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ABSTRACT

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The main conclusions of this paper are the following. In order to minimize switching costs, the name of the new EU currency should be the Deutschmark. Differential national requirements for seigniorage revenue provide a weak case for retaining national monetary independence. From the point of view of adjustment to asymmetric shocks, nominal exchange rate flexibility is at best a limited blessing and at worst a limited curse. Inter-state labour mobility in the United States does not compensate for the absence of state-level exchange rate flexibility. The absence of significant inter-member fiscal redistribution mechanisms in the EU is not an obstacle to monetary union. Convergence or divergence in real economic performance is irrelevant for monetary union. A common currency is the logical implication of unrestricted international mobility of financial capital. The Maastricht criteria are unlikely to hinder monetary union. There are no convincing economic objections left to monetary union in the EU.

JEL Classification: E42, E52, E63, F31, F33, F36, G15
Keywords: monetary union, optimal currency area, European Union

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NON-TECHNICAL SUMMARY

The paper reviews the familiar arguments for and against monetary union among the members of the European Union. Many of the arguments on both sides are found to be flawed. Implications are drawn for monetary and fiscal policy design in the transition to monetary union and following it.

Microeconomic efficiency arguments favour a common currency (as they do the adoption of a common language), provided the switching costs are not too high. In order to minimize the switching costs, rather than adopting a new and unfamiliar label, the name of the most widely used existing currency (the Deutschmark) should be attached to the new common numéraire.

Differences in national needs for recourse to seigniorage (or the inflation tax) do not provide a strong theoretical rationale for the retention of national monetary sovereignty. In addition, the (*anticipated*) inflation tax has been a very minor source of government revenue outside Greece and Portugal, and to a lesser extent, Spain and Italy. For countries with very high public debt and limited fiscal credibility such as Belgium, Greece and Italy, giving up the ability to amortize part of this debt through a bout of unanticipated inflation may be rather more costly.

It is nominal rigidities in national wage and price setting mechanisms that provide the rationale for nominal exchange rate flexibility as a desirable shock absorber for asymmetric demand shocks originating in the goods markets. These same nominal rigidities also provide the rationale against nominal exchange rate flexibility in the face of asymmetric demand shocks originating in the financial markets.

As these nominal rigidities are transient (money is neutral in the long run), policy instruments or changes in institutional arrangements that would compensate for the loss of national monetary sovereignty need only have transitory or temporary effects.

The inter-state redistribution that takes place in the United States through both sides of the Federal Budget also provides insurance against permanent differential shocks to state output. As state-level exchange rate flexibility could never provide the same insurance, the absence of large scale permanent redistribution mechanisms between EU members need not be an obstacle to successful monetary union among them. A redistribution mechanism among

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EU members that would fully compensate for the loss of exchange rate flexibility need only be capable of making temporary or transitory transfers.

Since nominal exchange rate flexibility can, at best, provide the means of fine-tuning the response to asymmetric shocks, international labour migration is unlikely to ever provide an effective substitute for it. The kind of labour mobility that would mimic the workings of a flexible nominal exchange rate would be strictly temporary (that is, reversible) migration. Even the United States does not have this high a degree of inter-state labour mobility, so if it is an optimal currency area, this is despite the absence of the requisite degree of labour mobility.

Divergent real economic structures, behaviour and developments are irrelevant from the point of view of the desirability of monetary union. Monetary policy simply does not have the ability to influence long-term real developments (productivity growth, real wage rigidities, non-wage labour costs, demographic strains on the budget) that matter.

With unrestricted international mobility of financial capital, a common currency becomes, at the very least, extremely desirable and in all likelihood, unavoidable. Fixed or fixed-but-flexible exchange rate regimes that fall short of a common currency are prone to collapse either for opportunistic reasons or because of irresistible speculative attacks. Floating exchange rates exhibit both excess short-term volatility and persistent medium-term misalignment. Re-imposing capital controls does not appear to be a feasible option.

Following the positive vetting of Ireland, the Maastricht convergence criteria appear to be applied sufficiently flexibly and sensibly not to be an obstacle to monetary union among a majority of current EU members. The one exception are those members with high public debt which also suffer from at least the perception (and quite likely the reality) of not being able to generate the required primary (non-interest) government surpluses in the future. Belgium, Greece and Italy come to mind. For these countries the inability (according to the Maastricht exchange rate criterion) of having one last maxi-devaluation before they throw the exchange rate key away by joining EMU may be quite costly. The recent Commission proposal to have a one-year delay between the announcement of the decision on who will join EMU and the irrevocable fixing of the parities is a recipe for speculative disaster.

There appear to be no convincing economic arguments left against monetary union among all but a few of the current EU members.

Macroeconomic Policy During a Transition to Monetary Union*

Willem H. Buiter

1. Introduction

The title of this paper is intentionally cautious about the likelihood of monetary union in Western Europe: it refers rather non-commitally to 'a' monetary union in the abstract rather than to 'the' monetary union that many hope or fear will occur as the culmination of the process set in motion by the Maastricht Treaty. Whether or not monetary union among the EU members will extend beyond the extraordinarily durable arrangement that has united Belgium and Luxembourg in a currency union since 1922, will be decided, as most European monetary matters seem to be these days, in Frankfurt and Berlin.

This paper is an analytical, but largely non-technical exploration of the considerations that should guide the design of monetary and fiscal policy by a group of nations considering monetary union. Much of the paper is a review of the pros and cons of monetary union. The reason for this focus is that, once it is clear what is actually given up by a nation (or group of nations) that relinquishes monetary sovereignty, it is quite straightforward to determine what changes are required, in the fiscal policy instrumentarium and/or in other aspects of the capacity to adjust, in order that she may compensate for the loss of the national monetary instrument(s). What follows is therefore essentially a review of the theory of optimal currency areas, one of the murkiest and most unsatisfactory areas of macroeconomic and monetary theory.

The outline of the rest of the paper is as follows. Section II reviews microeconomic arguments for a common currency. Section III reviews neoclassical public finance arguments against a common currency. Section IV considers the implications of nominal rigidities. Section V looks at what

kinds of additions to the policy arsenal or institutional capacity for adjustment to shocks are required to make up for the loss of the exchange rate instrument. Section VI reviews the role of capital controls and Section VII the Maastricht convergence criteria.

2. Microeconomic efficiency arguments for a common currency

The microeconomic efficiency arguments for a common currency are well-known and don't require rehashing at length. A medium of exchange or transactions medium is subject to an obvious *network externality* (see e.g. Dowd and Greenaway [1993]). This is most easily seen in the case of intrinsically valueless (or fiat) money: the usefulness to me of a medium of exchange (and therefore the likelihood of me accepting it in exchange for intrinsically valued goods and services) is increasing in the number of other people that are likely to accept it as a medium of exchange, since this is what determines the *liquidity* or *moneyness* of the medium of exchange: probability of me being able to dispose of it whenever I want to, at short notice, and at little cost.

The public good properties of money should be characterized carefully. The public good issue relates to the private and social utility derived from the choice of one particular currency (or set of currencies) rather than another, as numéraire, medium of exchange and means of payment. This issue is quite distinct from that of how the utility enjoyed by an individual agent varies with the quantity of a particular currency used or held by that agent, holding constant the pattern of currency use by all other agents. The use of a given stock of money balances in transactions is obviously *rival:* I can only spend a given dollar bill once. However, since the usefulness to me of any particular currency rather than another for effecting transactions (the "moneyness" of any given currency) is strictly increasing in the frequency, scale and scope of that

currency's use by others, there is an *ultra-non-rivalness* in the choice of which currency to use. This creates the public goods aspects of money. [1]

Social transactions costs are minimized with a single currency. There is a direct parallel here with the social gains from having a common language. Apart from aesthetic considerations, the value to me of learning another language is increasing in the number of other people that know the language. For communication purposes (as opposed to hobbyism), a common world language would clearly be optimal, if like the Creator, we could redesign the universe from scratch.

De Cecchini Report tried to estimate the real resource savings from the bid-ask spreads in the foreign exchange markets. This, the value added in the foreign exchange business, represents the competitive rentals of the physical and human resources currently tied up in the exchange of currencies that would become redundant (or liberated) by monetary union, plus any pure rents, enjoyed either as monopoly profits or as X-inefficiency (organizational slack).

To the extent that these markets are imperfectly competitive, the equilibrium spreads overstate the opportunity social costs incurred by banks and other foreign exchange traders of exchanging one currency for another.

On the other hand, the spread ignores altogether the real resource costs incurred by the other (non-bank) parties in the foreign exchange markets, called in-house costs in Emerson *et. al.*[1990]. It seems fair to say that no-one has a clue as to the true magnitude of the microeconomic efficiency gains that might be achieved by monetary union, in the EU or elsewhere.

While, if once could re-design the world from scratch, microeconomic efficiency would clearly suggest the optimality of a single common currency, it does not follow that it is necessarily efficient (from a microeconomic point of view) to move to a common currency from an initial situation involving many currencies. *Switching* currencies (not *exchanging* currencies, but beginning to use a different currency as numéraire and medium of exchange) is costly because, in a

world of boundedly rational agents with limited computational, data-gathering and data-processing capacity, "we must learn to reckon in the new currency, we must change the units in which we quote prices, we might have to change our record, and so on."(Dowd and Greenaway (1993, p. 1180]). In addition, there are the real resource costs of introducing a new currency (or of extending the use of an existing currency to previous non-users), the costs of converting contracts denominated in old currencies into the new currency (which will provide great opportunities for rent-seeking by the legal profession) and a variety of other costs that can be labelled "*vending machine costs*". The one-off cost of switching must be set against the continuing gains from operating with a single currency.

