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THE CURRENCY REFORM AS THE LAST STAGE OF
ECONOMIC AND MONETARY UNION: SOME POLICY QUESTIONS

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ABSTRACT

The paper discusses the policy problems of a project aimed at substituting several national currencies with one single currency. While these problems are of general interest, the analysis is motivated by the plan for Economic and Monetary Union among the members of the European Community. The issues discussed include the choice of conversion rates and the effects of exchange-rate devaluations at the time of the monetary reform.

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1 Introduction

The literature on the European Community's plans for Economic and Monetary Union (EMU) has reached gigantic proportions, and yet, to my knowledge, very little has been written on the ultimate step of monetary union, the substitution of national currencies with a single currency. This paper discusses some policy problems of a (hypothetical) currency reform among EC countries.

Perhaps the most notable effort to date to describe how the passage from a group of different currencies into a single currency would, or should, occur is represented by the proposals by the UK government. With them, the UK government offered a strategy for monetary union based on the principle of competition among currencies. According to the first UK proposal (HM Treasury, 1989), the best way to establish a single currency is to encourage currency substitution as much as possible, and let the private markets choose the national money that provides the best transactions and store-of-value services. A second document (HM Treasury, 1990) advocated the introduction of an ECU that was to be freed from its basket nature, and was to be managed in a way to ensure that it would never depreciate vis-à-vis any of the currencies participating to the arrangement.

The two UK proposals have a common feature: they object to the idea of mandating the elimination of national currencies by law, and they opt for strategy that, in a sense, allows the private sector to determine for itself whether or not to adopt a single currency in Europe. Historically, government-imposed currency reforms are, of course, the rule: see, for example, the review of the postwar reforms in Europe by Dornbusch and Wolf (1990). This observation, however, is not sufficient to conclude that monetary reforms can only succeed if mandated by the government. The economic conditions of European countries in the immediate postwar made it necessary to accompany the redefinition of national monetary units with other reforms, aimed, among other things, at eliminating the large monetary overhangs accumulated from years of monetary financing of budget deficits accompanied by price fixing. By contrast, the economic conditions of the 12 EC countries at present do not seem to

require any drastic monetary adjustment.¹

Yet, a more fundamental objection to the "laissez faire" strategy is that it might not achieve its stated objective, the adoption of a single currency, if markets do not respond in the intended way to the incentives laid out by the government, like for the examples those described in the two UK proposals.²

In this paper I do not plan to criticize currency reforms "from the bottom up". Instead, my more limited objective is to describe the problems of the alternative reform strategy, where national moneys are substituted with a single currency by law.³ The rest of the paper is organized as follows. Section 2 contrasts "neutral" and "nonneutral" currency reforms, and traces the effects of the choice of the conversion rates of national currencies into a single currency on relative prices. Section 3 discusses the policy questions, with reference to the case of the EC countries. These questions include the choice of the conversion rates and the desirability of mandating conversion rates on certain private nominal contracts outstanding at the time of the reform.⁴ Section 4 contains a few concluding remarks.

2 Rates of Conversion and Rates of Exchange

For the purposes of this paper, I define a currency reform as the replacement of several national moneys with a single one. The rate of conversion of national currencies is the rate of exchange of the national currencies vis-à-vis the new, common numeraire. Holders

¹Drastic fiscal adjustments might be desirable in some EC member countries.

²There are reasons to doubt that this strategy would lead to the adoption of a single currency. Suffices here to mention that, in the presence of "thick market" externalities that presumably characterize money demand and currency substitution in an integrated economic area, the market coordination needed to adopt a single currency might not be easily accomplished.

³This exercise might help to clarify what would happen in stage three of Delors plan (Committee for the Study of Economic and Monetary Union, 1989), which European governments have agreed to start in 1997. According to the Delors plan, during stage three exchange rates are irrevocably fixed, monetary policy is implemented solely by the European central bank, official foreign exchange reserves are pooled, and "preparations of a technical or regulatory nature" are made for the transition to a single Community currency. These preparations are not described in any further detail in the Report.

