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Monetary Union, Asymmetric Productivity Shocks and Fiscal Insurance: an Analytical Discussion of Welfare Issues

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Abstract

This paper addresses arguments that a system of fiscal insurance between member states of the European Union is needed to act in replacement of nominal exchange rate flexibility as an automatic stabilizer under monetary union. Many authors have argued or assumed that asymmetric real macroeconomic fluctuations pose an important threat to the success of monetary unification and that some manner of fiscal insurance is missing from plans to cope with a common currency. A theoretical model economy in which production is subject to asymmetric national shocks is used to analyze the benefits of fiscal insurance for allocative efficiency under monetary union in comparison with resource allocation under a flexible nominal exchange rate regime. It is shown that whether national markets in goods and services are arbitrated or there is pricing-to-market matters for assessing the usefulness of fiscal insurance for efficiency as well as for assessing the macroeconomic costs of monetary union. This paper argues that the benefits of fiscal insurance for allocative efficiency may be increased little by monetary unification. Fiscal insurance may not be an essential or even desirable companion to a common currency.

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Keywords: monetary union, exchange rate regimes, fiscal federalism.

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1. Introduction

Discussions of the economic case for or against European monetary unification inevitably concern the concept of an optimum currency area. By the classic definition of Mundell [1961], a group of states form an optimum currency area if the permanent fixing of nominal rates of exchange between them has no effects on real economic variables. This is the case if all prices and wages are perfectly flexible, or as pointed out by Mundell, all factors are perfectly mobile even if there are nominal price or wage rigidities. If labor market adjustment is sluggish, then nominal exchange rate movements can be a stabilizing tool in the presence of asymmetric national productivity or demand disturbances.¹

Eichengreen [1992b], Bayoumi and Eichengreen [1993] and others have focused the analysis of the macroeconomic effects of the monetary unification of Europe on comparisons between the European Union and the United States.² These studies compare the degree of interregional labor mobility and of the incidence of idiosyncratic regional aggregate supply and demand disturbances between the United States (and Canada) and the European Union. A conclusion is that Europe may be a more problematic candidate for monetary unification, although it is difficult to compare regional real disturbances for an established monetary union with those experienced under a flexible exchange regime with separate national monetary policies.

Nominal exchange rate flexibility allows autonomous monetary policy responses to idiosyncratic aggregate fluctuations and allows nations to pursue different goals of stabilization policy. By adopting a common currency, the European Union appears to be placing a greater burden on fiscal policies for achieving differential responses to productivity and demand disturbances, whether these are common or region-specific. Economists differ widely in their views on the justification and prospects for success of a European monetary union. McKinnon [1997], for example, argues that fiscal discipline imposed by the disestablishment of national central banks on national governments provides a strong justification for monetary union.³ Feldstein [1997] argues that a system of floating exchange rates is desirable for Europe due to differing political goals and sluggish labor market adjustment.

The recent policy debate on monetary unification also notes that the United States supplements a single monetary policy with a system of fiscal federalism. Interstate transfers through the federal tax system and transfer payments automatically stabilize spending power against idiosyncratic regional shocks as observed by Ingram [1959].⁴ Therefore, many authors suggest that successful European monetary unification may require fiscal consolidation as well.⁵ In this paper, I use a formal general equilibrium model to discuss the potential role for fiscal insurance between member states of a monetary union to act in a replacement of nominal exchange rate flexibility for short-run stabilization in the presence of asymmetric real shocks.

An analytical model of an international economy in which financial asset markets are integrated but labor markets are not is used to compare the welfare benefits of a system of state-contingent fiscal transfers with and without monetary union. Temporary nominal wage rigidities provide a role for monetary policies to alleviate short-run labor market disequilibrium caused by productivity shocks that can differ across countries. The elimination of nominal exchange rate flexibility with monetary union reduces the capacity of monetary authorities to influence resource allocation in the model economy. The model is analyzed in stages, adding structure as needed to discuss possible rationale for the argument that fiscal insurance is needed to act in replacement for independent monetary policies after monetary unification.

Fiscal insurance is first discussed in a standard model of international portfolio diversification under perfect price and wage flexibility and idiosyncratic national productivity shocks. Asset markets are incomplete because assets capitalizing future labor earnings are not tradable. The flexible price allocation of resources can be replicated when nominal rigidities are added to the economy under independent national monetary policies. This provides a benchmark case for discussing the gains from fiscal insurance with monetary union. It is argued that empirical evidence suggests that fiscal insurance schemes are unlikely to generate significant welfare benefits in the benchmark economy. Fiscal insurance schemes are most important when monetary policies are effective for reducing short-run labor market disequilibrium and prices in national markets for goods and services are arbitrated across borders. Empirical evidence shows that

goods and services are priced-to-market, so that these markets are segmented across member states of the European Union. The model reveals that the failure of the law of one price greatly reduces both the welfare benefits of fiscal insurance under monetary union and the welfare costs of monetary unification with nominal rigidities and asymmetric productivity disturbances.

In the model, consumption, saving, labor supply, money demand and portfolio allocation decisions are made by households optimizing over time. Investment and employment decisions are made by firms seeking to maximize their value. Nominal wage and price rigidities are introduced in a simple and, necessarily, ad hoc fashion following the literature on overlapping nominal wage contracts. The next section presents the basic model of international asset trade with asymmetric productivity risk and discusses state-contingent fiscal transfers under flexible prices. Section 3 introduces nominal rigidities and discusses the comparison benchmark of resource allocation with nominal exchange rate flexibility. The welfare gains and losses from fiscal insurance with integrated goods markets are discussed in Section 4 and with segmented goods markets in Section 5. The last section concludes.

2. Fiscal transfers with nominal flexibility

Behind arguments in favor of a system of fiscal transfers between members of a monetary union is the incompleteness of markets to share the risk of idiosyncratic disturbances to national productivities. Even with the highly integrated international financial markets of the European Union, labor income risk is largely uninsurable across borders. Aggregate labor income risk is the focus of concerns about asymmetric disturbances to real economic performance in the European Union. A natural starting point for a welfare analysis of fiscal insurance schemes is a model of incomplete international asset markets without nominal wage or price rigidities. A simple model is used in this section to show how the uninsurability of national labor income risk can lead to a welfare argument for intergovernmental fiscal insurance schemes. It is also used to argue, on the basis of empirical evidence, that the welfare benefits of fiscal federalism in Europe may be minor.