The existence of switching costs means that the microeconomic case for moving to a common currency from a pre-existing multiple currency system is not *a-priori* self-evident, although there can be little doubt that, unless one has an excessively high discount rate, there is a microeconomic case for moving to a common currency.

An interesting point, noted in Dowd and Greenaway [1993], is that a move to a single currency should be a move towards the universal use of one of the pre-existing currencies (say the D-mark in the EU) rather than the adoption of a new currency (such as the ECU).[2] That way at least the Germans will be spared the switching costs, and even non-Germans will be dealing with a common currency that will at least be somewhat familiar. By the same token, English, Spanish or Mandarin would make a better world language than Esperanto. Note that it is only the *name* and other pheno-typical superficialities like the appearance of notes and coins that need be adopted universally in order to minimize switching costs. The Bundesbank and the remainder of the current institutional framework determining German monetary policy can (and should) be replaced by the new European institutions envisaged in the Maastricht Treaty. This suggests the following proposition.

Proposition I.

If the European Union (or a subset thereof) moves to a common currency, efficiency considerations suggest that the name of the most widely used existing currency be attached to the new common numéraire. This means that the name of the new European currency should be the D-mark.

Nothing in the Maastricht Treaty precludes the adoption of the D-mark as the name of the common currency. Note again that while the name 'D-mark' would be retained, the Bundesbank would, as provided in the Maastricht Treaty, lose its ability to conduct monetary policy in Germany or anywhere, and would become just the German branch office of the ECB. It would be the ECB that controlled the issuance of D-marks following monetary union.

Leaving aside the microeconomic efficiency arguments for a common currency, there are just two fundamental reasons why the nominal exchange rate regime might matter for real economic performance. These are the same reasons why money matters in open or closed economies: *seigniorage* and *nominal inertia*. We consider these in turn in the next two sections. Note that, once we abstract from the microeconomic efficiency arguments, the arguments for a common currency (or monetary union) are the same as those for any *credible* fixed exchange rate regime. It may of course be the case that the only truly credible fixed exchange rate regime is a common currency. For most of the arguments that follow, however, the key issue is whether the peg is fixed and is believed to remain fixed now and in the future.

3. Exchange rate independence, seigniorage, the inflation tax and the neoclassical theory of public finance

Governments can appropriate real resource by issuing intrinsically valueless (fiat) money, provided private agents believe that fiat money will offer them a competitive rate of

return (including saved transactions costs) over the planned holding period. A government can raise the attractiveness to private agents of its fiat money by paying interest on it, by declaring it legal tender, by requiring certain transactions (say tax payments) to be made with it and by making the use of other transactions media costly or even illegal. Since the private (and social) marginal cost of producing fiat money is (approximately zero) the government must have some monopoly power over its issuance if it is going to gain command over real resources by varying its quantity.

Let the nominal quantity of government fiat money (henceforth base money) outstanding at the beginning of period t be denoted H_t . For simplicity, assume that base money (currency plus banks' balances with the central bank) is non-interest-bearing. Let P_t be the general price level during period t and Y_t real GDP. Δ is the backward difference operator.

While the terms "seigniorage" and "inflation tax" are often used interchangeably, there is many a slip between the cup and the lip in going from the one to the other. By *seigniorage* I mean the resources appropriated by the government by expanding the nominal monetary base. As a fraction of GDP, it is given by σ_t in equation (1):

$$\sigma_t \equiv \frac{\Delta H_{t+1}}{P_t Y_t} \qquad (1)$$

There is a closely related concept, occasionally also referred to in the literature as seigniorage (although I shall avoid that usage), given in equation (2), which defines the interest burden foregone by the government through its ability to issue non-interest-bearing liabilities. Let i_{t+1} denote the one-period nominal interest rate on government interest-bearing debt issued in period t. This concept of *interest burden foregone*, denoted ω_t , is given (as a fraction of GDP) in equation (2)

$$\omega_t \equiv i_{t+1}\frac{H_t}{P_t Y_t} \qquad (2)$$

The flows of current and future seigniorage and the flows of current and future interest burden foregone are related by the following identity:

$$\sum_{j=1}^{\infty}\left(\frac{1}{\prod_{k=1}^{j}(1+i_{t+k})}\right)\Delta H_{t+j} \equiv \sum_{j=1}^{\infty}\left(\frac{1}{\prod_{k=1}^{j}(1+i_{t+k})}\right) i_{t+j}H_{t+j-1} - H_t \qquad (3)$$

or, equivalently, letting $h_t \equiv H_t/(P_t Y_t)$ denote the monetary base-GDP ratio, $\pi_{t+1} \equiv (P_{t+1}/P_t)-1$, the rate of inflation and $g_{t+1} \equiv (Y_{t+1}/Y_t)-1$ the growth rate of real GDP,

$$\sum_{j=1}^{\infty}\left(\frac{1}{\prod_{k=1}^{j}\left(\frac{(1+i_{t+k})}{(1+\pi_{t+k})(1+g_{t+k})}\right)}\right)\sigma_{t+j} \equiv \sum_{j=1}^{\infty}\left(\frac{1}{\prod_{k=1}^{j}\left(\frac{(1+i_{t+k})}{(1+\pi_{t+k})(1+g_{t+k})}\right)}\right)\omega_{t+j-1} - h_t \qquad (4)$$

Thus, the present discounted value of current and future seigniorage equals the present discounted value of the current and future interest burden foregone (the operating profits of the central bank), minus the initial stock of base money (the liabilities of the central bank). The two sides of the equation therefore offer different ways of looking at the net worth of the central bank.

A third related concept, also at times referred to as seigniorage, is the Central Bank's budgetary contribution to the general government. This is effectively the tax levied by the Treasury on the Central Bank. It could, in principle, be anything, up to the maximal feasible resource transfer of the Central Bank to the Treasury, that is the Central Bank's net worth defined in equation (3).

The *inflation tax* is generally defined as the reduction in the real value of the outstanding stock of base money due to increases in the general price level. Thus, the inflation tax in period t, as a fraction of GDP, τ^{π}_{t}, is given by [3]

$$\tau^{\pi}_{t} \equiv \pi_{t+1}(1+g_{t+1})h_{t+1} \tag{5}$$

The inflation tax and seigniorage are related by the identity given in (6):

$$\begin{aligned} \sigma_t &\equiv [(1+\pi_{t+1})(1+g_{t+1})-1]h_{t+1} + \Delta h_{t+1} \\ &\equiv \tau^{\pi}_{t} + g_{t+1}h_{t+1} + \Delta h_{t+1} \end{aligned} \tag{6}$$

In the special case where base money velocity is constant and inflation expectations are realized, equation (6) simplifies to

$$\begin{aligned} \sigma_t &\equiv [(1+\pi_{t+1})(1+g_{t+1})-1]h_{t+1} \\ &\equiv \tau^{\pi}_{t} + g_{t+1}h_{t+1} \end{aligned} \tag{7}$$

Seigniorage exceeds the inflation tax to the extent that there is positive real growth.

If there exists a stable base money demand function and if we are able to predict the arguments in the base money demand function for the period of interest, we can provide a map between the seigniorage revenue extracted by the government and the rate of inflation. I illustrate with a simple small open economy with an ad-hoc money demand function. Let h_t be a negative function of the domestic short nominal interest i (representing the domestic financial margin of substitution between non-interest-bearing currency and short interest-bearing debt) and the expected rate of depreciation of the currency ε^{e} (representing the direct international currency substitution margin).

$$\ln h_t = \alpha_t - \beta i_{t+1} - \gamma \epsilon^e_{t+1} \qquad (8)$$

The domestic nominal interest is the domestic real interest rate plus the expected rate of inflation, π^e , that is,

$$1+i_t = (1+r_t)(1+\pi^e_t) \qquad (9)$$

If γ is the proportional rate of depreciation of the real exchange rate and π^* the foreign rate of inflation, then

$$1+\epsilon_t \equiv (1+\gamma_t)\frac{(1+\pi_t)}{(1+\pi^*_t)} \qquad (10)$$

If we can project the real exchange rate, the foreign rate of inflation and the domestic real interest rate, then the monetary base-GDP ratio is uniquely (and negatively) related to the domestic expected rate of inflation. This still does not suffice to give us the amount of seigniorage the government can extract, however. From the definitions of σ and h it follows that, in general, we have to project future base money velocity as well as current velocity in order to get from our base money demand function to a predicted value for the government's seigniorage[4]. Consider a steady state, with α, r, g and π^* constant and exogenous, $\gamma=0$, $\pi^e=\pi$ and $\varepsilon^e = \varepsilon$. Seigniorage as a function of the rate of inflation exhibits the familiar seigniorage Laffer curve given in equation (11)

$$\sigma = [(1+\pi)(1+g)-1]\, e^{\alpha' - \beta'\pi} \qquad (11)$$

with

$$\alpha' = \alpha - \beta r + \frac{\gamma\pi^*}{1+\pi^*}$$
$$\beta' = \beta(1+r) + \frac{\gamma}{1+\pi^*} \qquad (12)$$

When the demand for money is sensitive to the (expected) rate of inflation, the inflation tax is distortionary, like every other real-world tax, transfer or subsidy. The normative neoclassical theory of public finance recognizes that, in general, a (constrained) optimal design of fiscal policy will require the use of all distortionary tax instruments. Efficiency requires that the excess burdens imposed by the various distortionary taxes be equalized at the margin. This might seem to create a presumption that countries with well-developed direct and indirect tax systems therefore could be expected to make less use of the inflation tax than countries with less efficient revenue administrations and more relaxed public attitudes towards tax evasion. The (constrained) optimal inflation rates (from the perspective of the neoclassical theory of public finance) might be expected to vary across time and across countries as tax bases, tax administration and tax ethics vary.

