (6), \Pi^E_G(v) \geqslant 0, \quad S^E_G(v) \geqslant 0. \end{aligned} \tag{7}$$

When $W^E_G(v)$ is chosen, the employment outcome is given by (6). The union aims at maximising the 'surplus' of its members: $S^E_G = n^E_G[(W^E_G/P^E_G) - \theta]$. We assume that the 'outside option' for the firm is zero profits and for the union the disutility of labour (the unemployed can either work in the competitive sector or consume leisure). Inside options are normalised to zero. Equation (7) gives

$$\frac{W^E_G(v)/P_G - \theta}{W^E_G(v)/P_G} = \frac{\mu b_G}{1 - \mu(1 - b_G)}. \tag{8}$$

The bargaining process generates a real wage rigidity. The real wage mark-up over θ is increasing in μ (the firm's monopoly power) and b_G (the union's bargaining power). Assuming a symmetric equilibrium for each firm within each country yields the equilibrium nominal wages and prices:

$$\begin{gathered} W^E_j = \phi^E_j(1 - \mu)\,\theta P_j, \quad P^E_{Gj} = \phi^E_j\,\theta P_j = P^E_{Fj} \\ \phi^E_j \equiv \left[\frac{1 - \mu(1 - b_j)}{(1 - \mu)^2}\right] \geqslant 1. \end{gathered} \tag{9}$$

ϕ^E_j is a parameter that depends upon the 'market power' parameters in each country. In the Walrasian special case $\mu = 0 = b_j$, and $\phi^E_j = 1$. Therefore, the less competitive markets (the higher μ and b_j) the larger ϕ^E_j. The equilibrium output-employment in each country is

$$\begin{aligned} x^E_G &= x^E_{GG} + x^F_{FG} = s\left[\left(\frac{P^E_{GG}}{P^E_G}\right)^{-1/\mu}\left(\frac{c\alpha\Omega_G + G_G}{P^E_G}\right) + \left(\frac{P^E_{FG}}{P^E_F}\right)^{-1/\mu}\left(\frac{c\alpha\Omega_F + G_F}{P^E_F}\right)\right] \\ x^E_F &= x^E_{GF} + x^E_{FF} = (1 - s)\left[\left(\frac{P^E_{GF}}{P^E_G}\right)^{-1/\mu}\left(\frac{c\alpha\Omega_G + G_G}{P^E_G}\right) + \left(\frac{P^E_{FF}}{P^E_F}\right)^{-1/\mu}\left(\frac{c\alpha\Omega_F + G_F}{P^E_F}\right)\right]. \end{aligned} \tag{10}$$

I.4. *The International Traded Sector*

The price of the I good is set on world markets at P^*, so that its DM price is RP^*. We assume that this good is produced in both EMU countries by identical price-taking firms. Representative firms have a decreasing returns to labour technology: $x_j^I = (n_j^I)^\sigma$, $\sigma \in (0, 1)$. Labour markets are competitive. We assume there is not full employment, so that the nominal wage in Germany and France equates the real wage with the disutility of labour, i.e. $W_j^I = \theta P_j$. Hence, the profit maximising output level, say, in Germany is:

$$x_G^I = \left(\frac{RP^*\sigma}{\theta P_G}\right)^{\sigma/1-\sigma} \tag{11}$$

(for France, replace P_G with P_F). From (11) and technology, equilibrium employment is $n_G^I = (RP^*\sigma/\theta P_G)^{1/(1-\sigma)}$. The important thing to note is that the I outputs in France and Germany will be constant in equilibrium, independent of the exchange rate and indeed all nominal variables (cf. (16) below).

I.5. *The European Money Market*

There is a European Monetary Union: the money supply is fixed by the Central Bank, which we assume is completely independent. The 'external' exchange rate between the DM and the Yen, R, is assumed to float freely, so as to balance trade. Money is the only asset, and we ignore the impact of capital markets. The total European money supply is M^0. Thus: $M^0 = M_G^0 + M_F^0 = (1-c)(\Omega_G + \Omega_F)$. The second term gives the division of the money supply between Germany and France, and the third term the demand for money from the two countries.