The basic model is a variant of the Lucas [1982] model of international portfolio diversification. A two-country model is used for illustration. In each country, there is a representative resident household. A single tradable good is produced using capital and labor under constant returns to scale in each country. Factor productivity is subject to stochastic disturbances that are independent across countries. Households can trade equity claims to the earnings of capital and riskless bonds, but there is no asset market on which to trade claims to future wage income. Therefore, households diversify their portfolios through purchases of internationally traded equities and bonds to reduce their exposure to productivity risk. They may be unable to share fully idiosyncratic productivity risks internationally because labor income is not capitalized by tradable assets. ⁶

The equations of the model are only shown for the home country whenever the equations for the foreign country are analogous. Home variables do not carry superscripts and foreign variables are indicated by an asterisk. The home country household supplies labor at each date t in the amount \bar{L}_t earning a real wage given by $w_t = \frac{W_t}{P_t}$, where W_t and P_t are the nominal wage and price, respectively. It can hold bonds denominated in units of the single good, nominally-indexed bonds, money and equity claims. The single-period budget identity for the home country household at time t is given by

$$\begin{aligned} & \frac{W_t}{P_t} \bar{L}_t + (1 + r_t)b_t + (1 + i_t)\frac{B_t}{P_t} + \frac{M_{t-1}}{P_t} + [\theta_t(V_t + d_t) + \theta_t^*(V_t^* + d_t^*)] \\ & = c_t + b_{t+1} + \frac{B_{t+1}}{P_t} + \frac{M_t}{P_t} + \theta_{t+1}V_{t+1} + \theta_{t+1}^*V_{t+1}^* \end{aligned} \quad (1)$$

Here, b_t and B_t are the household's holdings of single-period bonds at the beginning of period t denominated in units of output and currency, respectively. M_{t-1} denotes the nominal money balances it carries forward from period $t-1$. V_t is the total market value of equities issued by home country firms, ex dividend, at time t , and d_t is the corresponding dividend paid at the beginning of period t . The share of outstanding home country equities held by the home household at the beginning of period t equals θ_t , and its share of foreign equities equals θ_t^* , where $0 \leq \theta_t, \theta_t^* \leq 1$. Purchases of home and foreign equities in period t equal $\theta_{t+1}V_t$ and

$\omega_{t+1}^a V_t^a$, respectively. The household's consumption is c_t , and M_t equals the money balances held in period t .

The household makes its consumption, labor supply, saving and portfolio allocation decisions seeking to maximize expected utility,

$$U_t = E_t \sum_{s=t}^{\infty} \beta^{s-t} [u(c_s) + v(\frac{M_s}{P_s}) + \lambda(\bar{c} - c_s)]; \quad (2)$$

which is assumed for convenience to be additively separable in consumption, real balances and leisure, subject to the budget identity and the solvency constraint,

$$\lim_{T \rightarrow \infty} \prod_{s=t}^T (1 + r_s)^{-1} b_{T+1} + \frac{B_{T+1}}{P_T} + \frac{M_T}{P_T} = 0; \quad (3)$$

The subjective discount rate, $(1 + \beta)^{-1}$, is assumed to be the same for home and foreign residents, although preferences can otherwise differ across borders.

Household utility maximization with respect to holdings of real-indexed bonds gives the standard Euler condition for riskless bonds,

$$u'(c_t) = (1 + r_{t+1}) E_t [u'(c_{t+1})]; \quad (4)$$

The choice of holdings of nominally-indexed bonds leads to another Euler condition,

$$u'(c_t) = P_t (1 + i_{t+1}) E_t \frac{u'(c_{t+1})}{P_{t+1}}; \quad (5)$$

Combining these gives the consumption-based Fisher interest parity condition,

$$(1 + r_{t+1}) E_t [u'(c_{t+1})] = (1 + i_{t+1}) E_t \frac{u'(c_{t+1})}{P_{t+1} = P_t}; \quad (6)$$

The household's holdings of nominal balances satisfies the first-order condition,

$$u'(c_t) = v'(\frac{M_t}{P_t}) + P_t E_t \frac{u'(c_{t+1})}{P_{t+1}}; \quad (7)$$

Optimal portfolio diversification leads to the necessary conditions,

$$V_{t+1} = E_t \frac{u'(c_{t+1})}{u'(c_t)} (V_{t+1} + d_{t+1}); \quad \text{for } 0 < \omega_{t+1} < 1; \quad (8)$$

for home equities and

$$V_{t+1}^a = E_t \frac{u'(c_{t+1})}{u'(c_t)} (V_{t+1}^a + d_{t+1}^a); \quad \text{for } 0 < \omega_{t+1}^a < 1; \quad (9)$$

for foreign equities. Similar conditions hold for the optimal portfolio allocations for foreign

country residents, so that

$$V_{t+1} = E_t \left[\frac{u^a(c_{t+1})}{u^a(c_t)} (V_{t+1} + d_{t+1}) \right]; \quad \text{for } 0 < \theta_{t+1} < 1; \quad (10)$$

for example.

It is possible that all home equity is held by domestic residents, in which case $\theta_{t+1} = 1$ and

$$E_t \left[\frac{u^a(c_{t+1})}{u^a(c_t)} (V_{t+1} + d_{t+1}) \right] = V_{t+1} = E_t \left[\frac{u^0(c_{t+1})}{u^0(c_t)} (V_{t+1} + d_{t+1}) \right]; \quad (11)$$

or by foreign residents, in which case $\theta_{t+1} = 0$ and

$$E_t \left[\frac{u^a(c_{t+1})}{u^a(c_t)} (V_{t+1} + d_{t+1}) \right] = V_{t+1} = E_t \left[\frac{u^0(c_{t+1})}{u^0(c_t)} (V_{t+1} + d_{t+1}) \right]; \quad (12)$$

The household makes its labor supply decision so that the marginal rate of substitution between leisure and goods consumption equals the real wage rate,

$$\lambda^0(\bar{l}_t, l_t) = w_t u^0(c_t); \quad (13)$$

The household optimum also satisfies the transversality condition, so that the solvency condition for the household sector holds with equality.

The home country aggregate production function is given by

$$Y_t = \mu_t F(\cdot_t; \bar{l}_t) = \bar{l}_t \mu_t f(k_t) \quad (14)$$

where \cdot_t is the capital stock, \bar{l}_t is employment and μ_t is a stochastic productivity disturbance. The capital-labor ratio is $k_t = \cdot_t / \bar{l}_t$. Under perfect competition in the domestic labor market, labor demand is determined by marginal productivity,

$$w_t = \mu_t (f(k_t) - k_t f'(k_t)); \quad (15)$$

Firms choose their investment levels to maximize shareholder value net of the cost of capital. Along with the equilibrium conditions for asset demands, equations 8 and 10, this implies that

$$u^0(c_t) = E_t [u^0(c_{t+1}) (1 + \mu_{t+1} f'(k_{t+1}))]; \quad (16)$$

if home residents hold home equities and

$$u^0(c_t^a) = E_t \left[\frac{f}{f'} u^0(c_{t+1}^a) (1 + \mu_{t+1} f'(k_{t+1})) \right]; \quad (17)$$

if foreign residents do. With perfect international financial capital mobility, the expected mar-

ginal productivity of capital will be equal across borders,

$$E_t \mu_t f^l(k_t) = E_t \mu_t^a f^l(k_t^a): \quad (18)$$

In equilibrium, the equities are valued according to the standard capital asset pricing model equations.

