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Monetary Union and Its Costs

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ABSTRACT

The issue of whether a nation increases its welfare by relinquishing its national currency and adopting some currency of a wider area leads us to analyse costs and benefits of having one currency. The costs of a monetary union derive from relinquishing an instrument of economic policy. The most benefits of a monetary union derive from the elimination of risk coming from the uncertain future movements of the exchange rates (Eijffinger and De haan 2000).

There are several ideas about the effects of the openness of a country on the costs of the monetary union. The economic literature of monetary union introduces two views about the relation between the degree of openness and the occurrence of asymmetric shocks: The European Commission view and the Krugman view (1991). According to the EC view, There is a negative relationship and we can conclude that the cost of a monetary union (as a percentage of GDP) reduces in the relatively open than in the relatively closed economy. Because the openness of a country reduces the probability that asymmetric shocks occur. But on the second view, the costs of a monetary union increase with the degree of openness of countries (De Grauwe 2000).

The present paper analyses how openness affects the cost of a monetary union by the effectiveness of the exchange rate in dealing with asymmetric shocks.

We can conclude that the devaluation is likely to be more costly in the open economy because of the more reduction in real output involved. Thus the loss of the exchange rate instrument is likely to be less costly for the relatively open economy than for the relatively closed one. We can therefore derive the conclusion that the cost of a monetary union most likely declines with the degree of openness of a country.

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1. Introduction

The issue of whether a nation increases its welfare by relinquishing its national currency and adopting some currency of a wider area leads us to analyse costs and benefits of having one currency. The costs of a monetary union derive from relinquishing an instrument of economic policy. This implies that a nation joining a monetary union will not be able any more to change the price of its currency. The most benefits of a monetary union derive from the elimination of risk coming from the uncertain future movements of the exchange rates. Exchange rate uncertainty introduces uncertainty about the future prices and the future output (Dornbusch 1982, 1987, De Grauwe 2000).

The economic literature of monetary union has identified several ideas about relationship between the benefits of a monetary union (MU) and the openness of a country in one hand, and the costs of a MU and the openness of a country on the other hand.

The welfare gains of a monetary union are to increase with degree of openness of an economy. Since, whenever we exchange currency, we experience the costs of exchanging one currency into another. So, when countries move to a monetary union, These costs disappear. The transaction costs will be more in open economies than in relatively closed economies.

We can conclude the elimination of transaction costs will weigh more heavily in open economies.

The Decisions of the economic agents about production, investment, and consumption are based on the price system information. If the price system become more uncertain, The quality of these decisions will decline. A common currency will eliminate the exchange risk, and thereby will lead to a more efficient working of the price mechanism. Economic agents in open countries are more subject to decision errors because they face large foreign markets with different currencies. Eliminating these risks will lead to a larger welfare gain in the relatively open than in the relatively closed economies. Now, we can represent a positive relationship between the benefits of a monetary union (as a percentage of GDP) on the vertical axis and the openness of the country (measured by the percentage of trade in the GDP of the country) on the horizonal axis.

There are several viewson about the effects of the openness of a country on the costs of the monetary union. We introduce one of these which is the most important. This is the relation between the degree of openness and the occurrence of asymmetric shocks. There are two views: The European Commission view and the krugman view (1991). According to the EC view, there is a negative relationship and we can conclude that the cost of a monetary union (as a percentage of GDP) reduces in the relatively open than in the relatively closed economy. Because the openness of a country reduces the probability that asymmetric shocks occur. But according to the second view, the costs of a monetary union (The costs of relinquishing the exchange rate instrument) increase with the degree of openness of countries.

If we accept the EC view, the intersection point of the benefit and the cost lines determines the critical level of openness for a country to join a monetary union. To the right of that point, the country is better off relinquishing its national money and replaces it with the new common currency that comes out of the monetary union.

Now, we can draw some conclusions about the importance of costs and benefits. The shape and the position of the cost schedule depend on one's view about the probability that asymmetric shocks occur. By the downward sloping cost line (EC view), as trade integration within the countries proceeds, a country will move to the right of intersection point. Thus, in this view, monetary unification will over time be beneficial for all countries.

There is also a pessimistic view which one can drive from the Krugman analysis. By the upward sloping cost line, we have to consider two possibilities. One is represented by a flatter slope line than the slope of the benefit line. In this case more integration leads to more asymmetric shocks.