II. EQUILIBRIUM

The model presented in Section I above distinguishes between the nominal variables and the real variables. This un-classical 'dichotomy' stems from the combination of our assumptions of constant disutility and marginal product of labour, and of homothetic preferences. In order to solve for equilibrium, we consider the case where there is trade balance in each country. Since the sum of balance of payments deficits is zero, it is sufficient to look at only two countries. The Japanese trade balance in DM in written:

$$(RP^*x_G^I - c\beta\Omega_G) + (RP^*x_F^I - c\beta\Omega_F) = 0. \tag{12}$$

The first bracketed term is the net imports of Germany, and the second term the net imports of France. Note that since consumer preferences are the same in Germany and France, all that matters in (12) is the total European income, and not its internal distribution.[5] Since the output of the I good can be treated as constant, it follows that we can solve for R directly from (12). The German balance of trade is given by:

$$(RP^*x_G^I - c\beta\Omega_G) + (P_{FG}^E x_{FG}^E - P_{GF}^{ET} x_{GF}^{ET}) = 0. \tag{13}$$

[5] The sum $\Omega_F + \Omega_G$ is fixed, since the European money supply is fixed.

Given the value of R^* determined by (12), intra-European trade is balanced via a specie flow mechanism: the European money supply is allocated across the member states so that trade balances. If we define k as being the proportion of the European money supply in Germany, then (13) can be seen as determining k in the 'long run'. The level of k that balances trade within Europe is denoted k^*.

The equilibrium level of nominal national income is determined by the standard income–expenditure process within Europe. In the case of balanced trade, the national income identity is: $Y_G = P_G c_G + G_G + S_G$, where $S_G = 0$ denotes German net exports. An analogous expression holds for France. From (4), (13), $M^0 = (1-c)(\Omega_G + \Omega_F)$ and the definitions of Ω_G and Y_G:

$$Y_G = \left(\frac{c}{1-c}\right) k^* M^0 + G_G. \tag{14}$$

The explicit solution for k^* is given below, (18). We can now solve for equilibrium prices and wages, conditional on the floating exchange rate R. The equilibrium consumer price index is

$$P_G = (V\theta)^{\alpha/\beta} RP^* = P_F. \tag{15a}$$

The equilibrium nominal prices and wages in the European traded sector are

$$P_G^E = (V\theta)^{1/\beta} RP^* = P_F^E, \tag{15b}$$

$$P_{Gj}^E = (\phi_j^E V^{\alpha/\beta} \theta^{1/\beta}) RP^* = P_{Fj}^E, \tag{15c}$$

$$W_j^E = [(1-\mu)\phi_j^E V^{\alpha/\beta} \theta^{1/\beta}] RP^*, \tag{15d}$$

$$V = [s(\phi_G^E)^{(\mu-1)/\mu} + (1-s)(\phi_F^E)^{(\mu-1)/\mu}]^{\mu/(\mu-1)}. \tag{15e}$$

Therefore, the equilibrium nominal wage in the competitive I sector is: $W_j = V^{(\alpha/\beta)} \theta^{1/\beta} RP^*$. Notice that nominal variables are pegged to RP^*, the DM price of the I good. Given (11) and (15a), we can solve for the equilibrium I output in Germany and France

$$x_G^I = \left(\frac{\sigma}{V^{\alpha/\beta}\theta^{1/\beta}}\right)^{\sigma/(-\sigma)} = x_F^I. \tag{16}$$