It is useful to begin with the (well-known) efficient allocation for this model economy. A welfare optimum can be implemented by a market equilibrium if tradable equities capitalize all of gross domestic product. In the case that $u(c)$ displays constant relative risk aversion, home country residents will hold claims to the same share of GDP in each country. This share is equal to the home country's initial share of total financial wealth. In this case, there is no net trade in either real-indexed or nominally-indexed bonds in equilibrium. If the two countries begin with equal wealth, then the residents of each hold exactly half of the claims on GDP for each country.

Under the assumption only claims to the share of GDP paid to non-human factors are tradable, the efficient allocation can be supported in a market equilibrium only if the share of labor payments in national product is less than the share of national wealth in total wealth. This must hold for each country. If this is the case, then the residents of each country can select portfolios that give them equal proportionate shares of the output of each country. To do this the portfolio shares, ϕ_t and ϕ_t^a , must satisfy the equalities,

$$\phi_t \mathbb{R}_t + (1 - \mathbb{R}_t) = \phi_t^a \mathbb{R}_t^a; \quad (19)$$

and

$$(1 - \phi_t^a) \mathbb{R}_t^a + (1 - \mathbb{R}_t^a) = (1 - \phi_t) \mathbb{R}_t; \quad (20)$$

for $0 \leq \phi_t \leq 1$ and $0 \leq \phi_t^a \leq 1$, where $\mathbb{R}_t = \phi_t f^l(k_t) = f(k_t)$ and $\mathbb{R}_t^a = \phi_t^a f^l(k_t^a) = f(k_t^a)$ are capital's share in national income for the home and foreign countries, respectively. Here, $(\phi_t \mathbb{R}_t + (1 - \mathbb{R}_t))$ is the fraction of home output that is paid to home residents, and $\phi_t^a \mathbb{R}_t^a$ is the fraction of foreign output paid to home residents. For an efficient allocation, these are equal to the home share in total initial wealth. If factor shares are the same in the two countries, an efficient allocation of risk implies that households will hold a larger share of foreign capital than of home capital equity. This follows because households already hold claims to domestic output

via labor income shares. Equation 19 requires that home residents hold a larger share of claims to the output of each country than labor earns in national output. Equation 20 states that this must also hold for the foreign country.

For trade in capital equities and bonds to implement the efficient allocation, labor's share in each country must be less than that country's share of total wealth of the monetary union. For N countries with equal initial wealth, this means that labor's share in national product must be less than $1/N$. Efficient diversification of idiosyncratic national productivity risk is not possible without tradable claims to future labor income for actual values of labor's share around seventy percent.

For realistic factor shares, the model implies that diversification goes as far as it can with the assets available to households. Using equations 19 and 20, the share of labor for the home country exceeds home residents share of foreign output, $(1 - \theta_t^*) > \theta_t^* \theta_t^*$, so that $\theta_t = 0$ in the solution for the equilibrium. For the foreign country, we have that $(1 - \theta_t^*) > (1 - \theta_t^*) \theta_t^*$ and $\theta_t^* = 0$. This means that home residents receive a higher share of income from home production than from foreign production in equilibrium. All home earnings for home residents, however, will be in the form of labor income for a constrained equilibrium. This is implied by the Euler equations for capital assets, 11 and 12, with dividends calculated as capital earnings. That is, home residents would like to trade away more of the claims to national GDP they hold than they can by trading claims to capital alone.

When the constraint on international risk sharing imposed by the absence of assets in future labor income binds, the marginal rate of substitution between date t and date $t + 1$ consumption is not perfectly correlated across countries (as it would be for efficiency with constant relative risk aversion). In particular, the marginal productivity of home country capital will have a higher covariance with home country consumption than with foreign country consumption. Therefore, the general model of international portfolio diversification predicts that domestic residents would only hold claims to foreign capital and that all claims to domestic capital would be held by foreigners. This prediction is in sharp contrast with what we observe for the member states of

the European Union. Also, note that in equilibrium with incomplete risk sharing, net holdings of internationally traded riskless bonds will not necessarily be zero as in the efficient allocation.

An international transfer scheme that promotes allocative efficiency can be designed to replicate the consumption path for each household in equilibrium with assets based on total national income. In such a scheme, the home country makes a gross transfer to the foreign country equal to the difference between the share of home output foreign residents would be paid under efficient risk sharing and the capital income they actually receive with incomplete asset markets. The foreign country makes a similar gross transfer to the home country. The net transfers give the residents of each country the same share of output for the monetary union as they would receive in the efficient allocation. That is, all asymmetric risk is shared. Therefore, the returns to capital and levels of investment will be the same under this transfer scheme as in the efficient equilibrium. Algebraically, the equilibrium lump-sum transfer net of tax to the home household under this scheme at each date is given by the difference between the gross transfer received and that paid as

$$\dot{z}_t = [\alpha \dot{w}_t - \alpha_t^* \dot{w}_t^*] Y_t - [(1 - \alpha_t) - \alpha_t^*] Y_t; \quad (21)$$

where α is the share of home initial wealth in total wealth. Output and factor inputs are evaluated in equilibrium. This is a balanced-budget scheme, as $\dot{z}_t = \dot{z}_t^*$ for all dates t .

The portfolio diversification model with the realistic assumption that financial claims to future labor income cannot be traded provides a welfare argument for fiscal insurance schemes between countries. So far, all prices and wages are assumed to be perfectly flexible, and the equilibrium is Walrasian. The nominal exchange regime does not affect the welfare analysis until nominal price or wage rigidity is introduced in the next section. Therefore, monetary unification does not affect these benchmark welfare gains from international fiscal insurance schemes. Before introducing nominal price or wage rigidity to the model, it is useful to consider how strong this welfare case is.

The model shows that international fiscal insurance can yield welfare benefits in competitive equilibrium when international asset markets are incomplete. Potential Pareto benefits arise if

residents seek to share more idiosyncratic national productivity risk than they can by trading equities to capital only. International fiscal insurance is welfare improving only when the residents of at least one country hold only equities in foreign capital income and foreigners hold all the equities in home capital income. Because fiscal insurance replaces trade in equities based on labor's share in GDP, the gains from fiscal insurance are the same as the gains from trading additional claims to gross domestic product. If we observe that domestic residents hold net claims to domestic capital in internationally integrated financial capital markets, then we should conclude that the gains from fiscal insurance schemes are nil.

Many authors (for example, Tesar [1995] among others) have noted the strong home bias in asset holding patterns for the advanced industrialized countries. This observation contradicts the model prediction that is necessary under perfect capital mobility for fiscal insurance to be desirable. Cole and Obstfeld [1991] and by Backus, Kehoe and Kydland [1992] have estimated the gains from international risk sharing among the advanced industrialized countries to be very small. Therefore, the diversification of productivity risk with fully flexible prices and wages does not appear to provide a substantial basis for implementing fiscal insurance schemes to make up for the absence of complete markets for sharing asymmetric labor income risk between member states of the European Union.