Even this presumption is less robust than one might assume, however. Recent insights into the optimal use of distortionary taxes on the returns from durable (capital) assets, due to Chamley [1986] (see also Lucas [1990], Zhu [1992] and Roubini and Milesi-Ferretti [1994]) imply that, at least in the fairly standard model developed below, the Friedman rule for the optimal quantity of money (the nominal rate of interest should be zero and satiation with real money balances should occur) still applies despite the fact that there are no non-distortionary tax instruments available for financing public expenditure. The optimal seigniorage argument for differential national inflation rates therefore needs to be qualified, even as a purely theoretical proposition.

3.1. A simple model of optimal seigniorage

The neoclassical public finance argument for nationally differentiated inflation rates can be made precise with the help of a simple formal model. The standard formulation of the optimal seigniorage argument is for a deterministic closed economy setting. Since the key theoretical points can all be addressed in this simplest format, I will follow precedent in the brief exposition that follows.

A representative infinite-lived competitive consumer maximizes the objective functional given in equation (13), defined over consumption of marketed goods, c, real money balances, h, and work effort, ℓ, subject to his sequential budget identity (14), non-negativity constraints on consumption and money holdings and the solvency constraint given in (15)

$$\sum_{j=0}^{\infty} u(c_{t+j},\ h_{t+j},\ \ell_{t+j})\left(\frac{1}{1+\delta}\right)^{j} \tag{13}$$

where (with a slight change in notation) $h_{t+j} \equiv H_{t+j}/P_{t+j}$. The felicity function u is increasing in consumption and decreasing in labour; it is increasing in h for $h < \bar{h} > 0$ and constant in h for $h \geq \bar{h}$. $\bar{h}$ is the satiation level of real money balances, which may be infinite. u is concave, twice continuously differentiable its third argument, strictly concave, twice continuously differentiable and satisfies the Inada conditions; $\delta>0$ is the pure rate of time preference.

$$c_t + \frac{H_{t+1}-H_t}{P_t} + b_{t+1}-b_t \equiv \ell_t(1-\tau_t) + r_t b_t \tag{14}$$

$$\lim_{T\to\infty} \frac{1}{\prod_{j=0}^{T}(1+r_{t+j})} b_{t+T} \geq 0 \tag{15}$$

b is the stock of one-period maturity, index-linked safe government debt and τ the proportional tax rate on labour income. Production uses labour only. One unit of labour produces one unit of perishable (non-storable) output. The monetary base and the safe one-period index-linked bond are the only stores of value.

The first-order conditions of the household optimization problem are given in (16) through (18)[5]:

$$u_c(t)\,(1-\tau_t) = -u_\ell(t) \tag{16}$$

$$\begin{aligned} i_t u_c(t) &= u_h(t) \qquad \text{for } i_t > 0 \\ h(t) &= \bar{h} \quad \text{for } i_t = 0 \end{aligned} \tag{17}$$

$$u_c(t) = \frac{(1+r_{t+1})}{1+\delta} u_c(t+1) \tag{18}$$

The household single-period budget identity can be rewritten as in equation (19)

$$(1+\pi_{t+1})\,h_{t+1} + b_{t+1} \equiv (1+r_t)\,b_t + h_t + \ell_t(1-\tau_t) - c_t \tag{19}$$

The government spends an exogenous amount G_t in period t on real resources (which can be viewed as government consumption that enters separably into the private felicity function) and finances this expenditure with the distortionary tax on labour income, by printing money or by borrowing. Its single-period budget identity is given in equation (20) and its solvency constraint in equation (21). Some exogenous fraction $(1-\theta_t)$ of the tax revenues it raises is lost (to the

government and to society). The parameter θ can be thought of as an index of the efficiency of the country's tax administration, $0 \leq \theta < 1$. It is quite likely that $1-\theta$ is increasing in the tax rate τ, but for reasons of space we shall not pursue this here.

$$H_{t+1} - H_t + P_t(b_{t+1} - b_t) \equiv P_t(G_t + r_t b_t - \tau_t \theta_t \ell_t) \tag{20}$$

$$\lim_{T\to\infty} \frac{1}{\prod_{j=0}^{T} (1+r_{t+j})} b_{t+T} \leq 0 \tag{21}$$

Note that (14) and (20) imply that

$$c_t + G_t = \ell_t[1-(1-\theta_t)\tau_t] \tag{22}$$

A benevolent government capable of credible precommitment, will choose the distortionary tax rates τ_t and its interest-bearing debt for the next period, b_{t+1} so as to maximize the utility of the representative individual given in (13), subject to equations (14) through (18) and (20) to (21). For the special case without uncertainty and separable logarithmic instantaneous felicity, $u(t) = \ln c_t + \alpha_1 \ln h_t - \alpha_2 \ln \ell_t \quad \alpha_1, \alpha_2 \geq 0$, equations (16) to (18) simplify to

$$\ell_t(1-\tau_t) = \alpha_2 c_t \tag{23}$$

$$i_t h_t = \alpha_1 c_t \tag{24}$$

$$\frac{c_{t+1}}{c_t} = \frac{1+r_{t+1}}{1+\delta} \qquad (25)$$

An optimizing government that maximizes the same objective functional as the representative household, by choosing infinite sequences of its labour income tax rate and its borrowing (and therefore, given the exogenously given sequence of public spending, also of its monetary financing) will find that its optimal programme is characterized by the condition that $\left(\frac{1}{1+\delta}\right)^j \frac{\alpha_1}{h_{t+j}} = 0$. This means that the familiar Chicago rule for the optimal quantity of money applies despite the distortionary character of the tax on labour: the nominal interest rate is zero in each period and that the equilibrium therefore supports the satiation level of real money balances. This result also holds
for the more general utility function of equation (13):

$$\begin{aligned} i_t &= 0 \quad \textit{for all } t \\ h_t &= \bar{h} \quad \textit{for all } t \end{aligned} \qquad (26)$$

If the exogenous variables are constant, there exists a stationary solution in which minus the inflation rate equals the interest rate which equals the pure rate of time preference

$$-\pi_t = r_t = \delta \qquad (27)$$

Note specifically, that the optimal inflation rate is independent of the parameters governing labour supply (which determine the excess burden associated with financing public spending by using the labour income tax) and of the value of θ, which measures the efficiency of the tax administration,

collection and enforcement system. Only differences in national time preference rates would result in differences in optimal national inflation rates.

By analogy with the results obtained by Chamley [1986], the durable asset is not taxed in the long run (in steady state). The durable asset in our model is not taxed in the short run either. This is because in our model the durable asset is money, which is unlike the physical capital that constitutes the durable asset in Chamley's model in two respects. First, real money balances, unlike physical capital, enter into the direct utility function and second, a capital levy on real money balances (through a jump in the price level) reduces the real stock of money balances, unlike a capital levy on the owners of physical capital, which leaves the physical capital intact as a productive resource.[6] A capital levy on real money balances therefore cannot be part of an optimal programme.

The result that the optimal policy is characterized by a zero nominal rate of interest is not robust to modifications of the model that result in the elimination of the tax instrument (the wage income tax), that does not involve an intertemporal distortion. If for instance, labour income were the return on human capital, an augmentable input, rather than the return on an input (time spent working) that is endogenous at a point in time but cannot be augmented over time through investment activities, the optimal tax programme would not be characterized by money balance satiation. Nevertheless, the little optimizing model of this sub-section suffices to make the case for attaching a health warning to conclusions about optimal seigniorage derived from the usual ad-hoc models (see e.g. Barro [1988] and Mankiw [1987]).

Few people are likely to lie awake about seigniorage for most EMU countries in any case. As is clear from Table 1, in recent years, there has been very little recourse to the anticipated inflation tax or to seigniorage for most EMU countries, with the notable exceptions of Spain, Italy and especially Greece and Portugal (see also Grilli [1989a,b]).

Few people are likely to lie awake about this for most EMU countries. It seems extremely unlikely that the imposition of a common (low) rate of inflation on the EMU countries would significantly increase the excess burden associated with the financing of the public spending programme.

3.2. A broader view of the inflation tax

Countries that are members of a common currency area are constrained to have a common equilibrium rate of inflation of traded goods prices. Non-traded goods inflation rates will differ, in equilibrium, by the difference between the national productivity growth differentials among traded and non-traded goods. Nationally differentiated inflation tax rates therefore disappear as a revenue-raising fiscal instrument.

The inflation tax of the previous sub-section is perhaps more accurately referred to as the *(narrowly defined) anticipated* inflation tax. Even then, anticipated inflation can influence the government's budgetary position through other channels. The most important of these is the Olivera-Tanzi effect through which a higher rate of inflation erodes the real value of taxes paid in arrears. The reason is that such arrears neither tend to be index-linked nor have a market interest rate reflecting anticipated inflation attached to them.

In addition to using the anticipated inflation tax (broadly defined to include the Olivera-Tanzi effect and similar phenomena), the government can improve its real financial net worth by reducing the real value of its outstanding nominally-denominated fixed interest rate debt through unanticipated inflation. The effect of an unexpected increase in the current and/or future rate of inflation on the market value of the domestic-currency-denominated non-indexed fixed-rate debt increases with the remaining term to maturity of the debt[7]. Variable interest rate, short maturity debt can have its real value eroded by an unanticipated increase in the price *level*. Even if nominal domestic costs are sticky, the CPI will be flexible in an open economy through the import

component of the consumption bundle. In a small open economy, a price level jump can be engineered through a discrete (or maxi-) devaluation.