Because of our assumptions of symmetry in preferences and technology, and of perfect competition, Germany and France produce the same amount of I output in equilibrium. Hence, assuming R adjusts to balance trade between Europe and Japan, using the EMU money market equilibrium and (12), yields the equilibrium DM/Yen exchange rate:

$$R^* = \left(\frac{c\beta}{1-c}\right)\frac{M^0}{P^* x^I}. \tag{17}$$

$x^I = x_G^I + x_F^I$ denotes the total EMU output of I. Clearly, with (17), all of the nominal variables in (15) are determined. Notice that equilibrium prices are fiscal policy invariant. Given the equilibrium value R^*, using (10), (13), and (17), we can solve explicitly for k^*:

$$k^* = \Gamma + \left\{\frac{(sA)\,G_F - [(1-s)\,B]\,G_G}{Q}\right\}. \tag{18}$$

$\Gamma \equiv [c/(1-c)]\,M^0(\alpha s A + \beta/2)/Q$, $\quad Q \equiv [c/(1-c)]\,M^0\{\alpha[sA+(1-s)\,B]+\beta\}$, $A \equiv (\phi^E_G/V)^{1-1/\mu}, B \equiv (\phi^E_F/V)^{1-1/\mu}$. Lastly, the equilibrium outputs in the European traded sector are

$$x^E_G = s\left(\frac{\phi^E_G}{V}\right)^{-1/\mu} \frac{\left(\dfrac{c\alpha}{1-c}\right)M^0 + G_G + G_F}{P^E_G}$$

$$x^E_F = (1-s)\left(\frac{\phi^E_F}{V}\right)^{-1/\mu} \frac{\left(\dfrac{c\alpha}{1-c}\right)M^0 + G_G + G_F}{P^E_F}. \tag{19}$$

P^E_j and k^* are given by (15*b*) and (18), respectively.

III. MARKET POWER AND EQUILIBRIUM

Before analysing the fiscal policy game within the EMU, we consider the comparative statics of equilibrium in terms of changes in German parameters (the analysis for French parameters is analogous). These are summarised in Table 1 below. Notice that derivatives are evaluated from a symmetric

Table 1
German parameters: Comparative Statics

	X^E_G	X^E_F	X^I_j	k^*	R
μ	−	−	−	0	+
b_G	−	?	−	−	+
s	+	−	0	+	0

Note: μ is assumed to change simultaneously in both countries.

equilibrium, where $\phi^E_G = \phi^E_F = \phi^E$, $G_G = G_F$, $s = 1/2 = k^*$. There are clearly strong general equilibrium spillover effects: changes in German union power in the E sector influence the output-employment not only in this sector, but also the output (and employment) in the German I sector and in France. An increase in b_G reduces German output and has ambiguous effects on French output. First, from (6), it increases the E sector's price mark-up. This generates a cost-of-living spillover, leading to higher nominal wages and prices in both EMU countries. Moreover, this inflationary effect is reinforced by a depreciation of the equilibrium exchange rate R^*. The depreciation is brought about by an increase in the Japanese net exports: from (12) and (16), total

EMU demand for the I output stays the same (as it only depends upon the fixed EMU money supply), and I production in both countries falls due to a higher real producer wage. Second, there is an 'expenditure switching' effect from German to French E output, since the price of German brands rises relative to that of French brands (i.e. $\partial(P_{FG}/P_{FF})/\partial b_G > 0$). This in turn provokes a balance of payment deficit in Germany, and thus a money outflow from Germany to France. Eventually k^* (the proportion of the EMU money supply stock detained by Germans at equilibrium) falls, and thus German private consumption. The effect of b_G on k^* is thus the source of ambiguity for the French E output, since it causes the consumer demand to increase.

IV. THE FISCAL POLICY GAME

In order to explore the effects of fiscal policy, we take as a reference point the case of a symmetric model, thereby $G_G = G_F$ and $s = 1/2 = k^*$. In each EMU country, the initial position in the European traded sector is:

$$x_i^E = \left\{\frac{[(c\alpha)/(1-c)]\,M^0/2+G}{(\phi^E\theta)^{1/\beta}[(c\beta)/(1-c)]\,M^0/2x_i^I}\right\}. \tag{20}$$

The symmetric I sector output is given by (16); k^* will change according to (18). We consider two types of fiscal policy. Uncoordinated policy is where one country (e.g. Germany) increases its government expenditure on its own (from a position where the expenditure levels are equal); coordinated policy occurs when the two countries vary their expenditure together. We shall designate the uncoordinated policy by a derivative where the change in government expenditure is specific to a country; the coordinated policy derivative will not specify the country.