3. Nominal rigidities and the role of exchange rate flexibility

In the model so far, the labor market clears every period in each country. Productivity shocks, however, can have a larger impact on output if real wages do not adjust to clear the labor market each period. With nominal wage or price stickiness, monetary policy has real effects and can be used actively to influence the output response to idiosyncratic national productivity disturbances. Nominal rigidities also mean that the exchange rate regime matters. The capacity of monetary policies to promote labor market equilibrium with imperfect international labor mobility and idiosyncratic productivity disturbances is reduced by the adoption of a common currency. By permanently fixing nominal exchange rates, monetary unification eliminates the

role of nominal exchange rates between member states as automatic stabilizers of employment and incomes against asymmetric national productivity shocks. National monetary authorities lose the ability to influence national employment, consumption and investment independently of other member states. This suggests that the welfare case for international fiscal insurance may be increased by the creation of a monetary union.

To assess how monetary unification affects the gains from fiscal transfer schemes, nominal wage rigidities are added to the model of international portfolio diversification with asymmetric productivity shocks. I then discuss resource allocation under nominal exchange rate flexibility. This provides the comparison case for discussing the argument that fiscal insurance is needed to compensate for the loss of nominal exchange rate flexibility with monetary union.

A simple way to introduce nominal rigidities is to assume that nominal wages are set one period in advance of employment. This could be extended to allow for infinitely forward and backward looking nominal wage contracts as explored in Jensen [1998]. Eliminating immediate real wage adjustment to shocks to the marginal productivity of labor leads to labor market disequilibrium. Therefore, some assumption must be made about how employment and output are determined. Adding nominal wage rigidity to the model of the previous section, it is assumed that employment is demand determined each period, as is done in the monopolistic general equilibrium model used by Obstfeld and Rogoff [1995] and Corsetti and Pesenti [1998]. A significant amount of algebra is avoided by sticking with the perfectly competitive market structure for producers.

The home nominal wage rate is set by firms at date $t-1$ so that

$$W_t = E_{t-1} [p_t \mu_t (f(k_t) - k_t f^0(k_t))]; \quad (22)$$

where W_t is the nominal wage rate and p_t equals the nominal price of output. The capital-labor ratio, $k_t = \frac{K_t}{N_t} = \frac{K_t}{N_t^d}$, depends on employment, N_t^d , chosen at time t and on the capital stock, K_t , chosen in period $t-1$. Therefore, k_t depends on the state of nature, μ_t . Employment demand, N_t^d , at date t is chosen by firms *ex post* for each realization of $p_t \mu_t$ so that the pre-determined

nominal wage rate equals the nominal value marginal product of labor,

$$W_t = p_t \mu_t (f(k_t) - k_t f'(k_t)) : \quad (23)$$

With separate national currencies, home money demand satisfies the first-order condition,

$$\frac{v^0\left(\frac{M_t}{P_t}\right)}{u^0(c_t)} = \frac{i_{t+1}}{1 + i_{t+1}}; \quad (24)$$

that the opportunity cost of money in terms of consumption equals the marginal rate of substitution of consumption for real balances. Consumption-based uncovered interest parity also holds,

$$1 + i_{t+1}^{\$} E_t \frac{\mu_{(S_{t+1}=S_t)}^{-u^0(c_{t+1})}}{P_{t+1}=P_t} = (1 + i_{t+1}) E_t \frac{\mu^{-u^0(c_{t+1})}}{P_{t+1}=P_t}; \quad (25)$$

where S denotes the spot exchange rate. Equation 25 is derived by adding bonds nominally-indexed to each currency to the household budget constraint, equation 1. This leads to two versions of the bond Euler condition, equation 5, one in terms of each currency. Combining these conditions yields this arbitrage condition, which holds with equality because asset markets are assumed to allow trade in bonds denominated in either currency. Counterparts to equations 22, 23, 24 and 25 for the foreign country are similar. With a single good, p_t and P_t are identical, and both are expressed in units of the home currency. With several goods, P_t is the consumption-based price index for the home country and p_t is the price of a home output. The price level is determined by requiring saddle-path stability and ruling out speculative bubbles.

It is first assumed that exchange-rate pass-through is complete, so that the law of one price holds for each tradable commodity individually,

$$p_t = S_t p_t^{\$}; \quad (26)$$

Consider an adverse output realization (μ_t less than its mean) for the home country and a positive one for the foreign country. In equilibrium, current home income falls so that home real consumption falls (relative to its value for a mean output realization). Consumption smoothing, implied by household optimization over time, implies that consumption is lower in both periods t and $t + 1$. In a stable equilibrium for the model, the home price level and the exchange rate rise to their expected future levels if both the home and foreign money supplies are held con-

stant. The foreign price level falls. With nominal wage adjustment in one-period, overshooting or undershooting of the exchange rate does not occur in a saddle-stable equilibrium. Because nominal wages are preset, the adverse productivity shock for the home country leads to an insufficiency of labor demand relative to labor supply at a constant nominal output price. The opposite occurs in the foreign country for p^* constant. Nominal rigidities exacerbate the output effects of productivity shocks. The adjustment of nominal prices, p and p^* , can at least partially offset these additional fluctuations to output. These changes are in opposing directions, so that nominal exchange rate flexibility is essential for this automatic stabilizing effect to work. The nominal exchange rate is also an automatic stabilizer under longer term nominal contracting regimes.

Independent monetary policies can be used to exploit this adjustment process. With pre-determined nominal wages, but flexible goods prices, independent expansions or contractions of national money supplies lower or raise the real wage rate faced by each firm in the current period. Nominal exchange rate flexibility allows the two monetary authorities (before monetary union) to expand employment and output separately in the two countries to satisfy, *ex post*, the two equilibrium conditions for labor-market clearing necessary for a Walrasian equilibrium:

$$\frac{\dot{A}^0(\bar{i}, \bar{t})}{u^0(c_t)} = w_t = \mu_t \left[f\left(\frac{\dot{t}}{t}\right) i + \frac{\dot{t}}{t} f^0\left(\frac{\dot{t}}{t}\right) \right] \quad (27)$$

and

$$\frac{\dot{A}^{*0}(\bar{i}^*, \bar{t}^*)}{u^{*0}(c_t^*)} = w_t^* = \mu_t^* \left[f\left(\frac{\dot{t}^*}{t^*}\right) i^* + \frac{\dot{t}^*}{t^*} f^0\left(\frac{\dot{t}^*}{t^*}\right) \right] : \quad (28)$$

Along with all the other equilibrium conditions, these choices of endogenous money supply responses to productivity shocks yield a, possibly constrained, efficient equilibrium allocation of risks and resources. The constraint that may be binding is that household portfolio diversification is limited by the absence of international trade in assets based on labor income exactly as in the previous section. International monetary coordination that seeks to maintain labor market equilibrium in each country in every period achieves all the same equilibrium conditions for the model under perfectly flexible prices and wages. The equilibrium allocation and relative prices under trade in capital income securities and in riskless real-indexed and

nominally-indexed bonds are the same. That is, nominal exchange rate flexibility allows endogenous money supply reaction functions to implement the flexible price equilibrium despite nominal wage rigidity. This implies that the welfare benefits of a fiscal insurance scheme are the same in this flexible exchange rate regime as in the Walrasian equilibrium.