⁴I do not discuss, however, the intra EC wealth distribution arising from the reform, and the incentive that governments might have to bargain on it. For an analysis of these issues, see Chang (1991).

of cash balances can obtain from the central banks or the banking sector new banknotes by presenting the old banknotes, at a rate of exchange equal to the rate of conversion. All outstanding nominal assets and liabilities are also rewritten.

I consider first the case of a single country, under a floating exchange-rate regime, which substitutes the national currency with another currency (new or existing). Let c represent the rate of conversion of the new currency and the old currency, that is, the price of one unit of the new currency in terms of the old currency. Let P , M and E denote the domestic price level, the stock of money balances and the nominal exchange rate (price of an arbitrary foreign currency in terms of the domestic currency). I use two superscripts: the superscript o denotes those variables in terms of the old currency, while the superscript n denotes those variables in terms of the new currency.

In a single-country currency reform, authorities announce c . This is the rate at which the central bank—or commercial banks under the instruction of the central bank—will exchange old banknotes for new. Authorities could also require that all, or a subset of, outstanding nominal contracts be rewritten at the announced rate, although this additional requirement is not, strictly speaking, the monetary reform, but a form of income policy that I will discuss in more detail below.

Given our notation, the effect of the currency reform on the nominal money stock is:

$$M^n = \frac{M^o}{c} \quad (1)$$

What will be the equilibrium response of prices and the exchange rate? Suppose that, free from the enforcement of the government, the private sector adopts prices in terms of the new currency by applying the same factor as the government, and in the foreign exchange market traders exchange the new currency with foreign moneys adopting the same rule:

$$cP^n = P^o \quad (2)$$

$$cE^n = E^o \quad (3)$$

This would clearly be an equilibrium, because all real variables are

the same as before the currency reform was announced:

$$\frac{M^n}{P^n} = \frac{M^o/c}{P^o/c} = \frac{M^o}{P^o} \quad (4)$$

$$\frac{P^w E^n}{P^n} = \frac{P^w E^o/c}{P^o/c} = \frac{P^w E^o}{P^o} \quad (5)$$

Where P^w stands for prices of rest-of-the-world goods, in terms of rest-of-the-world currency.

Whether this will indeed be the equilibrium chosen by the private sector depends on the nature of the equilibrium before the reform, and on whether the reform leads agents to revise expectations. If producers had no unfulfilled desire to change prices before the reform, and if the reform does not lead to a revision expectations, then there would be no incentive to apply a conversion rate that differs from the official one, that is, there would be no incentive to change relative prices. On the other hand, if the reform came as a surprise, leading agents to revise expectations, then changes in relative prices are to be expected. Two illustration of this phenomenon are:

- changes in inflationary expectations in the presence of perfectly flexible wages and prices, leading to changes in the demand for real money balances;
- changes in inflationary expectations in the presence of multi-period wage contracts. If wage contracts are written at a time when the currency reform is not expected, they discount a given loss of purchasing power that does not occur as a result of the reform. Thus the reform ends up changing real wages.

In summary, if the currency reform does not lead agents to want to change relative prices, real variables are independent of the chosen rate of conversion. Hence, governments are unconstrained in their choice of the rate of conversion of the old currency with the new currency.

The choice of the rate of conversion is not unconstrained in the case where several countries join in a currency reform that replaces their national moneys with a single one. Consider now two countries, which I call the domestic and the foreign country. Prices, moneys, exchange rates and the conversion rate of the foreign country are

denoted by an asterisk. When the two old currencies are substituted by a single, new currency, the following is true by definition:

$$E^n = E^{*n}, P^n = P^{*n} \quad (6)$$

Consider now the equilibrium described above, where the conversion rates announced by the governments were also used by the private sector to set the new prices and the new exchange rate. Applying that rule to exchange rates we get

$$\frac{E^{*o}}{c^*} = \frac{E^o}{c}, \quad (7)$$

that is,

$$\frac{c}{c^*} = e^o \quad (8)$$

where e^o is the (old) bilateral exchange rate, the price of the foreign currency in terms of the domestic currency before the reform. Equation (8) says that, when two countries introduce a new, single currency, the rates of conversion determine the rate of exchange between the two currencies at the time of the reform. If conversion rates do not satisfy (8) nominal exchange rates among the currencies participating in the reform are changed at the time of the reform.