Giving up the ability to have nationally differentiated unanticipated inflation tax levies on the national debt, may be more serious than the loss of the discretionary use of the anticipated inflation tax for a number of countries with high public debt GDP ratios and a doubtful capacity for generating significant and sustained primary surpluses. For this group of countries, which includes Greece, Italy and Belgium, the need for a *de jure* (through a (partial) "consolidation" or default by some other name) or *de facto* (through an inflation surprise or an unexpected devaluation) capital levy on the public debt may well become irresistible. If a *de jure* public debt repudiation turns out to be politically unacceptable, a fierce burst of monetary and exchange rate irresponsibility may be the only way to re-impose ex-post consistency on the public accounts. The optimal time to do this, would be just before joining EMU, as in that case there would be no cost (in terms of the credibility of the country's commitment to future non-inflationary policies) from having a last fling with inflation. Unfortunately, the exchange rate, inflation and interest rate criteria of the Maastricht Treaty would seem to rule out such a desirable public debt 'end-game'.

As the EU is only a relatively small subset of the set of all nations, there is an additional international seigniorage dimension. Member currencies (especially the D-mark) are used as reserves, intervention currencies and vehicle currencies by official and private agents outside the EU. The total amount of external seigniorage raised by all EU members from non-EU members is likely to change as a result of monetary union. It is quite possible that a new European currency could become, in relatively short order, a more effective competitor for the US dollar as an international store of value than the DM is today [8]. This good news must, however, be balanced by the recognition that the rules that will be followed by the European Central Bank for the distribution of its seigniorage

(including its external seigniorage) among the various member states is unlikely to mimic the current distribution of seigniorage. Scope for conflict is clearly present.

4. Nominal rigidities and the Keynesian arguments for an optimal currency area

The monetary non-neutralities I wish to focus on in this Section are short-run 'Keynesian' non-neutralities, due to various nominal rigidities in wage and/or price setting behaviour. They are to be distinguished from the non-neutralities that would be present even in a world without nominal rigidities and that reflect the effects of anticipated inflation on consumption demand and portfolio allocation, such as the Mundell-Tobin effect.

"Superneutrality" of money, that is, invariance of real equilibrium allocations in classical competitive equilibrium models with complete markets, under alternative fully anticipated rates of growth of the nominal money stock and associated rates of inflation, makes for fun theory but is unlikely to be of much practical interest. The Mundell-Tobin effect is probably the best-known channel through which higher anticipated inflation, by affecting the portfolio choice between money and real capital, influences real equilibrium allocations. It will be ignored in what follows.

Nominal wage and price rigidities are the result of the common empirical practice of setting wages and prices in money terms for several periods in advance. These multi-period nominal contracts are incomplete. In particular, they often are not contingent on nominal wage and price developments elsewhere in the economy or in the economy as a whole: they are not index-linked. We don't have good theories to explain this particular form of incomplete contracting. Indeed, we don't have good theories as to why wage and price contracts tend to use money (the medium of exchange and means of payment) as the numéraire (unit of account) rather than, say, bananas. There is no "unbounded rationality" theory explaining

why the numéraire and the means of payment tend to be the same object or class of objects. "Menu costs" theory begs the question. First, it does not explain why the prices on the menu are expressed in the means of payment [9] (use money as the numéraire). Second, it does not explain why there are real costs associated with quoting different prices in terms of the numéraire (whatever that happens to be).

In the absence of a satisfactory theory of nominal rigidities, two courses of action are open to the policy-oriented economist. The first is to say: "if I cannot come up with a satisfactory set of micro-foundations for the phenomenon, it really cannot exist. I therefore will proceed as if there is no nominal inertia". This is the approach of the new classical macroeconomics (and *a-fortiori* of its real business cycle offspring). It represents a dangerous form of intellectual hubris. The second approach is slightly more modest. It recognizes the absence of satisfactory microfoundations for nominal inertia but proceeds to try and capture the key empirical regularities in simple quasi-reduced form behavioral relationships (such as the Phillips curve). It then proceeds to keep its fingers firmly crossed by hoping that the observed empirical regularities will be robust to the Lucas critique. That is, it assumes that these empirical regularities are invariant under the class of policy regime changes and/or changes in the external economic environment under consideration. The proof of this pudding will be in the eating.

Incomplete indexation also accounts for the redistributions of income and wealth often associated with unanticipated changes in the rate of inflation. For instance, an unanticipated increase in the rate of inflation will redistribute real resources from creditors to debtors, whenever debt contracts are incompletely indexed. If creditors are capitalists (savers) and debtors are entrepreneurs (who take the physical investment decisions) unanticipated reductions in the rate of inflation may, because of asymmetric information, default risk and limited liability, lead to a

process of "debt deflation" that can, for a while, severely depress real economic activity.

I will cast my arguments about nominal inertia in terms of the simplest open-economy expectations-augmented Phillips curve, but many other formalizations are possible (see e.g. Buiter [1985] and Buiter and Miller [1985]). The first issue that must be settled is whether there is any *long-run* (steady-state) effect of monetary policy on such real variables as the level of capacity utilization or the rate of unemployment. In the Phillips-curve paradigm, long-run non-neutrality of inflation requires at least one of two phenomena to be present: either the long-run Phillips curve is non-vertical or there is *hysteresis* in the natural rate of unemployment.

4.1. The long-run neutrality and superneutrality of money

The argument is no doubt familiar, so I will only restate it briefly in the simplest possible setting. The actual unemployment rate is denoted u and the natural rate of unemployment u^N. The core inflation rate or underlying rate of inflation is denoted $\hat{\pi}$. The coefficient β measures the weight of foreign prices in the domestic price index. E_{t-1} is the expectation operator conditional on information at time $t-1$, and z denotes some exogenous process driving the natural rate of unemployment. Specifically, z is a process independent of past, current and anticipated future values of the rate of inflation, the growth rate of nominal money or the actual unemployment rate.

$$\pi_t = -\alpha (u_t - u_t^N) + \gamma \hat{\pi}_t - \beta [\hat{\pi}_t - (\epsilon_t + \pi_t^*)]$$
$$\alpha > 0;\ \beta \geq 0;\ 0 \leq \gamma \leq 1 \qquad (28)$$

$$\hat{\pi}_t = \eta E_{t-1}\pi_t - (1-\eta)\pi_{t-1}$$
$$0 \leq \eta \leq 1 \qquad (29)$$

$$u_t^N = \delta u_{t-1} + (1-\delta) u_{t-1}^N + z_t \qquad (30)$$
$$0 \leq \delta \leq 1$$

In a long-run steady state, expectations are realized ($E_{t-1}\pi_t = \pi_t$), the inflation rate is constant and the terms of trade (or real exchange rate) are constant ($\pi_t = \epsilon_t + \pi_t^*$). Consider first the case where the natural rate is exogenous, that is, $\delta=0$. In that case,

$$\pi = \frac{\alpha}{\gamma-1}(u-u^N) \qquad (31)$$

There in no long-run inflation-unemployment trade-off *if and only if* $\gamma=1$, that is, core inflation feeds one-for-one into actual inflation and the long-run Phillips curve is vertical at the exogenous natural rate of unemployment.

Now maintain the vertical long-run Phillips curve, that is, $\gamma=1$, but allow path-dependence or hysteresis in the natural rate by assuming $\delta>0$. The current natural rate now depends (with exponentially declining weights) on the entire past history of the actual unemployment rate (and, of course, on the entire past history of the exogenous process *z)*. While in steady state the Phillips curve is vertical, it can be vertical at any level of unemployment, depending on the past history of the actual unemployment rate. With hysteresis, any temporary shock, including a temporary nominal shock, can have permanent, irreversible real effects.

The assumption $\gamma<1$ ceased to be intellectually respectable quite a while ago. The hysteresis hypothesis is intriguing but as yet unsubstantiated. I will therefore, in what follows, work on the assumption that neither the non-vertical long-run Phillips curve nor the hysteresis hypothesis

are empirically relevant to the EU. This implies that any monetary non-neutralities are strictly short-run only. This has important implications for what exchange rate flexibility (or more generally exchange rate management) can achieve, and particularly for its ability to influence the real exchange rate and other aspects of real economic performance (such as output, employment and capital formation). It also has important implications for what a country actually gives up when it inexorably fixes the external value of its currency and thus for what it would have to gain or recoup in other dimensions of policy or in the degree of flexibility of market and non-market institutions, in order to restore the capacity to respond to internal and external shocks that it had before it gave up national monetary policy.

4.2. Short-run non-neutrality of money and the implications of nominal exchange rate flexibility for real economic performance

With money non-neutral in the short run but neutral in the long run (γ=1 and δ=0 in terms of the model of equations (28) to (30)), both the costs and benefits from nominal exchange rate flexibility are strictly limited and transitory.

The central messages of this subsection are conveniently expressed as a number of propositions.

Proposition II: (*The good news about nominal exchange rate flexibility in the presence of nominal price or cost rigidities*).