As a result, despite the increase in asymmetric shocks, more integration will lead us to the right of intersection point.

The second case is represented by a steep line. Here integration brings us increasingly farther away from the benefit line. Thus, it implies that a lowering of trade integration can bring us to the left of intersection point, where the benefits exceed the costs. If the countries could go back and disintegrate, monetary union would become attractive! (De Grauwe 2000)

This article analyses how openness affects the cost of a monetary union by the effectiveness of the exchange rate in dealing with asymmetric shocks.

2. Asymmetric shocks and devaluation

Mundell (1961) in his celebrated article on optimum currency areas developed the case of a demand shift. Let us suppose that consumers shift their preference away from country A to country B products. The demand shift is represented by an upward movement of the demand curve in country B, and a downward movement in country A. Both countries will have an adjustment problem. Country A is plagued wth unemployment and a current account deficit. In country A the value of domestic output has declined as a result of the shift in aggregate demand. If spending by country A residents does not decline by the same amount, country A will have a current account deficit. Country B experience a boom which also leads to upwards pressures on its price level, and it accumulates current account surpluses.

There are two mechanisms that will automatically bring back equilibrium in two countries, without the countries having to resort to devaluations and revaluations. One is based on wage flexibility, The other on the mobility of labor. If these conditions are not satisfied, however, the adjustment problem will not vanish.

This dilemma can only be solved by revaluing the money of country B against the money of country A. The revaluation of the money B reduces aggregate demand in country B, so that the demand curve shifts back to the left. In county A the opposite occurs. The devaluation of the money A increases the competitiveness of the country A products. This shifts the country A aggregate demand curve upwards. The effects of these demand shifts is that country A solves its unemployment problem, and that country B avoids having to accept inflationary pressures. At the same time the current account deficit of country A and surplus of country B tend to disappear (De Grauwe 1983).

New, Let us take the case of country A. As a result of the devaluation aggregate demand in country A shifts back upwards and corrects for the initial unfavorable demand shift. It is unlikely that this new equilibrium point can be sustained. The reason is that the devaluation raises the price of imported goods. This raises the cost of production directly. It also will increase the nominal wage level in country A as workers are likely to be compensated for the loss of purchasing power. Thus, the aggregate supply curve will shift upwards. All this means that price increases and output declines. The initial favorable effects of the devaluation tend to disappear over time. It is not possible to say here whether these favorable effects will disappear completely. This depends on the openness of the economy, on the degree to which wage- earners will adjust their wage claims to correct for the loss of purchasing power.

Both the demand and the supply effects of a devaluation differ between two countries, one relatively open, the other relatively closed.

As far as the demand- side effects are concerned, the same devaluation has a stronger effect in the relatively open economy than in the relatively closed one.

* The two countries also differ with respect to the supply-side effects of the devaluation. One can expect that in the relatively open economy, the upward shift of the supply curve following the devaluation is more pronounced than in the relatively closed economy. This has to do with the fact that the more open economy imports more (as a percent of total consumption) so that the CPI increases more, leading to a stronger wage-price spiral than in the relatively closed economy.

We now arrive at the following conclusion. The combined demand and supply effects of a devaluation in the two countries are such that we cannot say a priori in which country the devaluation is most effective in stimulating output.

The effects of devaluation in stimulating output will be discussed in the next section.

3. contractionary devaluation

Unit the publication of a paper by krugman and Taylor (1978), the dominant view was that real devaluation was likely to ensure the net expansionary effect on output. The krugman-Taylor paper formalized several channels through which a nominal devaluation could cause real output to contract.

Lizondc and Montiel (1989) adopt a fairly general analytical framework to survey the channels through which devaluation has been perceived to affect domestic economic activity.

They consider a small open economy producing both traded and nontraded goods using homogeneous labor, sector-specific capital, and imported inputs.

Their analysis, however, is subject to the general limitations that characterize the literature on contractionary devaluation. For example, where the exchange rate is the only exogenous nominal variable, a nominal devaluation can have no long-run real effects. Thus, devaluation can be neither expansionary nor contractionary in the long run and for this reason, the analytical literature on contractionary devaluation has concerned itself with impact effects[1] on output.