The natural question at this point is about the effects of such exchange-rate changes. Consider first the case where the conversion rates apply only to the exchanges of currency. The effect of the currency reform depends on the degree of price flexibility at the time of the reform. With perfectly flexible prices, the exchange-rate change that occurs at the time of the reform will only amount to a tax on the holders of cash balances denominated in the depreciating currency. If prices were not perfectly flexible, the exchange-rate change would affect directly the relative valuation of the goods and services whose prices do not move freely at the time the reform is implemented.

The degree of price flexibility is one of the central questions in macroeconomic theory. Empirical evidence generally suggests that, especially in the second postwar period, aggregate price indices have adjusted to changes in the state of the economy apparently only to a limited extent.⁵ Failure of prices and wages to adjust is ascribed

⁵See Mussa (1986) for evidence on price stickiness in open economies, and Mankiw and Romer (1991) for a collection of theoretical essays on sticky prices.

to two distinct sets of phenomena: long term contracts and various kinds of adjustment costs. In the event of a currency reform, and absent government restrictions, long term contracts which specify a given payments schedule in nominal terms have to be re-written, hence this source of nominal rigidity would be absent. The once-and-for-all nature of the reform suggests that also the rigidities arising from menu costs should not be important: agents would take the opportunity of changing the unit of account to set their relative prices right. Hence my maintained assumption is that at the time of a currency reform the degree of wage and price flexibility is highest.

With flexible prices, the channels through which exchange-rate changes affect the real economy are the wealth and substitution effects of the changes in the real stock of money. In the standard two-sector model,⁶ an exchange-rate change—say, a devaluation of the domestic currency—leads to a decrease in spending, a fall in output and the relative price of nontraded goods, an increase in output of traded goods and a trade balance surplus (or a fall in the trade-balance deficit). The fall in spending arises from the decrease in the real value of wealth brought about by the nominal exchange-rate devaluation. The effect of the devaluation on the relative price of nontraded goods (the real exchange rate) equals to the change in spending on nontraded goods arising from the devaluation, divided by the absolute value of the slopes of the (general equilibrium) demand and supply functions for nontraded goods. As the discussion in the next section will argue, the crucial parameter in this expression appears to be the effect of the exchange-rate devaluation on spending in nontradeables.

In the model described above, changes in the stock of real money balances do not have any impact on marginal rates of substitution among any goods. This is of course a simplifying assumption. Models of money in the utility function⁷ can be parametrized in such a way that a change in real money balances changes the marginal rate of substitution between traded and nontraded goods.

The last channel of transmission of exchange-rate changes to the real economy, typically neglected in the traditional open-economy

⁶ See, for example, Dornbusch (1973).

⁷ As Feenstra (1986) shows can arise from transactions-costs models of money demand *à la* Baumol (1952) and Tobin (1956).

macroeconomic models, is the financial system. Financial intermediaries are subject to reserve requirements, often in the form of cash. A currency devaluation is a tax on the reserves held by financial intermediaries. In the absence of concomitant rules adjusting reserve requirements, a currency depreciation leads to increased demand for reserves, and to a contraction of credit. See, for example, Greenwood and Williamson (1989) and Jefferson (1990).

3 The Policy Questions

3.1 *The Choice of Conversion Rates*

Historically, the conversion rate chosen in a currency reform is either a power of 10 or the spot exchange rate of a reference currency. The former is the case of the most recent currency reform in Argentina, the so-called Austral Plan of June 1985.⁸ Currency and sight deposits were exchanged at a rate of 1000 to 1 (1000 pesos for 1 austral). The latter is the case of Nicaragua, where the new currency, the Cordoba Oro, immediately after the reform of September 1990 exchanged at par with the US dollar: the conversion rate was 9,108,715,994.4 Cordobas for 1 Cordoba Oro, not a power of 10. These choices reflect two objectives of policymakers: simplification of the operation and an attempt to bolster the credibility of the new currency and the new monetary policy. The Austral conversion rate is one that simplifies calculations of new prices. The Cordoba Oro conversion rate is meant to induce the public to think that the parity with the dollar is there to stay. In the intention of policymakers, the currency reform in Nicaragua was meant to be part of a dollarization program, which did not take place.