> *Nominal exchange rate flexibility permits international relative price and cost adjustments that are warranted by fundamental real developments and fundament real shocks--adjustments that will eventually occur regardless of the nature of the nominal exchange rate regime--to be achieved more quickly and at smaller transitional or adjustment costs.*

Proposition III: (*The bad news about nominal exchange rate flexibility in the presence of nominal price or cost rigidities).*

> *Nominal exchange rate flexibility will cause financial shocks and other nominal shocks to result in temporary changes in international relative prices and costs--changes that are unnecessary and harmful from the point of view of the underlying real fundamentals and that involve real, albeit transitory, adjustment costs.*

Proposition IV: (*The very bad news about nominal exchange rate flexibility in the presence of nominal price or cost rigidities).*

> *In a world with incomplete markets, the existence of multiple currencies with (potentially) flexible exchange rates creates additional financial markets through which extrinsic (sunspot) noise and noise traders can inject additional extrinsic, non-fundamental volatility into the financial system and thus into the economic system as a whole. Exchange rate flexibility may breed excess volatility and temporary (but possibly persistent) misalignment rather than merely filtering an exogenously given amount of irreducible, fundamental uncertainty.*

4.3. Asymmetric shocks

The optimal currency area literature (see e.g. Mundell [1961], McKinnon [1963], Kenen [1969], Ingram [1969, 1973], Ishiyama [1975], Melitz [1991], De Grauwe and Vanhaverbeke [1991], Masson and Taylor [1992], Krugman [1992], Krugman [1992, 1993], Dehesa and Krugman [1993], Eichengreen [1990a,b] Bayoumi and Eichengreen [1992], Bayoumi and Thomas [1995], Bini-Smaghi and Vori [1993], Eichengreen and Wyplosz [1993], Leeftinck [1994], Bayoumi [1995], von Hagen and Hammond [1995] and Muet [1995]) has emphasized that if the preponderance of shocks hitting a potential common currency area are

idiosyncratic or asymmetric, that is, region-specific or nation-specific shocks, then the case for a common currency is weakened. Much of this literature has not been sufficiently diligent in pointing out that *nominal* rigidities are a necessary condition for this conclusion to follow. Without nominal rigidities, the exchange rate regime is, give or take the optimal inflation tax, a matter of indifference. You have to be a Keynesian (at least for the short run) if you are to get legitimately exercised about the exchange rate regime.

Two further characteristics of a country's economic structure have been argued to be important for the choice of exchange rate regime. These are the openness of the country to trade in goods and services and the degree of diversification of its production structure.

As regards openness to trade, the argument is that, if imports and exports (or more generally importables and exportables) are large relative to domestic absorption, respectively production, then variations in the nominal exchange rate will tend to be translated swiftly and comprehensively into increases in domestic consumer and producer prices, without any changes in key indices of international competitiveness. The limiting case would be that of the small open economy with only traded goods. Note, however, that even in this case nominal wage rididity would result in (short-run) changes in real wages and real unit labour costs resulting from variations in the nominal exchange rate, thus influencing an important dimension of international competitiveness, even without any changes in the relative prices of different traded goods.[10]

As regards diversification of the production structure, this is best viewed as a determinant of the likelihood that shocks to the demand for or supply of goods and services are symmetric (general) or asymmetric (nation-specific). If goods demand or supply shocks are more symmetric, fewer and smaller international relative price or cost adjustments are required and nominal exchange rate flexibility is less valuable. E.g. if two nations have well-diversified production structures, an

industry-specific supply shock is more likely to affect both countries in a similar manner. Similarly, if their demands are well-diversified, shocks to demand (say fiscal policy shocks) are likely to impact more symmetrically on the domestic and foreign economies.

Even having granted nominal rigidities their central place in the argument, the presumption that asymmetric shocks favour independent currencies and floating exchange rates is seriously misleading. Consider, for concreteness, the basic semi-small[11] open economy model with perfect international capital mobility, presented in equations (32) to (38) below. All variables are in natural logarithms with the exception of nominal and real interest rates. Foreign variables and parameters are distinguished by a star superscript. All parameters are positive. m is the nominal money stock, p the price level, e the nominal spot exchange rate (the domestic currency price of foreign exchange), y real output, c the real exchange rate, d the stock of domestic credit and ρ the stock of international reserves. The money demand shock, the IS shock and the supply shock are denoted ϵ^l, ϵ^d and ϵ^s, respectively.

Assume for concreteness that the objective is policy is to stabilize real output around its 'full information', natural level ϵ_t^s.[12] Basically (and at the risk of only slight simplification), nominal exchange rate flexibility is desirable when faced with "IS" shocks (shocks to the private or public demand for goods and services). Nominal exchange rate flexibility is definitely undesirable in the face of domestic financial market shocks (say liquidity preference (money demand) or shocks to the domestic money supply process). The relative merits of fixed versus floating exchange rates are qualitatively ambiguous and depend on the relative magnitudes of key behavioral parameters for supply shocks and foreign interest rate shocks. Without going through a rather tedious full-blown Poole-style analysis, we can still be very precise about the case of monetary shocks.

$$m_t - p_t = ky_t - \lambda i_t + \epsilon_t^l \quad (32)$$

$$y_t = -\gamma r_t + \delta c_t + \epsilon_t^d \quad (33)$$

$$r_t \equiv i_t + E_t(p_{t+1} - p_t) \quad (34)$$

$$i_t = i_t^* + E_t(e_{t+1} - e_t) \quad (35)$$

$$y_t = \chi(p_t - E_{t-1}p_t) + \epsilon_t^s \quad (36)$$

$$c_t \equiv s_t + p_t^* - p_t \quad (37)$$

$$m_t = \theta d_t + (1-\theta)\rho_t \quad (38)$$

With a floating exchange rate, $\rho=0$ (and, for notational simplicity, $\theta = 1$); $m = d$ is exogenous. Since our semi-small open economy takes the foreign interest rate as given and has perfect international capital mobility (as shown by the uncovered interest parity (UIP) condition in equation (35)), credibly fixing the nominal exchange rate (setting $s_t = E_t s_{t+1} = 0$, say) is equivalent to pegging the domestic nominal interest rate at the level of the foreign nominal interest rate. The endogenous domestic money stock adjusts passively to shocks in the demand for money through endogenous variations in the stock of international reserves, ρ, even if the stock of domestic credit, d, is exogenous. Real economic activity (output, real exchange rate and real interest rate) is perfectly insulated from domestic financial shocks ϵ^l. So is the domestic price level.

The presumption in favour of interest rate pegging, and therefore of fixed exchange rates, for the semi-small open economy with perfect international capital mobility in the face of domestic financial shocks carries over, in the multi-country version of this model (given by equations (32) to (38) and equations (39) to (43) below), to asymmetric financial shocks (and indeed to symmetric financial shocks as well).

$$m_t^* - p_t^* = k^* y_t^* - \lambda^* i_t^* + \epsilon_t^{*l} \tag{39}$$

$$y_t^* = -\gamma^* r_t^* - \delta c_t + \epsilon_t^{*d} \tag{40}$$

$$r_t^* \equiv i_t^* + E_t(p_{t+1}^* - p_t^*) \tag{41}$$

$$y_t^* = \chi^* (p_t^* - E_{t-1} p_t^*) + \epsilon_t^{*s} \tag{42}$$

$$m_t^* = \theta^* d_t^* - (1-\theta^*)\rho_t \tag{43}$$

The particular system-wide monetary and exchange rate policy package that is optimal from the point of view of insulating real activity in both countries (and the two price levels!), from the effects of monetary shocks, is system-wide nominal interest-rate targeting. This means a fixed nominal exchange rate, $s_t = E_t s_{t+1} = 0$ (say) (which implies $i=i^*$), and an adjustment of the system-wide quantity of money, $d+d^*$, to keep the common nominal interest rate constant at its target level in the face of monetary shocks in either country or in both countries. Note that it is only the total stock of money, $d+d^*$, that matters for our purposes; its decomposition into home country and foreign country domestic credit is irrelevant.

Open-loop nominal interest targeting leads to price level indeterminacy in the two-country version of the model under

consideration: the real money stock required to support the target nominal interest rate at any given levels of real output in the two countries can be made up out of infinitely many nominal money stocks and (fully anticipated) general price levels: there is no nominal anchor for the system as a whole. The solution to this technical problem is to make some real exogenous variable or policy variable a function of current, past or anticipated future values of the some nominal price or quantity. An example would be to make the nominal interest rate (the *real* rate of return differential between bonds and base money) a function of the current or lagged price level, e.g.

$$i_t = i_t^* = \hat{i} + \eta p_{t-s} \qquad \eta \neq 0 \; ; \; s \geq 0$$

It is therefore not sufficient to identify demand and supply shocks and decompose them into idiosyncratic vs. common shocks.[13] Demand shocks in turn have to be decomposed into financial (or LM) and goods market (or IS) shocks for it to be possible to draw sensible inferences about the appropriate exchange rate regime. Empirical evidence (based on credible identifying restrictions) about the relative importance of IS vs. LM shocks in the EU would be most welcome.

An equally serious qualification to many of the "shocking" recent findings is that the nature and magnitude of the shocks perturbing the system may be a function of the exchange rate regime itself, as asserted in Proposition IV. That is, not only do different exchange rate regimes transmit *given* fundamental (real and nominal) shocks differently, but also may different exchange rate regimes generate different kinds and amounts of extrinsic, non-fundamental noise.

I summarize this subsection in another proposition.

Proposition V.

Asymmetric shocks are not an argument against a fixed

exchange rate or a common currency if the shocks in question are financial shocks and the degree of international financial capital mobility is high.

5. What is required to make up for loss of exchange rate flexibility?

What is gained through exchange rate flexibility is an instrument with strictly temporary or transitory real effects. It facilitates adjustment to goods market shocks and complicates adjustment to financial shocks. Compensating for the loss of the exchange rate instrument therefore only requires an instrument that has strictly temporary or transient real effects.

It is true that the word "temporary" can cover any interval of real time from one nana-second to 20 million years. How long is the short run relevant for assessing the real effects of variations in the nominal exchange rate? There obviously can be no answer to this question that is universally valid; it depends on the nature of the shocks hitting the system, on the collective institutional arrangements that have evolved and are in place in a particular country at any given point in time and on the decision rules adopted by private agents.

A conventional wisdom going back at least to Milton Friedman holds that in a low-inflation, rather closed to international trade OECD-type economy like the US, it may take as much as two years for monetary changes to feed through into prices rather than quantities. If capital formation has been affected in the mean time, real consequences of nominal shocks may last and linger even longer than that. For more open economies and for economies undergoing higher and more variable rates of inflation, the real consequences of nominal shocks may be significantly less persistent. The UK is probably the European economy with the highest degree of nominal inertia, and even there it is significantly less important than in the USA. A good case can be made that most

of continental Europe has significant real price and cost rigidities, but no nominal inertia of any consequence. The loss of the exchange rate instrument would be of no consequence if that were the case.