In a small open economy producing traded and nontraded goods, the demand curve facing the traded-goods sector is given by the law of one price.

$$P_t = EP_t^* \tag{1}$$

Where P_t is the domestic-currency price of traded goods. E is the nominal exchange rate (units of domestic currency per unit of foreign currency). And P_t^* is the foreign-currency price of traded goods, which we take to be unity.

Devaluations produce changes in real output. Because we are discussing impact effects, we will be interested primarily in the change in real output at the initial production levels of nontraded and traded goods. To obtain the endogenous change in output, it would be necessary to solve the complete model, including demand and supply factors simultaneously. The discussion of the impact effect will be sufficient to illustrate the forces at work.

The effect of a real devaluation on real output for given production levels of nontraded and traded goods is ambiguous.

$$\frac{dy}{de} = e^{-1}(\alpha - \beta)(y_n e^{-\beta} + y_t e^{1-\beta}) \gtrless 0 \tag{2}$$

Where α is the share of traded goods in total output, β is the share of traded goods in consumption, y_n is the production of nontraded goods, y_t is the production of traded goods and $e = \frac{P_t}{P_n}$ is the real exchange rate, where P_n is the domestic- currency price of nontraded goods. Equation (2) shows that the impact effect on real output depends on whether traded goods have a higher share in consumption or in total output.

The presence of imported input is an additional factor that may have a negative effect on the real output after a devaluation. The modification that imported inputs introduce in the previous analysis is that they must be subtracted from domestic output. Now, we can write:

$$y = y_n e^{-\beta} + y_t e^{1-\beta} - m e^{1-\beta} \tag{3}$$

Where m is the volume of imported inputs. We calculate the effect of a devaluation on real output for given production levels of traded and

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1- *"Impact effects" refer to effects conditional on the initial values of the state variables.*

nontraded goods. This is done by differentiating equation (3) with respect to e, with y_n and y_t kept constant, which yields[1]:

$$\frac{dy}{de} = e^{-1}(\alpha-\beta)(y_n e^{-\beta} + y_t e^{1-\beta}) + e^{-\beta} m \left[\sigma - (1-\beta)\right] \tag{4}$$

Where σ is elasticity of substitution between imported input and labor according to a CES production function.

The presence of imported inputs will thus contribute to a reduction in real output when $(1-\beta)>\sigma$. It is clear that the net effect is ambiguous, and a variety of result are possible. For example, if there is no substitution in production, $\sigma=0$, and $\beta>\alpha$, the net effect is necessarily negative.

4. Concluding remark

To conclude the paper, we must suppose the value of some parameters. For example, suppose there is no substitution in production, $\sigma=0$ [as in Krugman and Taylor (1978)], and α is constant. We can expect that the relatively open economy imports more (as a percent of total consumption) so that β increases more, leading to more reduction in real output.

From this discussion of the effectiveness of a devaluation in open and relatively closed economies one can conclude that the devaluation is likely to be more costly in the open economy because of the more reduction in real output involved. Thus the loss of the exchange rate instrument is likely to be less costly for the relatively open economy than for the relatively closed one. We can therefore derive the conclusion that the cost of a monetary union most likely declines with the degree of openness of a country.

The relationship between the cost of a monetary union (The cost of relinquishing the exchange rate instrument) and the degree of openness is negatively sloped. This cost is expressed as a percent of GDP. The openness is expressed as the trade share in the GDP of the country. We will therefore conclude that the cost of the monetary union declines with openness.

Appendix

In this appendix we derive the relations that are used in our analysis of

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1- In the appendix, you can see the derivation of relations.

contractionary devaluation. We need some definitions. The price level will be denoted by P, with

$$P = E^{\beta} P_n^{1-\beta} \tag{1}$$

Where β is the share of traded goods in consumption. Real output is equal to:

$$Y = \frac{P_n y_n + P_t y_t}{P} = \frac{P_n y_n + P_t y_t}{P_t^{\beta} P_n^{1-\beta}} = \frac{y_n + \left[\frac{P_t}{P_n}\right] y_t}{\left[\frac{P_t}{P_n}\right]^{\beta}} = y_n \left[\frac{P_t}{P_n}\right]^{-\beta} + y_t \left[\frac{P_t}{P_n}\right]^{1-\beta}$$

$$y = y_n e^{-\beta} + y_t e^{1-\beta} \tag{2}$$

Where y_n is the production of nontraded goods, and y_t is the production of traded goods. Differentiating real output equation with respect to e, with y_n and y_t kept constant, yields