At this stage, it is useful to summarise the rule for optimal government expenditure. Using (4), we can write (1) in short-hand as a social welfare function:

$$SW = \frac{(PW)^\delta}{\delta}\frac{(g)^{1-\delta}}{1-\delta}, \tag{21}$$

where PW is the 'private welfare' the household derives from consumption and real money holdings, less the disutility of work. The second term is the welfare of government expenditure. The rule for optimal government expenditure can be expressed as:

$$\frac{\partial \log SW_i}{\partial g_i} = \delta\left(\frac{\partial PW_i/\partial g_i}{PW_i}\right)+\frac{(1-\delta)}{g_i} = 0. \tag{22}$$

Clearly, the optimal level of g will depend upon the precise form of $\partial \log PW_i/\partial g_i$. However, we can generalise from these results and note that in our model factors that lead to a higher PW (given g) lead to a higher optimal government expenditure (this is not as simple as it sounds, since PW depends upon g both through a change in leisure and the lump-sum tax). The marginal percentage cost of a unit increase in government expenditure (the first RHS term in (22)) is in fact decreasing in PW (because the marginal utility of PW is lower when PW is higher), while the marginal benefit (the second RHS term in (22)) is independent of PW.

Before turning to welfare analysis, it is useful to consider the spillover effects of an increase in German government expenditure on French activity. Real government expenditure in Germany is given by $g_G = G_G/P_G^E$.

PROPOSITION 1: *Positive demand spillovers under balanced trade*
Following an increase in g_G:
(*i*) *there is a reduction in* k^*, *whilst* R^* *is unaffected;*
(*ii*) *French welfare increases: output, employment and consumption of the French E good increase, as does French consumption of the I good;*
(*iii*) *effects* (*i*) *and* (*ii*) *are larger the smaller s.*

All proofs are in the Appendix. The reason for the positive spillover (or 'demand externality') is that some of the German government expenditure on E goes (directly or indirectly) to French producers. This leads to a smaller multiplier in Germany (there is crowding out of private consumption through the balanced budget), and a positive effect on France. The mechanics underlying this rely partly on the specie flow mechanism operating on k^*: an initial increase in g_G causes a balance of payments deficit, which leads to a flow of European money towards France, with an increase in its eventual stock of money ($1-k^*$ increases). Since R^* only depends on the total European money supply (and not its geographical distribution), R^* is unaffected by g_G. Whilst there is a positive externality caused by the 'leakage' of demand to France, there is also a greater cost to Germany in terms of the effect of fiscal expansion on crowding out private consumption.

The welfare spillover of an increase in g_G can be decomposed into two effects. First, the 'asset' effect (money moves from Germany to France). Second, the 'surplus' effect: as activity increases in France, so long as real wages and prices are marked up over the disutility of labour, the total surplus in France goes up. In the Walrasian special case, $\phi_j^E = 1$, this surplus effect is absent: the total welfare spillover is therefore smallest in the Walrasian case (but still strictly positive due to the asset effect, cf. Appendix 1). The normative implications of German government expenditure are summarised as follows:

PROPOSITION 2: *Fiscal policy*
(*i*) *An increase in* g_G *under balanced trade leads to an increase in German activity in E. German private consumption of all goods decreases.*
(*ii*) *The optimal level of* g_G *is increasing in s.*
(*iii*) *Government expenditures in each country are strategic complements.*

The uncoordinated equilibrium can be represented by depicting the best reply functions of the two countries. The best reply function for Germany gives its optimal choice of g_G as a function of that of France, and *vice versa*. Since the expenditures are strategic complements, it follows that the best reply functions are upward sloping: higher government expenditure in France leads to higher government expenditure in Germany. The mechanism for this is via the