The optimal currency area literature is woefully inadequate and confused on the issue of what policy, institutional or other behavioral changes are necessary in order to compensate for the loss of the nominal exchange rate instrument. The main confusions concern the roles of international factor mobility, of international fiscal transfers and of divergent or convergent underlying real economic behaviour (such as productivity growth, real earnings growth and demographic developments). I shall deal with them in turn.

5.1. Factor mobility

International factor mobility, including labour mobility may be a wonderful thing from the point of view of adjusting to asymmetric goods market shocks. It is only very tangentially related, however, to the optimal currency area argument. The governor of the Bank of England is a distinguished recent recruit to the ranks of those who are deeply confused about this issue (George [1995]).

The point is often made that the states of the US are better candidates for a common currency area than the members of the EU, because inter-state labour mobility is significantly higher in the US than inter-country labour mobility in the EU (see e.g. Eichengreen [1990a,b], Muet [1991, 1995], Blanchard and Katz [1992],and Mantel [1994]). While it is correct that the US has more mobile labour than the EU, I would argue that even the US does not have the kind and degree of inter-state labour mobility that would be required to make up for the loss of an independent currency. The international factor mobility that is required to compensate fully for the loss of the ability to vary the nominal exchange rate, is a strictly temporary (that is, reversible) migration. The fact that there is little or no

permanent international migration among the EU member states is irrelevant from the point of view of EMU, just as the fact that there is rather more permanent or long-term inter-state labour mobility in the USA is irrelevant to the issue as to whether or not the USA is an optimal currency area. Permanent international factor mobility is not a substitute for nominal exchange rate flexibility. Temporary (that is, reversible and reversed) international factor mobility would be a substitute for the loss of nominal exchange rate flexibility. Reversible, short run labour mobility is not an economic proposition, either in Europe or the US, owing to the high sunk costs of physical relocation (within as well as across national boundaries). The kind of temporary international labour mobility required to compensate for the loss of monetary autonomy is therefore not found anywhere in the world. It is specifically not found in the USA or in other Federal states with a common currency.

If the US is an optimal currency area, it therefore is one despite the absence of the highly reversible or temporary inter-state movements of labour that would be required to compensate for the loss of exchange rate flexibility. The fact that Europe not only has no reversible, temporary international labour mobility but also has only negligible long-term international labour mobility, does not represent an additional ***binding*** constraint on the European capacity to compensate for the loss of national exchange rate autonomy.

The EU might be a richer region if artificial obstacles to international labour mobility were eliminated, but it would be richer regardless of the exchange rate regime.

5.2. International fiscal transfers

What is lost by giving up nominal exchange rate flexibility can be recouped through international fiscal transfers that are strictly temporary or transitory (and indeed reversible (in present value terms) if there is no Ricardian equivalence). There is no need for any permanent fiscal transfers to make up for the loss of national monetary

autonomy. The fact that the EU budget is tiny and engages in a negligible amount of international redistribution is therefore irrelevant from the point of view of monetary union, just as the fact that the US Federal budget is responsible for a significant amount of inter-state redistribution (when state GDP varies) represents massive overkill from the point of view of establishing the presumption that the US is an optimal currency area. Sachs and Sala-i-Martin [1992] manage to be thoroughly confused on this issue, by failing to distinguish between insurance against certain kinds of transitory shocks (which is all that nominal exchange rate flexibility can provide) and permanent redistribution through the Federal Budget (see also Eichengreen [1990a], Van Rompuy , Abraham and Heremans [1991], von Hagen [1992], Courchene [1993], Goodhart and Smith [1993], Bayoumi and Masson [1994] and Muet [1995]).

Their confusion is shared by the Governor of the Bank of England (see George [1995]). All the EU needs is an international transfer mechanism that is capable of making temporary, that is, self-liquidating transfers between countries in order to make up for what is lost through exchange rate flexibility.

It may well be that greater international and interregional redistribution will be required within the EU in order to render the system politically viable. That, however, is a quite separate matter from the issue of what needs to be done in order to make up for the loss of the national exchange rate instrument.

5.3. Divergent real developments

In his recent Churchill lecture, the Governor of the Bank of England also cited divergent real economic structures, behaviour and developments

> *"This longer-term problem of unemployment reflects, at least in part, structural features of the European labour market, which also differ from one country to another-for example in the degree of flexibility in*

wages and other conditions of employment, or in the degree of non-wage, social costs of employment. It is being addressed, variously, through structural policies nationally and through measures such as those that are being explored by the European Commission and debated by the European Council. But it will not easily go away. And it could in fact become more difficult to resolve within monetary union as a result of on-going differences between member countries, for example, as a result of differences in rates of productivity growth, or unrelated differences in earnings growth, or as a result of divergent demographic trends and associated differences in dependency ratios."

The important and 'real' (in both senses of the word) problems referred to in the preceding quote are completely orthogonal to the question of the desirability of monetary union in Europe, unless the wage flexibility referred to in its first sentence were to be interpreted as *money* wage flexibility. I fear that such an interpretation would be too charitable.

This fundamental misunderstanding of what nominal exchange rate flexibility can deliver prompts the following proposition.

Proposition VI.

Real convergence or divergence is irrelevant for monetary union.

Asserting the contrary would mean attributing to monetary policy (under which I include exchange rate policy) powers and significance well beyond what it can deliver. Does anyone really believe that the problems of Italy's Mezzogiorno would have been alleviated if Southern Italy had been given its own currency and had decided to float the Southern Lira independently of the Northern Lira? Or that Appalachia would have been more prosperous if it had been granted its own

currency? How would real wage rigidities be alleviated by having an independent currency and a floating exchange rate? How are the competitiveness problems associated with excessive non-wage labour costs mitigated by having a floating exchange rate? Why would international differences in the severity of intergenerational distribution problems and in the strains put on public sector budgets by greying populations and emerging "youth deficits", be any less with a floating exchange rate than under a fixed rate? There is no reason whatsoever why regions characterized by persistent differences in total factor productivity growth or by persistent differences in real earnings growth unrelated to productivity growth differentials cannot be locked together in a common currency area. No doubt real economic performance would be dismal in a region characterized by real earnings growth systematically in excess of productivity growth, but it would de equally dismal with a fixed exchange rate, a floating exchange rate, or bilateral barter.

The foregoing discussion implies that arguments such as those made by Krugman [1992, 1993] and by Dehesa and Krugman [1993] about increasing returns, thick market externalities, conglomeration and the processes of regional specialization and concentration are also irrelevant to the debate concerning the merits of monetary union. If money is neutral, even in the short run, then the exchange rate regime is obviously irrelevant. If money is non-neutral at least in the short run, the hysteretic features of many of these new economic geography models imply that transitory shocks, including monetary and exchange rate shocks, can have permanent effects. But so can any other transitory shock, including the most transitory of fiscal shocks. As these models make it so cheap to influence the long-run course of history, neutralizing the undesirable real effects of the absence of nominal exchange rate flexibility (or the undesirable real effects of its presence) would not necessarily pose a significant challenge to policy makers.

With nominal inertia, monetary policy can influence the

current short real interest rate, that is, it can influence the short real interest rate in the short run. With the myopia, herd-instinct and bandwagon effects that tend to dominate financial markets on a day-to-day basis, monetary policy may also have a transitory effect on the long real interest rate, that is, it may be able to influence long rates in the short run (although not necessarily in a very predictable manner). It cannot influence either the short real rate or the long real rate in the long run. *Mutatis mutandis*, the same holds for the ability of monetary and exchange rate policy to influence the real exchange rate or any other real variable[14]. It is worrying that anyone in a position of influence over monetary and exchange rate policy appears to overestimate so dramatically the long-run power of his instruments over the real variables that matter.

6. Restrictions on capital mobility

Virtually all the arguments given in Emerson et. al. [1990], to the effect that the logic of market integration implies the need for a common currency are seriously flawed. Many seem to derive from fears that competitive devaluations (increases in the nominal exchange rate) can buy a country a lasting competitive advantage (a lasting real devaluation), thus distorting the competitive level playing field. These fears are misplaced for a number of reasons. First, even if a lasting competitive advantage could be achieved in this manner (which it cannot), the mercantilist obsession with competitiveness and trade surpluses that they betray, is unhealthy and without merit. Second, they ignore the inflationary bias that would result from a systematic policy of pursuing a higher real exchange rate through repeated attempts at keeping nominal exchange rate devaluations ahead of domestic price and cost increases, even if such a policy could be successful (which it cannot). Third, they ignore the historical evidence, which supports the view that it is not possible to gain any enduring competitive advantage by pursuing deliberately inflationary policies.

Arguments against exchange rate flexibility based on the complications it creates for managing the CAP (through the wedges it drives between market exchange rates and "Green currency values") are so far into the realm of the N^{th} best that it is very hard to take them seriously. The way out of this pseudo-difficulty would be to abolish the CAP, end all forms of agricultural protection and force farmers to make a living at world prices, or choose alternative occupations. It makes no sense to tie the choice of currency regime to the fate of a moribund agricultural welfare state.

Only one aspect of market integration does indeed point in the direction suggested by the "One market, one money" school of thought. That aspect is financial market integration, and specifically the removal of fiscal and administrative obstacles to the international movement of financial capital. The key point here can be summarized in the following proposition

Proposition VII.

With unrestricted international mobility of financial capital, a common currency becomes, at the very least, extremely desirable. In all likelihood, it becomes unavoidable.