In the case of European countries the special nature of the currency reform, which involves the creation of a single currency out of several national currencies, does not allow to use conversion rates that—for all currencies—are powers of 10. The reason is that, given the existing bilateral exchange rates of European moneys, the consistency condition in equation (8) would not be satisfied. The discussion in the previous section has shown that, if the reform did not change in a significant way expectations, the official conversion rate

⁸See Heymann (1990) for a description and analysis of the plan.

would be used to translate private nominal contracts and prices, but only if the exchange rate is not modified. By contrast, if the currency reform affects the exchange rate, it is in the interest of the private sector not to adopt the official conversion rate, and therefore the benefit of round numbers in terms of simplifying price calculations is lost.

Table 1 illustrates the size of exchange-rate changes that would be induced by the selection of a set of rounded conversion rates. The table reports the spot rate of the ECU on August 2, 1991, and a set of rounded conversion rates for the eleven European currencies. The implied and actual Deutsche mark rates are also shown, together with the percent implicit devaluations of national currencies relative to the mark. To understand how the table is constructed, note that if the first two sets of numbers on the left were equal (conversion rates equal to spot ECU rates), the next two columns would be equal, and the last column on the right would be a column of zeros.

The conversion rates were chosen from an arbitrary set of round numbers close to the ECU spot exchange rates. Note that the implied exchange-rate changes, except in the case of the lira and the Irish punt, are not large. Thus the table suggests that, in several countries, the public could use as a rule of thumb the official conversion rate. Note, however, that Belgium and Luxembourg's conversion rate of 37, the UK's of 0.6, Ireland's of 0.7, and Germany's of 1.8 do not appear to much facilitate price translations.⁹

An additional important question in the choice of conversion rates is the selection of the numeraire. European parliaments could choose the ECU, as in the example of table 1, thus forcing all residents of the countries participating to the reform to adopt a new unit of account. Alternatively, they could choose the Deutsche mark—assuming that Germany participates to the currency reform. The choice of the Deutsche mark would save the cost of conversion at least to the residents of Germany, and could also be a psychological device, given the reputation of the German currency as a better store of value than most other European currencies. It is however

⁹The problem of finding the round conversion rates that maximize an objective function defined in terms of deviations of the implied bilateral rates from target rates can be formally setup as an integer programming problem. The numbers in the table are the result of some experiments with such a programming problem.

highly unlikely that European parliaments will accept to keep the name "Deutsche mark" for the new European currency. Hence the adoption of the DM could be accompanied by a change of name: say, from DM to ECU. The new ECU would thus not equal the ECU currently in existence.¹⁰ In the example of the table, by contrast, the old and the new ECU are approximately identical.

3.2 *How to Do a "Last Realignment"*

A crucial aspect of the plan of gradual monetary reform laid out in the Delors Report is the fact that it calls for convergence of inflation and at the same time allows exchange-rate realignments. If expectations are an important determinant of inflation, an exchange-rate devaluation accommodates inflation differentials and simply validates the public's expectations that the exchange-rate targets are not to be believed. Thus inflation convergence and exchange-rate devaluations are quite unlikely to go together. For this reason, it has been advocated that, if at all, exchange-rate devaluations can only occur at the very last step of the gradual monetary reform, when national currencies are replaced by a single currency: from this time on the credibility of the weak currencies is no more an issue, and the expectations of wage and price setters will be formed on their perception of the anti-inflationary stance of the European central bank.¹¹

What would be the purpose of a last exchange-rate realignment? If price and wage setters believe that there is a positive probability that the currency will be depreciated, wages and prices increase at a rate that is not consistent with a fixed nominal exchange rate, building up misalignments of relative prices. Giovannini (1990b), Dornbusch (1991) and Froot and Rogoff (1991) draw attention to these misalignments. The last authors also provide evidence from regression analyses which they interpret as indicating that the movements of real exchange rates are due to the credibility problem described above.

¹⁰This would require that all outstanding ECU contracts be translated using the ECU/DM exchange rate.