This gives a benchmark for discussing how the welfare benefits of fiscal insurance are increased by monetary unification. The empirical results that actual asset portfolios are not diversified internationally to the extent predicted by a competitive equilibrium model also implies that fiscal insurance schemes would not provide notable welfare improvements under flexible exchange rates.

The efficacy of monetary policy in this model derives from the result that nominal but not real wages are rigid in the short run. When nominal wages are *de facto* indexed to nominal prices, monetary policies are ineffective for adjusting employment demand to clear the labor market in response to productivity shocks. Therefore, the larger is the proportion of goods prices that are preset along with wages, the less important and useful is nominal exchange-rate flexibility for aiding short-run output stabilization. With short-run real wage rigidity, monetary policy only affects resource allocation through its impact on nominal and real interest rates, hence investment, as implied by equations 24 and 25. In this case, the benefits from sharing national productivity risk internationally through fiscal insurance schemes would be greater than in the Walrasian equilibrium of Section 2. But real wage rigidity also implies that the exchange rate regime has little to do with the welfare benefits of introducing a fiscal insurance scheme.

4. Monetary union and fiscal insurance

The adoption of a common currency reduces the capacity of monetary authorities to influence labor market clearing in each country separately. Under the assumptions made so far, nominal exchange flexibility plays a key role for monetary stabilization with nominal wage rigidities. It allows coordinated monetary policies to implement the same equilibrium as would be achieved under perfectly flexible prices. The elimination of nominal exchange rate flexibility and adop-

tion of a common monetary policy can increase the benefits of a system of international fiscal insurance between member states of the European Union. This section continues to use the basic portfolio diversification model with idiosyncratic productivity shocks with the assumption that nominal output prices are flexible while nominal wages are pre-determined.

Under a common currency, the demands for money by home and foreign residents satisfy the equilibrium conditions,

$$\frac{v^0(\frac{M_t}{P_t})}{u^0(c_t)} = \frac{i_{t+1}}{1 + i_{t+1}} \quad \text{and} \quad \frac{v^0(\frac{M_t^\pi}{P_t^\pi})}{u^0(c_t^\pi)} = \frac{i_{t+1}}{1 + i_{t+1}}. \quad (29)$$

Financial market integration implies that the nominal rate of interest faced by the residents of different countries is the same. The money equilibrium condition becomes

$$M_t + M_t^\pi = M_t^S;$$

where M_t is home money demand, M_t^π is foreign money demand and M_t^S is the common supply of nominal balances. Equation 29 is written to allow for differences in consumer price levels, P_t and P_t^π , respectively. Under the assumptions of the previous section (a single good and fully integrated goods markets), these price levels are identical. The rest of the equations for the household equilibrium are unchanged.

With pre-determined nominal wages, an increase in the money supply affects employment in each country by raising the nominal price of output for each. The response of labor demand to an increase in the nominal price level is given by differentiating the labor demand equation for each country as

$$\frac{d\lambda_t}{\lambda_t} = \frac{(f(k_t) - k_t f'(k_t))}{k_t^2 f''(k_t)} \frac{dP_t}{P_t} \quad \text{and} \quad \frac{d\lambda_t^\pi}{\lambda_t^\pi} = \frac{(f(k_t^\pi) - k_t^\pi f'(k_t^\pi))}{k_t^{\pi 2} f''(k_t^\pi)} \frac{dP_t^\pi}{P_t^\pi},$$

where λ_t and λ_t^π satisfy the labor demand equations for predetermined capital stocks. The output of one country cannot be increased in response to an adverse asymmetric national productivity shock without raising the output of every member state of the monetary union. Monetary expansions and contractions can be used to stabilize output against common productivity shocks. Using the common monetary policy to stabilize employment in one country in the presence of asymmetric productivity shocks will destabilize employment for the other member states.

As a realistic objective for monetary policy under the Euro, let the money supply respond to common aggregate shocks but not to idiosyncratic regional productivity disturbances. This allows a comparison of the impact of asymmetric shocks on national output under monetary union with that under a system of national monetary policies with flexible nominal exchange rates that seeks to stabilize employment. Under the flexible exchange rate regime, the national money supply reaction function satisfies the two relationships by raising or lowering P_t ,

$$\frac{\dot{A}^0(\bar{c}_i, \bar{c}_t)}{u^0(c_t)} = \frac{W_t}{P_t} = \mu_t(f(\frac{\dot{c}_t}{c_t})_i - \frac{\dot{c}_t}{c_t} f^0(\frac{\dot{c}_t}{c_t})): \quad (30)$$

Under monetary union, an idiosyncratic shock does not lead to a change in the price level and only the second equality holds.

For an adverse asymmetric productivity shock, output falls by more under monetary union than under national currencies with monetary policy coordination. How much more determines the increase in the welfare benefits of fiscal insurance. It also depends on the elasticity of labor supply with respect to real wages, $\epsilon = \frac{\dot{A}^0(\bar{c}_i, \bar{c}_t)}{(\bar{c}_i, \bar{c}_t) \dot{A}^{00}(\bar{c}_i, \bar{c}_t)}$. If labor is perfectly elastic, there is no difference between the effect of asymmetric shocks on output with or without monetary union. Therefore, if labor supplies are fairly elastic in the short run, monetary unification will have a small impact on the capacity of governments to stabilize output against temporary asymmetric productivity disturbances.

Upper bounds on the costs of monetary unification for stabilization with idiosyncratic shocks can be characterized by assuming that increases in output volatility do not lead to responsive changes in the structure of production through the allocation of investment. A simple calculation can be done by letting the aggregate national production function be given by $y_t = \mu_t \cdot \bar{c}_t^{-1} \bar{c}_t^{\alpha}$ and assuming that productivity shocks are distributed log normally. The approximation also assumes under monetary union, the common monetary policy does not respond to asymmetric output shocks, while with separate national currencies monetary policies are perfectly coordinated to take advantage of nominal exchange rate flexibility in stabilizing output.

When separate money supplies are used to maintain labor market equilibrium, differentiation of equation 30 for the Cobb-Douglas production function gives the response of equilibrium

employment to a productivity shock as

$$\frac{d\ell_t}{\ell_t} = \frac{\mu}{1 + \mu} + \frac{\eta}{1 + \mu} \frac{d\mu_t}{\mu_t};$$

and the response of output as

$$\frac{dy_t}{y_t} = \frac{d\mu_t}{\mu_t} + (1 - \frac{\mu}{1 + \mu}) \frac{d\ell_t}{\ell_t} = \frac{\mu}{1 + \mu} \frac{1 + \eta}{1 + \mu} \frac{d\mu_t}{\mu_t}.$$