The arguments supporting this position are both theoretical and empirical. Managed exchange rate regimes, including fixed-but-flexible exchange rate regimes such as Bretton Woods, or target zones with hard barriers such as the original ERM, break down with probability 1 in finite time. They are not sustainable, and therefore, except in the short run, infeasible. Floating exchange rate regimes, whether they float cleanly or dirtily, may be feasible, but will have very undesirable operating characteristics: they will be characterized by excess short-term volatility and persistent medium-term misalignments.

Take a fixed exchange rate regime as epitome of all managed exchange rate regimes. Any fixed exchange rate regime

that is not irrevocably fixed (that is, anything short of monetary union[15]) can be abandoned for one of two reasons. The authorities can choose to abandon the fixed parity, for any number of virtuous or opportunistic reasons, or they can be forced off the fixed parity by a speculative attack that exhausts their international reserves and credit lines. While technically (that is, in a world with credible commitment) any solvent government should be able to borrow infinite amounts of foreign exchange (simply by swapping it for its own currency), in reality there is a limit to the credit lines that any monetary authority can draw on. Any finite limit can be challenged by private speculators in reasonably efficient financial markets.

Even without speculative attacks, governments (including benevolent, optimizing and competent ones) that are incapable of credibly committing themselves to a fixed parity, may find themselves in suboptimal strategic interaction with the private sector (at home or abroad) or with other governments. Some equilibria of these games may involve an individually rational but socially inefficient abandonment of the fixed parity (see Obstfeld [1994], Ozkan and Sutherland [1994] and Buiter, Corsetti and Pesenti [1995]).

The gold standard survived as long as it did for two reasons. First, the degree of international capital mobility was undoubtedly significantly less than it is today. Second, the key national authorities were not held responsible for real macroeconomic performance (output and unemployment) and could make the defense of the gold standard their overriding priority. At least since World War II, no government has been able to enjoy the luxury of focusing monetary and fiscal policy exclusively on the defense of the external value of their currency. Absent a lexicographic utility function with the maintenance of the parity in the lead position, any commitment to a fixed parity is vulnerable, and will be tested by the markets.

It was therefore the completion of the single market programme that sealed the fate of the EMS and the ERM, but

only one component of that programme: the elimination of all remaining restrictions on the intra-EC mobility of financial capital. With all legal restrictions removed and much of the accumulated inefficiency of the previously protected private financial sectors swept away, a market mechanism was created that could shift literally hundreds of billions of dollars worth of financial claims between currencies in a matter of minutes, and at very little cost. Add to this a renewable population of unskilled and unsuccessful speculators (especially those in charge of economic policy in the national ministries of finance and Central Banks, but also new and inexperienced players from the private sector), and all the elements for a successful attack on a fixed-but-adjustable exchange rate arrangement like the ERM were in place.

Floating exchange rates determined in competitive financial asset markets are likely to exhibit both *excess volatility* and *persistent misalignment*. Excess volatility may reflect both rational speculative bubbles and the presence of noise-traders. Persistent misalignment results from the interaction of (technically) efficient financial markets and markets for real goods and services characterized by nominal inertia. It is important to realize that when we compare a common currency regime with a multiple currency regime, we are not just tracing how and where a given amount of fundamental noise shows up under the two regimes. The opening up of additional financial markets (such as the currency markets in our case) creates the potential for additional noise to be thrown into the system. *Markets make noise, they don't just process it.*

Is it possible to put the genie back in the bottle through fiscal or administrative capital controls? I don't think so. The scope and efficiency of the global industry ready to take on the authorities by supplying the means to avoid and evade controls is awesome. The rewards from taking on the monetary authorities are too high, given the penalties likely to be imposed and the risk of being caught evading the controls. If our society is unwilling to line speculators up

against the wall and shoot them after a fair trial, the odds on capital controls working effectively are virtually nil.

Proposals for imposing non-interest-bearing reserve requirements on balances used for taking open positions to attack currencies are naïve because they ignore key developments of the last two decades in the international financial markets. There are myriad ways now of attacking a currency: through the spot markets, through the forward, swap and futures markets, through currency options markets etc. "Tobin" taxes (see e.g. Tobin [1982]) on foreign exchange transactions would likewise have to be expanded in their coverage to include transactions in the forward markets and in markets for all other kinds of derivatives. Note that this argument for a common currency extends beyond the EU and applies to any countries linked by unrestricted financial capital mobility, including the US and Japan.

7. The Maastricht convergence criteria

A common currency may be the only logical option left after the abolition of capital controls, the question is, can we get there from here? In particular, how do the Maastricht convergence criteria enhance or impede the process?

Interest rates. Long-term nominal rates of interest on government debt are required to converge to a level close to that achieved by the three countries with the lowest rate of inflation. In the absence of differential default risk, there will be complete interest rate equalization immediately following currency unification. The only way to make sense of the interest rate convergence criterion, which imposes limits on interest rate spreads *prior to* monetary union is that it is yet another stratagem for keeping out of the monetary union governments whose debt is subject to a significant default risk premium. Barring default risk, the criterion is redundant: monetary union ensures interest rate equalization. It is not necessary to have interest rate convergence prior to monetary union.

Exchange rate. Exchange rates should be stable (within the normal bands allowed for the ERM) for at least two years before EMU, without any special measures to restricting the free flow of foreign exchange. While since the ERM margins were widened to 15%, it is no longer clear what the exchange rate criterion for EMU membership means in practice, the rationale for ruling out significant parity changes (devaluations) prior to monetary union surely is to avoid the risk of "endgame" devaluations aimed at achieving a transitional competitive advantage.

As long as monetary autonomy is expected to exist in the future, maintaining a reputation for being tough on inflation is valuable to the monetary authority. The cost of losing that reputation militates against the temptation to gain a competitive advantage (or boost output) through devaluation. Once monetary union is a fact, national reputations for monetary restraint are worth nothing. The temptation to get in one last, big devaluation before the ECB throws the key away, may be hard to resist (see Froot and Rogoff [1991] and Bayoumi [1995]). The exchange rate criterion rules this out and therefore makes sense from the point of view of avoiding zero-sum (at best) 'endgame' devaluations in pursuit of competitive advantage.

'Endgame' devaluations as a means of amortizing excessive public debt are of course also ruled out by the exchange rate criterion. Unless there are other feasible ways of imposing a capital levy on public debt holders, the loss of a final devaluation as a fiscal instrument may be costly to a number of countries for fiscal reasons.

Inflation. Prior to being allowed to join, a prospective entrant's inflation rate must be close to the inflation rates achieved by the three countries with the lowest rates of inflation. It is clear that monetary union is a means for achieving inflation convergence. Inflation rates for traded goods should converge quite quickly while non-traded goods prices and costs also would ultimately rise at a common rate

(corrected for the familiar inter-member differences in the productivity growth differential between the traded and non-traded good sectors). Why then impose inflation convergence prior to monetary union as a criterion for EMU membership?

If there is a reasonable answer, it must involve an empirical judgement about the inheritability of inflation inertia following monetary unification. The issue is a fascinating and important one, and one on which we have little or no empirical evidence. Clearly, if there is no nominal inertia, the prior inflation convergence criterion makes no sense. However, enough in order to reach the conclusion that prior inflation convergence is desirable, it does not suffice to note that potential EMU members have historically been characterized by inflation inertia. Assume the UK has inflation inertia and the current core inflation rate (in Sterling) is x percent per annum. As long as contracts are denominated in Sterling, this core inflation rate will respond only sluggishly to changes in economic conditions (that is the meaning of inflation inertia). It is by no means clear, however, what will happen to Sterling inflation inertia once contracts are denominated in the new currency (say the ECU). Will UK ECU inertia simply inherit UK Sterling inertia or will it instead evolve according to a different process (say the average prior core inflation of the other EMU members?). We don't know.

If there is full inheritance of inflation inertia, convergence of core inflation rates prior to EMU is desirable to avoid important changes in relative prices and costs building up under EMU before national core inflation rates have converged. It probably makes sense to be cautious, but this is surely a judgement that can be left to the individual member countries and does not need to be written in stone.

Public debt and deficit ceilings. I have argued elsewhere and at length (Buiter, Corsetti and Roubini [1993]), that while fiscal restraint is a wonderful thing, the two numerical criteria of the Maastricht Treaty (an upper bound on the

general government financial deficit relative to GDP of 3% and an upper bound on the stock of general government gross financial liabilities relative to annual GDP of 60%) make no sense.

Fortunately, the two criteria were applied quite sensibly in the one test case we have had thus far, that of Ireland. Unfortunately, the average debt-GDP ratio has continued to rise in the EU, despite an urgent need to stimulate saving and capital formation throughout the EU. The purpose of the criterion (other than providing Germany with an alibi if it decides not to give up the D-mark when the time comes) is to strengthen the hand of the ECB vis-à-vis the national ministries of finance, and the hand of the fiscally responsible countries and of Brussels vis-à-vis the fiscally irresponsible countries (especially Italy, Greece and Belgium). It is intended to strengthen the effectiveness of the "no bail-out" (directly by other ministries of finance or by Brussels and indirectly by monetization through the ECB) clause by making it less likely that a debt default contingency would ever arise or that any country could ever blackmail the rest of the EU into servicing part of its debt. As long as it is applied sensibly, as it was in the Irish case, no serious damage needs result from the pursuit of these fiscal norms. The automatic fiscal stabilizers can continue to perform their normal cyclical stabilizing functions at the national level and each government can aim to reduce its claim on national savings in ways and at a rate that respects differences in initial conditions, economic structures and external environments.