$$\frac{dy}{de} = -\beta y_n e^{-\beta-1} + (1-\beta) y_t e^{-\beta}$$

$$= y_t e^{-\beta} - \beta (y_n e^{-\beta-1} + y_t e^{-\beta})$$

$$= e^{-1}(y_t e^{1-\beta}) - \beta e^{-1}(y_n e^{-\beta} + y_t e^{1-\beta})$$

$$= e^{-1}(y_t P_t^{1-\beta} P_n^{\beta-1}) - \beta e^{-1}(y_n e^{-\beta} + y_t e^{1-\beta})$$

$$= e^{-1}\left[\frac{P_t y_t}{P_t^{\beta} P_n^{1-\beta}}\right] - \beta e^{-1}(y_n e^{-\beta} + y_t e^{1-\beta})$$

$$= e^{-1}\left[\frac{P_t y_t y}{Py}\right] - \beta e^{-1}(y_n e^{-\beta} + y_t e^{1-\beta})$$

$$= e^{-1}\left[\frac{P_t y_t}{Py} - \beta\right](y_n e^{-\beta} + y_t e^{1-\beta})$$

$$\left[\frac{dy}{de}\right] = e^{-1}(\alpha - \beta)(y_n e^{-\beta} + y_t e^{1-\beta}) \tag{3}$$

With the presence of imported inputs, we can define real output as follows.

$$y = y_n e^{-\beta} + y_t e^{1-\beta} - m e^{1-\beta} \tag{4}$$

Where m is the volume of imported inputs that are used in the ontraded goods sector. Differentiating real output equation with respect to e, with y_n and y_t kept constant, yields

$$\frac{dy}{de} = e^{-1}(\alpha - \beta)(y_n e^{-\beta} + y_t e^{1-\beta}) - (1-\beta)e^{-\beta} m - e^{1-\beta}\left[\frac{dm}{de}\right] \tag{5}$$

Now, we must find $\frac{dm}{de}$ and replace it in the above relation. We define α_{ij} as the quantity of input i is used to produce a unit of product j. The conditions of unit cost of production and full employment of inputs are assumed to be determined by the following expressions:

$$\alpha_{ln} w + \alpha_{mn} E = P_n \tag{6}$$

$$\alpha_{lt} w + \alpha_{mt} E = P_t \tag{7}$$

$$\alpha_{ln} y_n + \alpha_{lt} y_t = L \tag{8}$$

$$\alpha_{mn} y_n + \alpha_{mt} y_t = M \tag{9}$$

Where L is labor input and W is wage rate. Differentiating the relation 6 yields:

$$da_{ln}w + a_{ln}dw + da_{mn}E + a_{mn}dE = dPn$$

$$\frac{da_{ln} \cdot a_{ln} \cdot w}{a_{ln} \cdot P_n} + \frac{a_{ln} \cdot w . dw}{P_n . w} + \frac{da_{mn} . a_{mn} . E}{a_{mn} . P_n} + \frac{a_{mn} . E . dE}{E . P_n} = \hat{P}_n$$

$$\theta_{wn} \cdot \hat{a}_{ln} + \theta_{wn} . \hat{w} + \theta_{mn} \cdot \hat{a}_{mn} + \theta_{mn} \cdot \hat{E} = \hat{P}_n$$

Where $\hat{P}_n = \frac{dP_n}{P_n}, \hat{E} = \frac{dE}{E}, \hat{w} = \frac{dw}{w}, \hat{a}_{mn} = \frac{da_{mn}}{a_{mn}}, \hat{a}_{ln} = \frac{da_{ln}}{a_{ln}}$ and θ_{ij} shows the cost share of input i in product j.

$$\theta_{wn} . \hat{w} + \theta_{mn} . \hat{E} = \hat{P}_n - [\theta_{wn} \hat{a}_{ln} + \theta_{mn} \hat{a}_{mn}] \tag{10}$$

Firms minimize their costs with respect to a specific production. In nontraded goods sector, They minimize the equation 6, with W and E are constant and change α_{in} so that the differentiation of unit cost of production equals zero. This yields:

$$\hat{a}_{ln}\,\theta_{wn} + \hat{a}_{mn}\theta_{mn} = 0 \tag{11}$$

The elasticity of substitution is specified as follows:

$$\sigma = \frac{\hat{a}_{mn} - \hat{a}_{ln}}{\hat{W} - \hat{E}} \tag{12}$$

We use the relations (11) and (12) to find $\hat{m}$.