Under monetary union, labor demand is determined by the equality of the real wage facing producers and marginal productivity of labor,

$$\frac{W_t}{P_t} = \mu_t (1 - \frac{\mu}{1 + \mu}) \cdot \frac{\eta}{1 + \mu} \frac{d\mu_t}{\mu_t};$$

with both the price level P_t and the nominal wage rate W_t remaining constant as μ_t varies. This implies that the quantity $\mu_t \frac{\eta}{1 + \mu}$ remains constant, and labor demand and output vary with productivity shocks according to

$$\frac{d\ell_t}{\ell_t} = \frac{1}{\mu_t} \frac{d\mu_t}{\mu_t} \quad \text{and} \quad \frac{dy_t}{y_t} = \frac{1}{\mu_t} \frac{d\mu_t}{\mu_t}.$$

If labor supply is perfectly elastic, then monetary does not affect short-run output volatility. The other extreme is achieved if households supply labor perfectly inelastically. When monetary policy responds to regional shocks, as in a constrained-efficient equilibrium with nominal exchange rate flexibility, ℓ_t always equals the fixed supply of labor desired by households, and output varies proportionately to μ_t . In that case, money supply increases and decreases have the greatest impact on output when they are chosen to achieve labor market equilibrium. Under monetary union without monetary accommodation of asymmetric shocks, labor demand varies with productivity and output varies in proportion to $\mu_t^{1-\mu}$. For a share of labor in GDP equal to two-thirds, the percentage standard deviation of output is three times greater with monetary unification than without if the labor supply elasticity equals zero and twice if the elasticity is one.

Monetary union should increase the variability of output under asymmetric productivity shocks. The real returns to financial claims to shares of national output should consequently increase. If the residents of each country held the optimal portfolio before the elimination of national currencies and intra-union exchange rates, then no further risk sharing opportunities arise. Each

household would already be exposed only to aggregate risk and not to idiosyncratic risk. This does not mean to say that the equilibrium without independent monetary policies is efficient. Full diversification with perfectly flexible relative prices or the equivalent of perfectly coordinated output stabilizing national monetary policies achieves a first-best allocation. With monetary union, the labor market distortions due to nominal wage rigidity remain. This is because monetary policies under a common currency cannot be used to clear all national labor markets simultaneously.

A system of fiscal insurance cannot achieve the first-best either. Redistributing spending power between the residents of different countries does not have an asymmetric effect on employment across borders with a single good. Therefore, state-contingent redistribution policies cannot raise employment and output for one member state suffering an adverse productivity shock without also raising for another country that is not.

Fiscal transfers can have differential effects on employment across countries in a monetary union with more than one good if consumption demands vary with residence. State-contingent redistributions of income change relative expenditures on different commodities. When the home country experiences an adverse productivity shock and receives a fiscal transfer from the foreign country, the relative price of home products generally rises in response to an increase in demand if there is a home consumption-spending bias. This can cause domestic employment to rise and foreign employment to decrease. The common monetary policy can be used to balance the effect on foreign employment. However, households smooth their consumption intertemporally. A fiscal transfer to the home country made contingent on a low realization of μ_t represents an increase in the permanent income of the home country, so that demand for the home country's consumption bundle rises in period t and in expectation for future periods. This shifts investment during period t toward the home country because the expected future price of home goods relative to foreign goods rises. The investment effects of the policy can be welfare reducing. For example, suppose that productivity shocks are serially correlated. Then a fiscal insurance scheme in a monetary union will tend to destabilize output.

This contrasts with how a monetary transfer to home residents under a flexible exchange rate serves to raise home output to clear the home labor market. In that case, a money transfer leads to an increase in the home currency price level, raising the nominal producer price and labor demand. The increase in the value of output produced in the home country raises real income for both countries equiproportionately with unconstrained asset trade. Therefore, output stabilizing monetary policies increase the relative supply of home goods without changing the distribution of real income across households with heterogeneous tastes. For homothetic preferences, the relative price of home goods falls. That is, a monetary expansion causes a nominal and real depreciation. If risk sharing is incomplete due to the inability of households to sell claims to labor income, then aggregate spending patterns are affected by national monetary policies. But in this case, the constrained optimum can be achieved using monetary policies.

Fiscal insurance schemes under monetary union do not replicate the allocation of resources that can be implemented under flexible exchange rates. As pointed out, this schemes introduce a distortion to capital accumulation because they affect employment by changing the pattern of consumer spending across tradable commodities and over time. If household portfolios are fully diversified internationally *a priori*, then the welfare benefit of increased employment is reduced, possibly reversed, by the welfare costs of investment distortions.

It was demonstrated in Section 2 that fiscal insurance is a first-best policy instrument if the constraint on international portfolio diversification (caused by the absence of trade in labor income-based assets) was *a priori* binding. With each labor market clearing in every period, fiscal insurance exactly filled the role of the missing market in claims to labor earnings. That is, fiscal transfers are equivalent to dividend payments on GDP-based assets. To attain an efficient allocation, if the constraint on asset trade is binding in a market equilibrium, these transfers simply match the shares of labor income that would be paid to the residents of each country by the other country in a fully-diversified Pareto-optimum. The introduction of a state-contingent transfer scheme does affect the pattern of consumption spending and investment with more than one good and home consumption bias. These effects, however, are consistent with full portfolio

diversification and efficient equilibrium investment in each sector for each country.

With nominal wage rigidities and monetary union, a fiscal insurance scheme can provide the benefits of increased risk sharing if the constraint on diversification by households binds. It can also reduce labor market disequilibrium. In this case, it is one policy instrument seeking to address two distortions. This suggests that the benefits of fiscal insurance in the absence of trade in claims to future labor earnings are increased by monetary union. That is, support is found here for the argument that monetary union raises the incentives to introduce interregional fiscal insurance. The importance of these welfare benefits depends on the how responsive relative prices are to fiscal redistribution, the elasticity of output supplies and marginal propensity to consume from permanent income.

The empirical observations that international risk sharing is much less extensive than feasible with existing markets contradicts this line of thinking. Suppose that the portfolio diversification observed is optimal subject to transactions costs (for exactness, assume these to be convex); the marginal benefit of increasing the holding of shares in the foreign country's capital stock just equals the marginal cost of doing so for home country residents. As shown above, the variance of share returns rises with monetary union. Therefore, households will diversify their portfolios more after monetary union than before, and the same marginal condition for optimal household portfolio selection will hold. So, what happens if a fiscal insurance scheme is added? It distorts investment decisions relative to what they are under the optimal portfolio selection of households facing transactions costs. Taking the degree of diversification of savings in international asset markets as revealed preferred by households given unobserved transactions or similar costs (assuming these are convex) implies that fiscal insurance has a negative welfare effect through investment that could offset the benefits of stabilizing current output against asymmetric regional shocks.

5. Monetary union and the need for fiscal insurance with market segmentation

Deviations from purchasing power parity and the law of one price for many individual tradable goods are well-documented. Goldberg and Knetter [1997] survey the empirical evidence that goods are priced to market, and there are many models of pricing with market segmentation that rationalize failures of the law of one price for traded goods (see Feenstra [1995]). Most recently, Engel and Rogers [1998] find that relative prices are more volatile across borders within the European Union than within each country controlling for transport and other transactions costs using distance.⁷ Essentially, the domestic currency prices of consumer goods in the European Union respond slowly to exchange rate changes and are much less volatile than nominal exchange rates.