Phase A. Between the end of 1996 and July 1, 1998 the decision will have to be taken on which countries qualify for EMU. Stage 3, involving the irrevocable locking of exchange rates is supposed to begin no later than January 1, 1999. However, the recent Green Paper of the European Commission (Commission [1995]) suggests that it may take up to a year between the date on which it is decided which countries qualify for EMU

and the date on which the currencies of the countries in question are actually locked together permanently. This so-called Phase A seems purpose-designed to wreck the process of monetary unification. If it is intended to do so, its architects deserve our sincere congratulations, otherwise it represents a monumental lapse of judgement and design error. The Green Paper recognizes the problem of end-game instability (see Froot and Rogoff [1991] and Bayoumi [1995]); "Once the date for the starting of the third stage is known, markets would make guesses about the final conversion rates and they would switch between possible outcomes; markets could also push exchange rates significantly away from levels justified on the basis of fundamentals". The only way around this difficulty would be to commit credibly, right from the starting date of the third stage, to the final conversion rates. How such credible commitment can be achieved without formally abandoning monetary sovereignty, that is, without subordinating national monetary authorities to a European Central Bank, is, unfortunately, unclear.

The practical difficulties involved in switching from national currencies to a new common currency and the public relations problem of selling the new currency to the people of Europe are real but not very significant or interesting. Fortunately it doesn't take either genius or imagination to handle the legal problem of extending and enforcing contracts previously written in terms of national currencies or the engineering problem of refitting vending machines. The only interesting economic and political issues concern the membership of the group that will irrevocably fix their exchange rates, its relationship to the EU members that are not in the group and the conduct of monetary policy by the ECB.

8. Conclusion

There are no convincing economic objections left to monetary union for most EMU members. Even Italy and Belgium are potential candidates, if they manage to solve their debt

overhang problems and put in place a fiscal control mechanism capable of preventing a renewed unsustainable build-up of public debt. Only Greece looks, at the moment, like a rather hopeless case.

Most economic arguments against monetary union are misconceived, in that they overestimate what is gained by retaining monetary sovereignty and given up by surrendering it. The atavistic opposition in part of the UK (the "every nation has a flag, a national anthem, a football team and a currency" variety of political debate favoured by political dinosaurs like Lady Thatcher) will, I think, turn out to be of interest mainly to cultural anthropologists.

Note that the case for a common currency made in this paper does not depend in any way on the validity of the view that a fixed exchange rate provides a means through which a traditionally inflation-prone country (say the UK, France or Italy) can import anti-inflationary credibility from a country with a strong anti-inflationary reputation (Germany, say). I have never understood why a nominal exchange rate commitment short of monetary union would be more credible than the commitment to some other nominal target, such as a domestic monetary aggregate, the price level or nominal GDP. Both *a-priori* and in view of the long history of broken exchange rate commitments, it seems extremely unlikely that the nominal exchange rate has any unique advantage as a nominal "focal point". It is true that monetary union (if it is indeed irreversible) constrains its members to have a common long-run inflation rate for traded goods. Whether this common rate turns out to be the old German rate, a convex combination of the old rates of all EMU members or something completely new is an interesting topic for speculation. The case for monetary union developed in this paper goes through as long as the ECB is "within the convex hull" of the EU member central banks.

Just because an idea makes sense does not mean it will be adopted. Europe has a talent for snatching defeat from the jaws of victory. If the issue is decided on its economic merits, however, there will be a common currency in Europe by

the middle of the next decade.

Table 1

Seigniorage in the EU

	Seigniorage as % of GDP Average over Annual Figures		Inflation Tax*** as % of GDP Average over Annual Figures		Interest Forgone as % of GDP Average over Annual Figures	
	1985-1989	1990-1994	1985-1989	1990-1995	1985-1989	1990-1994
UK	0.47*	0.15	0.20	0.17	0.40	0.34
Austria	0.39	0.44	0.28	0.33	0.53	0.76
Belgium	0.16	-0.07	0.30	0.21	0.62	0.58
Denmark	0.60	0.62	0.21	0.10	0.47	0.50
France	0.35	-0.24	0.24	0.12	0.52	0.43
Germany	0.67	0.56	0.21	0.34	0.42	0.73
Italy	1.56	0.86	0.98	0.92	1.77	1.81
Netherlands	0.67	0.50	0.06	0.19	0.51	0.60
Sweden	0.74	1.52	0.40	0.34	0.66	0.86
Finland	1.09	0.73	0.31	0.21	0.64	0.79
Greece	2.24	1.91	2.55	2.38	2.71	2.60
Ireland	0.53	0.20	0.37	0.07	0.93	0.89
Portugal	4.08**	2.93	2.21	2.90	2.24	2.87
Spain	1.89	-0.42	1.34	0.82	1.86	1.61

1. Source: IFS on C.D. Rom, International Monetary Fund, June 1995.
2. Definitions
   Base Money: Reserve money.
   Inflation: Annual inflation in the GDP deflator, year-over-year.
   Interest Rate: TB rates except for the Netherlands, where the call money rate is used and Finland for which the money market rate is used.
3. Notes: 1990-1994 averages.
   For the Seigniorage measure, the averages are over 1990-1994 except for: Austria, 1990-1993; Belgium, 1990-1993; Italy, 1990-1992; Greece, 1990-1993; Ireland, 1990-1993;

Portugal, 1990-1992.
For the Inflation Tax measure, all are 90-94 except: Austria, 1990-1993; Belgium, 1990-1993; Italy, 1990-1992; Greece, 1990-1993; Ireland, 1990-1993; Portugal, 1990-1992.
For the Interest Forgone measure,all are 90-94 except: Austria, 1990-1993; Belgium, 1990-1993; Italy, 1990-1992; Greece, 1990-1993; Ireland, 1990-1993; Portugal, 1990-1992.

4. IFS lines corresponding to the various items:

Real GDP	99b.r
Nominal GDP	99b.c.
Interest rates	60b or 60c
Monetary base	14

* There is a break in the U.K. series between 1985 and 1986. Excluding 1986 changes the 1985-89 figure from 0.47 to 0.30.

** There is a major break in the monetary base series for Portugal between 1988 and 1989. Excluding 1989 changes the 1985-89 figure from 4.08 to 1.92.

*** Note that, in order to preserve comparability with the rest of the literature, the inflation tax is calculated using the beginning-of-period money stock rather than the end-of-period money stock argued to be the proper measure according to this paper. The numerical differences turn out to be negligible.

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FOOTNOTES

1. The non-convexity intrinsic in this transactions technology means that the value of the "technological network externalities" is not captured by the bid-ask spread in the foreign exchange markets, even if the latter are competitive and efficient. I elaborate on this below.

2. The only exception would be when the network-independent benefits of using a new currency would be significantly larger than those of each of the existing currencies.

3. The capital loss incurred on non-interest-bearing money balances during period t as a result of the price increase between period t and $t+1$ also applies to the new money issued during period t. The base for the tax should therefore be H_{t+1} rather than H_t. Thus the inflation tax during period t, as a fraction of period t GDP, equals $\frac{1}{Y_t}\left(\frac{H_{t+1}}{P_{t+1}} - \frac{H_{t+1}}{P_t}\right) \equiv \pi_{t+1}(1+g_{t+1})h_{t+1}$

.

4. Note that we need the growth rate of real GDP as well, and that both actual and expected rates of inflation enter into the relationship linking seigniorage and the inflation tax.

5. We restrict ourselves in what follows to equilibria in which the one-period nominal interest rate is positive. The set of such equilibria is known to be non-empty for the model under consideration.

6. Note that real money balances, unlike the physical capital stock, is not a predetermined state variable. If the exogenous variables are constant, the economy can achieve the steady state instantaneously.

7. To the extent that the Fischer hypothesis does not hold and higher anticipated inflation reduces the real rate of interest, the real value of the debt is eroded even by higher *anticipated* inflation.

8. We are talking potentially serious money. A recent Bundesbank study, reported in the Financial Times (Financial Times [1995]), estimated that some 30 to 40 per cent of the total currency circulating outside the banking system (between DM65bn and DM90bn) was probably abroad. The corresponding figure for the US dollar was estimated to be between 60 and 70 per cent.

9. which also happens to be an 'outside' fiat asset

10.In the model under consideration, labour services (and leisure) are of course non-traded goods, so variations in the nominal exchange rate still work by influencing the relative price of traded and non-traded goods. The only other transmission channel would be the asset revaluation effects of nominal change rate changes, including real balance effects.

11. Semi-small because it faces a downward-sloping demand curve for exportables, while it treats the world nominal rate of interest and the foreign price level as parametric.

12. Alternatively, the objective could be to stabilize output around its *ex-ante* full information natural level, 0. The optimal policy response to LM shocks and IS shocks is unaffected by this. The optimal policy response to supply shocks obviously would be.

13. Some of identifying restrictions commonly imposed in order to distinguish supply from demand shocks tend to be laughable. The common restriction that demand shocks have no long-run real effects only makes sense for monetary policy shocks. It certainly does not make sense for fiscal policy shocks. Even the redistribution over time (through borrowing) of the lump-sum tax financing of a given exhaustive public spending programme will affect saving and capital formation. Likewise, permanent variations in exhaustive public spending will, except in the simplest representative agent models, have long-run real effects. Changes in private savings behaviour brought about by shocks to the subjective discount rates, the parameters characterizing intertemporal substitution or the parameters characterizing risk aversion likewise will tend to have long-run real effects. It is extraordinary that the long-run effects of "IS" shocks of this kind are simply assumed away in much recent empirical work.

14. Other than the nominal rate of interest, which is, despite its name, a real variable.

15. It is true that even monetary union is not irreversible. The Maastricht Treaty does not, however, have any provisions for a country leaving EMU after joining it. Indeed, neither the Rome Treaty nor the Maastricht Treaty have provisions for member states leaving any of the European institutions to which they have acceded (*pace* Mr. Portillo and Lady Thatcher).