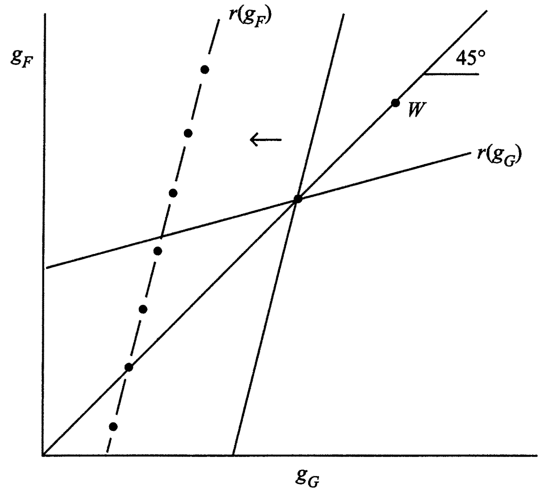

Fig. 1. Uncoordinated fiscal policy.

demand spillover: higher French expenditure leads to higher private welfare in Germany, and hence higher optimal government expenditure. The formula for the German best reply function is

$$g_G^E = h_1 g_F^E + h_2 \tag{23}$$

$$h_1 = (1-\delta)\left(\frac{1-c/\phi^E}{1+c/\phi_E}\right) < 1 \tag{23a}$$

$$h_2 = \left[\frac{(1-\delta)\,c}{(1-c)\,\theta\phi^E}\right]\left(\frac{M^0}{P_G}\right)\left[\frac{1-c(\alpha/\phi^E+\sigma\beta)}{1+(c/\phi^E)}\right] > 0, \tag{23b}$$

M^0/P_G being given from (15a), (16)–(17) above. The French best reply function is symmetric to (23). The uncoordinated equilibrium is depicted in Fig. 1: the best reply functions are linear and their slope is positive and less than unity.

We can explore the effects of changes in parameters in the model on the uncoordinated equilibrium. Increases in $\{\mu, b_G\}$ in Germany tend to reduce the optimal amount of government expenditure, leading to a downward shift in the German best reply function. Hence, both German and French government expenditure fall, as shown by the dotted line in Fig. 1. The fall in France is smaller than the fall in Germany (the slope of $r(g_G)$ is less than unity and French parameters are assumed to stay the same). The limiting Walrasian case with $\phi_j^{ET} = 1$ involves the highest level of equilibrium expenditures in the uncoordinated case (as given by point W in Fig. 1). Having analysed the uncoordinated policy equilibrium, we can now consider the gains to coordination:

PROPOSITION 3: *Coordinated fiscal policy in the symmetric case*
(*i*) *The optimal level of government expenditure in a symmetric coordinated policy is higher than in a symmetric uncoordinated policy.*

(*ii*) *A symmetric increase in g in both EMU countries leads to:* (*a*) *no change in private consumption of any good;* (*b*) *an increase in output E in each country equal to the increase in government expenditure in that country;* (*c*) *a corresponding decrease in leisure.*

Clearly, in the presence of a spillover of any kind, the uncoordinated Nash equilibrium is Pareto inefficient. The coordinated equilibrium must lead to higher welfare (and if both countries are symmetric it leads to a Pareto improvement). Since there is a positive demand externality and government expenditures are strategic complements, the coordinated policy involves higher levels of expenditure. This is depicted in Fig. 2. Notice that in Fig. 2 the Pareto