Adding incomplete exchange-rate pass-through turns out to reduce the welfare costs of monetary unification with nominal rigidities. With commodity market segmentation, nominal exchange rate flexibility becomes less important for enabling short-run monetary stabilization of national outputs in the presence of idiosyncratic productivity disturbances. By explaining these claims, this section shows that the case for a system of fiscal insurance as a replacement for separate monetary policies under monetary union is further reduced. It also shows that the extent to which goods and services markets are integrated across borders is an important concern for assessing the welfare case against monetary union.

In the model, the failure of exchange-rate pass-through means that equation 26 no longer holds. Again, nominal rigidities are represented by assuming that nominal wages are set one-period in advance of employment and that nominal goods prices are flexible so that real wages can respond to changes in the supply of money. All the other equilibrium conditions of the basic model with nominal wage rigidities hold for either a flexible exchange rate regime or monetary union, as appropriate. Resource allocation under flexible exchange rates is discussed first.

In the absence of exchange-rate pass-through, exchange rate fluctuations do not directly change consumer relative prices, but they can affect national income through the return to equi-

ties calculated in terms of the appropriate consumption price index for shareholders. Let wages be set in domestic currency and consumption take place at domestic currency prices. The value of a claim on a firm's capital depends on the proportions of output that are sold at home and abroad. The total revenue in domestic currency units of home production if firms do not hedge against exchange rate risk is given by

$$p_t^p Y_t = (p_t(1 - x_t) + s_t p_t^a x_t) \mu_t f(k_t); \quad (31)$$

where p_t^p indicates the producer price index for period t and x_t equals gross exports. Nominal wages are given by

$$W_t = E_t [(p_t(1 - x_t) + s_t p_t^a x_t) \mu_t (f(k_t) - k_t f'(k_t))]; \quad (32)$$

and the net returns to capital equal $(p_t(1 - x_t) + s_t p_t^a x_t) \mu_t f'(k_t)$. The earnings of foreign capital denominated in units of foreign currency equal $p_t^a(1 - x_t^a) + x_t^a \frac{p_t}{s_t} \mu_t f'(k_t^a)$. Imperfect competition and market segmentation could be used to model pricing behavior in each national market, but it would unnecessarily complicate the exposition matters. Assume that imports and exports are imperfect substitutes, so that $c_t = A(c_{1t}; c_{2t})$ is the home country's consumption index defined over home and foreign goods, respectively. With prices set in each market, adverse productivity shocks will tend to be associated with domestic currency depreciation with separate currencies (this depends on the endogenous monetary policy response). If this correlation holds, the variability of firm earnings can be reduced by international goods market segmentation. With currency-adjusted producer prices unequal across borders, nominal and other financial shocks can create significant exchange-rate risk for firms so that they have an incentive to hedge against exchange risk in financial markets. Hedging does not affect the arguments made here.

Under these additional assumptions, the asset pricing relationship implies that investment in home capital satisfies

$$1 = E_t \left[\frac{-u'(c_{t+1})}{u'(c_t)} \mu \frac{p_{t+1}^p}{P_{t+1}} (1 + \mu_{t+1} f'(k_{t+1})) \right]; \quad (33)$$

and foreign investment satisfies

$$\frac{s_t P_t^a}{P_t} = E_t \left[\frac{-u'(c_{t+1})}{u'(c_t)} \mu \frac{s_{t+1} p_{t+1}^{ap}}{P_{t+1}} (1 + \mu_{t+1}^a f'(k_{t+1}^a)) \right]; \quad (34)$$

if home country residents hold claims on capital in each country. The term, $\frac{p_{t+1}^p}{P_{t+1}} (1 + \mu_{t+1} f^0(k_{t+1}))$, is the return to home country capital in terms of home consumption. Capital goods can be taken as identical composites of the two commodities for each country. The equations imply that exchange rate flexibility reduces the variance of the returns to households' holdings of equity claims in terms of their consumption bundle with respect to productivity shocks.

The labor market equilibrium conditions for the home and foreign countries are given by

$$\frac{A^0(\bar{c}_t, i_t)}{u^0(c_t)} = \frac{W_t}{P_t}, \quad \frac{W_t}{p_t^p} = \mu_t f\left(\frac{\dot{c}_t}{\dot{c}_t}\right) i_t + \frac{\dot{c}_t}{\dot{c}_t} f^0\left(\frac{\dot{c}_t}{\dot{c}_t}\right) \quad (35)$$

and

$$\frac{A^0(\bar{c}_t^a, i_t^a)}{u^0(c_t^a)} = \frac{W_t^a}{P_t^a}, \quad \frac{W_t^a}{p_t^{pa}} = \mu_t^a f\left(\frac{\dot{c}_t^a}{\dot{c}_t^a}\right) i_t^a + \frac{\dot{c}_t^a}{\dot{c}_t^a} f^0\left(\frac{\dot{c}_t^a}{\dot{c}_t^a}\right); \quad (36)$$

respectively.

Equilibrium for the money market requires

$$\frac{v^0\left(\frac{M_t}{P_t}\right)}{u^0(c_t)} = \frac{i_{t+1}}{1 + i_{t+1}}, \quad \frac{v^0\left(\frac{M_t^a}{P_t^a}\right)}{u^0(c_t^a)} = \frac{i_{t+1}^a}{1 + i_{t+1}^a}; \quad (37)$$

and uncovered interest parity (equation 25).

The consumer price indices, P_t and P_t^a , for each country depend on the domestic prices of the two goods as

$$P_t = P(p_{1t}; p_{2t}) \quad \text{and} \quad P_t^a = P^a(p_{1t}^a; p_{2t}^a);$$

respectively. With goods market segmentation, nominal wage rigidity and nominal goods prices flexible, the real wage rates in each country can adjust independently of each other even if the exchange rate is permanently fixed. That is, with the exchange rate constant, nominal interest rates, i_{t+1}^a and i_{t+1} , are equal, but P_t and P_t^a can move separately and p_{1t} and p_{2t} do not have to equal $S_t p_{1t}^a$ and $S_t p_{2t}^a$, respectively, through continuous goods market arbitrage. With a permanently fixed nominal exchange rate, the real exchange rate defined in terms of consumer price indices, $P_t = P_t^a$, can still change with the common money supply to clear both labor markets simultaneously.

Two essential assumptions are being made here. The first is that nominal wages are preset in each country but nominal goods prices are not. A monetary expansion immediately increases

the nominal price level through money market clearing, which in turn translates into a rise in the nominal producer price of output lowering the real wage rate for the firm. The second is pricing-to-market. The relative prices $p_{1t}=p_{1t}^a$ and $p_{2t}=p_{2t}^a$ are endogenous. The addition of pricing-to-market leads to the conclusion that monetary union does not affect the capacity of monetary authorities to influence resource allocation in the presence of asymmetric national productivity shocks. Under these conditions, the welfare benefits of fiscal insurance are identical with or without monetary union. Asymmetric productivity shocks provide the same basis for introducing state-contingent international fiscal transfers before the elimination of national currencies as after. The observed absence of exchange-rate pass-through argues against the claim that fiscal insurance is needed to compensate for the loss of nominal exchange rate flexibility under monetary union.