¹¹See Giovannini (1990a,b) for a discussion. Froot and Rogoff (1991) argue that the anticipation of the last devaluation destabilizes exchange rates even in the early stages of the monetary reform.

Having explained what might motivate an exchange-rate realignment at the time of a currency reform, we now need to ask how such a realignment can induce the change in relative prices that is deemed desirable. In the previous section I have argued that at the time of a currency reform prices are likely to be highly flexible, and that an exchange-rate depreciation in that case becomes a tax on nominal money balances. How much can that tax affect relative prices? As I pointed out in section 2 the transmission is through the wealth effect of the exchange-rate change. Table 2 shows that such an effect is insignificant. The table reports the percent share of high-powered money in total wealth, as in the IMF MULTIMOD model. In that model, the long-run elasticity of consumption with respect to financial and human wealth is unity (consumption is a constant fraction of total wealth). Thus the elasticity of spending to a change in the real value of high-powered money is just the fraction of high-powered money in total wealth. The numbers in the table imply that such elasticity is nearly insignificant.

No empirical estimates on the effects of a change in required reserves on the supply of credit and the real economy are, to my knowledge, available.¹² Reserve requirements differ widely across European countries, and interest rates paid on reserves differ as well. The effect of an exchange-rate devaluation on the real value of reserves is of course independent on whether they pay interest, since they are fixed in nominal terms. The equilibrium effects of the devaluation on credit supply, by contrast, does depend on whether the interest paid on reserves approximates a market rate, which would in part embody expectations of such devaluation, or is fixed by law.

The above discussion has indicated that, unless the public displays some form of money illusion, and wrongly applies the official conversion rates to translate outstanding nominal contracts, an exchange-rate devaluation at the time of the currency reform has little hope of significantly affecting relative prices. Perhaps for this

¹²Accounting relations imply:

$(\text{Credit to nonbank sector})/(\text{non-bank deposits}) = (1 - \text{req.res.ratio}) - \text{req.res.ratio} \times (\text{interbank deposits})/(\text{non-bank deposits})$. Given average required reserves and the size of interbank deposits in EC countries the change of credits to the nonbank sector induced by a change in required reserves is a very small number.

reason all countries mandate conversion rates for a large number of nominal contracts outstanding at the time of the reform.

Mandating conversion rates is a type of incomes policy: private parties are imposed a new set of real payments in their outstanding nominal contracts. How should the conversion rates for prices and wages be chosen? If the source of misalignment that governments intend to correct is the lack of credibility of the fixed exchange rate, the answer to this question is straightforward: a conversion rate which induces exactly the same exchange-rate depreciation that was expected by wage and price setters and that gave rise to the relative-price distortion has the effect of accommodating exchange-rate expectations, thus eliminating distortions.

This clearcut policy rule, however, conceals a number of serious practical problems, familiar to observers of actual experiences of countries which enacted incomes policies:

- What exactly should be such conversion rates? A solution of this problem requires knowledge of equilibrium relative prices across countries. Widely different productivity performances across countries, the difficulty of measuring productivity in the services and government sectors, and the occurrence of structural changes in individual industries, all make the exercise of extracting the expectations component in the dynamics of prices and wages a daunting task.
- Mandatory conversion rates can be enforced easily in some sectors—consider for example public-sector employees—but can be an administrative nightmare elsewhere in the economy.
- It is not possible to avoid that those who feel hurt most by this policy will attempt to re-gain the lost purchasing power as soon as they are allowed to.

The question of the rate of conversion of long term debt deserves special attention: it is particularly relevant for countries that have substantial stocks of public debt denominated in long-term fixed-rate securities. If expected inflation and interest rates decrease after the currency reform—even in the absence of exchange-rate changes—long-term lenders have a capital gain, matched by a capital loss of long-term borrowers. This wealth re-distribution can be

avoided with two measures, which can be shown to produce equivalent wealth transfers. The first measure is mandating a conversion rate for long-term nominal debt that decreases the real value of the principal. The second measure is allowing long-term lenders and borrowers to mark-to-market the terms of their contract. Both devices eliminate the capital gain of lenders.