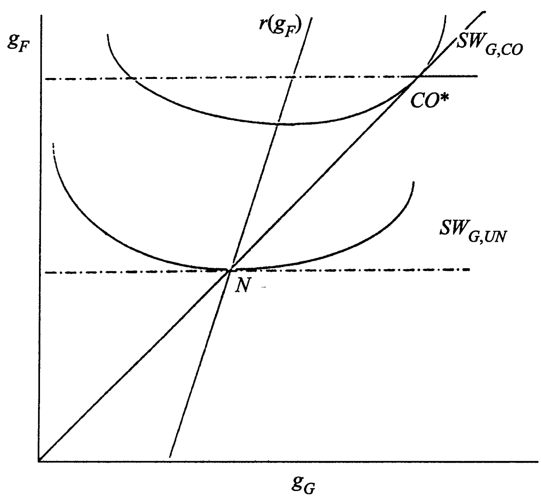

Fig. 2. A comparison of Pareto Optimum CO^* with Nash outcome N.

optimal levels of government expenditure at CO^* are northeast of the non-cooperative levels. The point CO^* in Fig. 2 does not represent a Nash equilibrium: both countries are off their best reply functions, and have an incentive to deviate from CO^* by a unilateral reduction in g.[6]

The fiscal multipliers have all been evaluated under the assumption that trade is balanced. This means that k^* adjusts to policy. However, this adjustment would take time, as the monetary stocks adjust to the trade imbalance. We can also evaluate the impact multipliers, the multipliers derived under the assumption that k is fixed, allowing the country to run a 'short-run' trade deficit or surplus. For convenience, the short run is considered as a small

[6] In this game, for any given policy parameters, there is a unique Nash-equilibrium, which we have followed convention and called the 'non-coordinated' equilibrium. The 'coordinated' equilibrium merely refers to what in other parts of economics is called the 'cooperative' equilibrium. The recent literature on coordination failures (Cooper and John, 1988) refers to the situation where there are multiple Nash equilibria. This does not occur in our model since best reply functions (23) are linear. It is conceivable that in a general version of the model there might be multiple Pareto-ranked Nash equilibria. These are inefficient, in that the cooperative equilibrium would involve higher levels of government expenditure. The possibility of a 'coordination failure' occurs when players act non-cooperatively and 'choose' the low expenditure equilibrium.

deviation from the initial long-run equilibrium position (i.e. short-run multipliers are evaluated using (14)). Clearly, the short-run multipliers will be greater: the demand spillover will be smaller, since it partly operates via the 'long-run' change in k (the asset effect). We can therefore consider the case of a myopic government, which optimises only in the short run (e.g. due to electoral considerations). The myopic best reply function is defined as the optimal level of government expenditure using the impact multipliers. The results are summarised as follows:

PROPOSITION 4: *Myopic fiscal policy*
The uncoordinated equilibrium with myopic fiscal policy involves higher expenditure than the coordinated outcome with myopic policy. Coordinated myopic and non-myopic outcomes coincide: $g^*_{UN,MY} > g^*_{CO,MY} = g^*_{CO} > g^*_{UN}$.

The reason for this result stems from the government's perception of the marginal cost of public good provision. Since the marginal benefit stays the same, the optimal level of government expenditure is the higher the lower the perceived marginal cost to the government. In the symmetric solution, the marginal cost of public good provision is lower without coordination than with coordination (since the outflow of money is not taken into account). Moreover, if policies are coordinated, the optimal level of government expenditure is the same in the 'short' and 'long' runs. The reason is that in both cases the German and French governments do not perceive reductions in the utility from consumption and real money holdings of European households, but only the cost in terms of leisure of producing extra output for the two governments. Finally, notice that the optimal levels of government expenditure are always higher in the Walrasian case (e.g. $g^*_{UN,MY}$ is higher when $\phi^E = 1$), so long as private welfare is lower with imperfect competition.

V. CONCLUSION

In this paper, we have constructed a model which captures the possibility that there are positive demand externalities across countries that make coordinated fiscal expansion an attractive possibility. This is in clear contrast to much of the standard literature that points to the negative externalities, and hence the need of coordination to reduce the levels of fiscal expenditure. We believe that in times of recession and high unemployment, such as occurred in Europe in the early 1990s, the positive demand externality was felt to be important by governments in Europe, and it is in this situation that our model will be most pertinent.