For the United States, the evidence suggests there are nominal rigidities but that nominal prices and wages are not highly correlated. Nominal wage and price movements are more highly correlated within each member state of the European Union. Real wages are more rigid in Europe than in North America.⁸ Movements in the prices of consumer goods and services are imperfectly correlated across regions of the United States and between European countries.

Introducing correlations between nominal wages and nominal prices allows nominal exchange rate flexibility to serve an essential role for the efficacy of monetary policy in short-run adjustment under pricing-to-market. With real wage flexibility and pricing-to-market, the nominal producer prices in one country can move independently of producer prices in the other through uncorrelated movements in national consumer price levels under a common currency. In this case, nominal exchange rate flexibility is an additional way to achieve the same adjustment in real wage rates but a redundant instrument of policy. If real wages are indexed to national consumer prices, then producer prices can adjust independently of each other through international trade receipts expressed in domestic currency. The second term in the expression, $p_t^p = p_{1t}(1 - \alpha_t) + \alpha_t p_{1t}^a$, rather than the first allows producer real wages to adjust, although equations 35 and 36 show that the labor market does not clear because household real wages are

rigid. Flexible exchange rates and separate currency are a partial substitute for real wage flexibility when there is pricing-to-market. Their usefulness in this regard rises with the openness of national economies conditional on the degree of goods market integration.

This suggests that nominal exchange rate flexibility reduces the cost of real wage rigidity for allocative efficiency. The adoption of a common currency should raise the welfare costs of indexing nominal wages to the price level. If the result of monetary union for Europe is a significant reduction in the extent of real indexation, then monetary policy could end up being more effective as a tool of short-run stabilization. With nominal goods prices flexible and markets in similar goods incompletely arbitrated across regions, regional asymmetries will yield asymmetric short-run real wage movements in response to a common monetary policy. On the other hand, if real wage rigidity persists under monetary union, then the benefits of a fiscal insurance scheme appear along with the intertemporal welfare costs discussed in Section 4.

6. Conclusions

The general equilibrium models allows an analysis of the argument that monetary union raises the welfare benefits of introducing a system of fiscal insurance between member states. Progressive changes in the model structure enable us to understand how fiscal insurance and monetary unification affect resource allocation in the presence of real productivity disturbances. This helps to identify possible rationale for the idea that fiscal insurance is needed to compensate for independent monetary policies as an instrument for short-run output stabilization with asymmetric national productivity shocks.

The monetary economy with perfectly flexible prices provides a benchmark for understanding the welfare gains from international fiscal insurance for diversifying the idiosyncratic share of production risk. In the model, international asset markets are incomplete in the sense that households cannot trade claims to future labor income. The benefits of introducing fiscal insurance in this case are the same as the benefits from further international diversification of household asset portfolios, so that these only arise if the constraint on asset trade is binding.

Section 3 showed that introducing nominal rigidities with separate national currencies and flexible exchange rates did not change the welfare economics of fiscal insurance. By comparing the implications of the model with the empirical observation of a strong home bias in the portfolio allocation of national saving, the analysis predicts no incentive to introduce fiscal insurance with independent monetary policies.

Monetary union can raise the benefits for allocative efficiency that can be gained from a system of interregional fiscal insurance. This follows from the well-understood point that a common monetary policy cannot achieve labor market equilibrium in each member country with asymmetric productivity shocks. However, fiscal insurance does not replace coordinated separate monetary policies. It brings additional distortions to the allocation of resources intertemporally that must be counted against the potential gains. As shown in Section 4, the strongest case for fiscal insurance arises when markets for goods and services are internationally integrated and real wages are responsive to money supplies.

The next embellishment of the model allows goods markets to not be arbitrated continuously across member states of the monetary union. This is an empirically important case as many studies of exchange-rate pass-through have demonstrated. Monetary union does not increase the welfare case for fiscal insurance with pricing-to-market in the absence of indexation of nominal wages to nominal price levels. The model also implies that market segmentation within the European community may enable the current flexible exchange rate regime to aid labor market equilibrium in a restricted way despite rigid real wages in terms of domestic consumer prices. However, wage indexation does not provide a convincing argument that monetary union will raise the benefits of fiscal insurance under consumer market segmentation.

This paper concentrates on the role of fiscal insurance schemes in replacement of nominal exchange rate flexibility in the presence of asymmetric productivity disturbances. Others have considered the macroeconomic benefits of monetary union for providing fiscal and monetary discipline (see McKinnon [1997], for example) or eliminating the adverse effects of nominal and financial market disturbances for allocative efficiency (see Buiter [1997], for example).

Another argument that fiscal insurance schemes may be inessential for promoting allocative efficiency with nominal rigidities and asymmetric real shocks is given by Buiter and Kletzer [1997] and Kletzer [1997]. In an overlapping generations framework, they show that fiscal insurance may add little if anything to the capacity of policy instruments already available to national fiscal authorities for alleviating short-run disequilibrium due to temporary nominal rigidities. Eichengreen [1997] provides a political-economy perspective that fiscal federalism may not be necessary under European monetary union.

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Endnotes

¹The theory of optimum currency areas is further elaborated by McKinnon [1963], Kenen [1969], Ingram [1973] and Ishiyama [1975].

²These include Bayoumi and Masson [1994], Bayoumi and Thomas [1995], De Grauwe and Vanhaverbeke [1991], Dehesa and Krugman [1993], Eichengreen [1992a], Eichengreen and Wyplosz [1993], Kenen [1992], Krugman [1993], Melitz [1991] and van Hagen and Hammond [1995]. Most recently, Obstfeld [1997a and 1997b] and Obstfeld and Peri [1998] have reviewed the empirical evidence for and against European monetary unification.

³McKinnon [1997a and b] is supportive of limitations on public sector debts and deficits as set forth in the Treaty of Maastricht and subsequently tightened in the Stability Pact. Criticisms of these restrictions are given by Buiter and Kletzer [1991], Buiter, Corsetti and Roubini [1993] and Eichengreen and von Hagen [1995]. An overview is given by Hutchison and Kletzer [1997].

⁴Sachs and Sala-i-Martin [1992] estimate interstate fiscal transfers in response to aggregate income shocks for the United States. Von Hagen [1990] argues that these overestimate the role of fiscal federalism in stabilization by including permanent interstate income transfers.

⁵Examples in the economics literature include van Rompuy, Abraham and Heremans [1991], Eichengreen [1992a], Courchene [1993] and Bayoumi and Masson [1994].

⁶Neumeyer [1998] considers the effects of monetary unification in a general equilibrium model with incomplete markets adopting a special specification for household utilities and incorporating the transactions demand for money differently.

⁷Engel and Rogers [1998] also discuss the usefulness of nominal exchange rate flexibility in an IS-LM version of the Mundell-Fleming model.

⁸See, for example, Eichengreen [1992a] for typical comparisons of wage-price correlations.