In general, the proposition that surprises induce misallocation of resources can be applied to this problem as well, and suggest that fulfilling expectation of exchange-rate changes minimizes distortions. As pointed out above, however, these policies require accurate estimates of private expectations.

Both asking private parties to recontract (or mark to market) and mandating conversion rates are policies whose feasibility and social costs are determined, among other things, by legal factors. If existing contracts have clauses covering the eventuality of a change in national currency it seems that mandating conversion rates might encounter substantial resistance and litigation. If, on the other hand, such eventuality is not covered, parties might be reluctant to recontract. In this case mandating conversion rates could meet less resistance.

4 Concluding Remarks

This paper has discussed the problems of the substitution of several national currencies with a single currency. The focus has been the plan for Economic and Monetary Union of European countries. With reference to the pattern of spot exchange rates of European currencies, I have analyzed the question of the choice of the rate of conversion of each national currency to the single European currency.

A number of observers have advocated the desirability of a last exchange-rate realignment to occur at the time the single European currency is introduced. I have shown that an exchange-rate realignment alone is very unlikely to produce the effects that are called for by its advocates. A significant correction of relative price distortions can only occur if authorities mandate conversion rates on a range of outstanding nominal contracts, a measure that is effectively an

incomes policy.

Exchange-rate changes at the time of the currency reform might be desired by governments for two sets of reasons. On one hand, governments might want to affect the allocation of resources by changing the exchange rate, in pursuit of objectives that are not directly linked to monetary policy objectives. These types of exchange-rate changes have been ruled out by the Delors Report.

Another reason why governments could pursue exchange-rate changes is to offset the distortions created by the lack of credibility of the monetary convergence plans, discussed above in section 3.2. The discussion in that section has argued that such exchange-rate changes, if chosen to fulfill expectations, minimize the welfare costs of expectations errors. Such conclusion suggests an additional device to smooth out the transition to a single currency: announcing in advance—say two years ahead of time—the rates of conversion of the currencies participating to the reform and the new single currency. These conversion rates, which could be a set of round numbers similar to those in table 1, could be declared by the European governments—and endorsed by the European Commission—only as intentions, in order to allow for adjustments which might be called for in case credibility problems arise, perhaps due to unforeseen exogenous shocks. If these conversion rates are credible, economies will have the time to adapt to them and the final reform would give rise to minimal disruptions. If they are not, governments will have to, again, fulfill expectations.

TABLE 1:
THE EFFECT OF ROUNDING CONVERSION RATES

Country	ECU Rate	Conv. Rate	Implied DM Rate	Actual DM Rate	Percent Deviation
UK	0.686789	0.6	0.333333	0.339775	-1.90
IRL	0.755968	0.7	0.388888	0.374000	3.98
GER	2.021302	1.8	1.000000	1.000000	0.00
NED	2.278833	2.0	1.111111	1.127408	-1.45
FRA	6.871380	6.0	3.333333	3.399482	-1.95
DEN	7.824769	7.0	3.888888	3.871152	0.46
BEL	41.62359	37.	20.55555	20.59246	-0.18
SPA	126.6148	110	61.11111	62.64021	-2.44
POR	174.8539	160	88.88888	86.50557	2.76
GRE	222.3606	200	111.1111	110.0086	1.00
ITA	1510.901	1500	833.3333	747.4889	11.48

Note: The first column contains the name of the country (Belgium and Luxembourg under BEL). The second column contains the price of 1 ECU in terms of that country's currency (from *The Wall Street Journal*, August 3, 1991. Exchange rates on August 2, 1991). The third column contains a set of conversion rates of the 11 currencies into the new single currency. The fourth column contains the implied bilateral rates for the Deutsche mark. The fifth column contains the actual bilateral rates for the Deutsche mark on August 2, 1991. The last column contains the percent difference of the fourth and the fifth column (the implied percent depreciation of each currency relative to the Deutsche mark).

TABLE 2:
HIGH-POWERED MONEY AS PERCENT OF TOTAL WEALTH
Averages: 1970-1989

Country	High-Powered Money: % of Total Wealth
France	0.32
Germany	0.49
Italy	0.68
United Kingdom	0.23

Source: International Monetary Fund, *MULTIMOD* model.

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