$$\theta_{wn}\begin{cases}\theta_{wm}\,\hat{a}_{ln} + \theta_{mn}\,\hat{a}_{mn} = 0\\ -\hat{a}_{ln} + \hat{a}_{mn} = \left[\hat{w} - \hat{E}\right]\sigma_n\end{cases}$$

$$\overline{\left(\theta_{mn} + \theta_{wn}\right)\hat{a}_{mn} = \sigma_n\theta_{wn}\left[\hat{W} - \hat{E}\right]}$$

Where $\theta_{mn} + \theta_{wn} = 1$, thus, we can write:

$$\frac{da_{mn}}{a_{mn}} = \sigma_n\theta_{wn}\left[\hat{W} - \hat{E}\right] \tag{13}$$

We know that:

$$\frac{da_{mn}}{a_{mn}} = \frac{dm}{m}$$

This yields:

$$\frac{dm}{m} = -\sigma_n\theta_{wn}\left[\hat{E} - \hat{W}\right]$$

$$dm = -m\sigma_n\theta_{wn}\left[\hat{E} - \hat{W}\right]$$

$$\frac{dm}{de} = -m\sigma_n\theta_{wn}\left[\hat{E} - \hat{W}\right]\frac{1}{de}$$

$$\frac{dm}{de} = -e^{-1}m\sigma_n\theta_{wn}\left[\hat{E} - \hat{W}\right]\frac{e}{de}$$

Where $\frac{e}{de} = \left[\hat{e}\right]^{-1}$. So, we can write:

$$\frac{dm}{de} = -e^{-1}m\sigma_n\theta_{wn}\left[\hat{E} - \hat{W}\right]\left[\hat{e}\right]^{-1} \tag{14}$$

We can derive $\hat{a}_{ln}$ The same as $\hat{a}_{mn}$.

$$\hat{a}_{ln} = -\sigma_n\theta_m\left[\hat{W}-\hat{E}\right] \tag{15}$$

We can now substitute (15) and (13) into the relation (10). This yields:

$$\theta_{wn}.\hat{W}+\theta_{mn}.\hat{E}=\hat{P}_n-\left[\theta_{wn}\left[-\sigma_n\theta_{mn}\left[\hat{W}-\hat{E}\right]\right]+\theta_{mn}\left[\sigma_n\theta_{wn}\left[\hat{W}-\hat{E}\right]\right]\right]$$

$$\theta_{wn}.\hat{W}+\theta_m.\hat{E}=\hat{P}_n \tag{16}$$

However, $\hat{e}$ is not independent of $\hat{E}$ and $\hat{W}$. Because $e=\frac{E}{P_n}$ by definition and because P_n is equal to the unit cost of production, by profit maximization we obtain:

$$\hat{e}=\hat{E}-\hat{P}_n \tag{17}$$

We can now substitute (16) into (17). This yields:

$$\hat{e}=\hat{E}-\theta_{wn}\ \hat{W}-\theta_{mn}.\hat{E}$$

$$\hat{e}=\hat{E}-\theta_{wn}\ \hat{W}-(1-\theta)\ \hat{E}=\theta_{wn}\left[\hat{E}-\hat{W}\right] \tag{18}$$

Equation (18) indicates that a real devaluation can only be obtained if wages increase by less than the full amount of the nominal devaluation.

Now, We can substitute (18) into (14), this yields:

$$\frac{dm}{de}=\frac{-e^{-1}m\sigma_n\theta_{wn}\left[\hat{E}-\hat{W}\right]}{\theta_{wn}\left[\hat{E}-\hat{W}\right]}=-e^{-1}m\sigma_n \tag{19}$$

Now, we can substitute (19) into (5). This yields the solution for $\frac{dy}{de}$:

$$\frac{dy}{de}=e^{-1}(\alpha-\beta)(y_n e^{-\beta}+y_t e^{1-\beta})-(1-\beta)e^{-\beta}+e^{-\beta}m+e^{-\beta}m\sigma$$

$$\frac{dy}{de}=e^{-1}(\alpha-\beta)(y_n e^{-\beta}+y_t e^{1-\beta})+e^{-\beta}m[\sigma-(1-\beta)] \tag{20}$$

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