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Appendix

Proof of Proposition 1

(i) Directly from (17)–(18). (ii) From (1) and (4), French consumption is proportional to $\Omega_F = (1-k^*)\, M^0/(1-c)$, i.e. equilibrium nominal income under balanced trade and balanced budget; French E output, (19), is proportional to g_G. The effect of German expenditure on France welfare is

$$\frac{\partial \log SW_F}{\partial g_G} = (1-s)\left(\frac{\delta\theta\phi^E}{c}\right)\left(\frac{1-c/\phi^E}{PW_F}\right) > 0. \tag{A 1}$$

Equation (A 1) has been evaluated at a quasi-symmetric equilibrium (i.e. with $s \in (0,1)$). The Walrasian case is when $\phi^E = 1$. From (A 1), for the spillover to be smallest in the Walrasian case it suffices that the Walrasian PW is greater than the imperfectly competitive PW. It can be shown that a sufficient condition for this is $\phi^E \geqslant 1 + (G/Pc)$, which we assume satisfied (iii). The German demand spillover on French activity is: $\partial n_F/\partial g^E_G = \partial n^e_F/\partial g^E_G = (1-s)$, and decreasing in s.

Proof of Proposition 2

(i) Directly from (4), (19), with $\partial k^*/\partial g_G < 0$. (ii) The non-cooperative Nash solution evaluated at a quasi-symmetric equilibrium (where $s \in (0,1)$ and other parameters are the same) is

$$\begin{aligned} \frac{\partial \log SW_G}{\partial g_G} &= -\left(\frac{\delta\theta\phi^E}{c}\right)\left[\frac{(1-s)+sc/\phi^E}{PW_G}\right] + \left(\frac{1-\delta}{g_G}\right) = 0 \\ \frac{\partial \log SW_F}{\partial g_F} &= -\left(\frac{\delta\theta\phi^E}{c}\right)\left[\frac{s+(1-s)\,c/\phi^E}{PW_F}\right] + \left(\frac{1-\delta}{g_F}\right) = 0. \end{aligned} \tag{A 2}$$

$PW_G = k^*\{M^0/[(1-c)\,P_G]\} - \theta n_G$; (18) gives k^*. (ii) A sufficient condition for $(g_G)^*$ to be increasing in s is that $\partial PW_G/\partial s > 0$ (as the numerator of the first RHS term in (A 2) is decreasing in s). Using PW_G and (18), yields: $\partial PW_G/\partial s = [(1-c)/\phi^E]\{(g_G + g_F)\,(\theta\phi^E/c) + \alpha M^0/[P_G(1-c)]\} > 0$. (ii) From (A 2), the German SW function is globally concave in g_G, so that the S.O.C. is satisfied. Therefore, the sign of the slope of its best reply function is

$$\text{sign}\frac{\partial^2 \log SW_G}{\partial g_G \partial g_F} = \text{sign}\frac{\partial PW_G}{\partial g_F} = \left(\frac{s\theta\phi^E}{c}\right)(1 - c/\phi^E) > 0. \quad \text{(A 3)}$$

Proof of Proposition 3

(i) The F.O.C. for optimal government expenditure in e.g. Germany becomes

$$\frac{\partial \log SW_G}{\partial g} = -\left(\frac{\delta\theta}{PW_G}\right) + \left(\frac{1-\delta}{g_G}\right) = 0 \quad \text{(A 4)}$$

as $\partial k^*/\partial g = 0$ with $s = 1/2$ and coordination. The marginal cost is here lower than in the uncoordinated solution, so that the optimal g is higher. (ii) Directly from (18)–(19).

Proof of Proposition 4

The German F.O.C. for myopic uncoordinated government expenditure becomes

$$\frac{\partial \log SW_G}{\partial g_G} = -\left(\frac{\delta\theta}{2PW_G}\right) + \left(\frac{1-\delta}{g_G}\right) = 0. \quad \text{(A 5)}$$

Comparing (A 5) with (A 4) and (A 3) yields proposition 4, since $1 - c/\phi^E > 0$.