Rotating Slumps in a Monetary Union

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Revised, September 2010

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Abstract

Ever since it was created in 1999, the European Economic and Monetary Union (EMU) has experienced surprisingly large and persistent inflation differentials across member states causing substantial shifts in relative price levels. At the same time, member countries exhibited distinct non-synchronized output fluctuations, giving rise to a pattern of 'rotating slumps' (a term coined by Olivier Blanchard). This paper presents a stylized theoretical model of a monetary union which demonstrates how inflation differentials and relative output movements interact dynamically. A number of implications are derived from the model. In particular, national fiscal policies are shown to have an important role in containing internal macroeconomic disparities in a monetary union. An optimal fiscal policy rule is derived from the model to that purpose.

1. Introduction[1]

On the eve of the financial and economic crisis of 2008/09, the European Commission published a report to commemorate and celebrate the 10th anniversary of the final decision to introduce a single currency for the European Union. This report contains a comprehensive assessment of the experience of the first decade of EMU, setting initial hopes and fears against actual outcomes, taking stock of successes and failures. Not surprisingly, the Commission reaches the verdict that "the Euro is a clear success" without denying, however, that some initial expectations have been disappointed, in particular with regard to GDP growth and income distribution. [2]

Two years on, as Europe struggles to escape from the worst financial and economic crisis since the Great Depression, it has become obvious that the eurozone suffers from serious macroeconomic imbalances. The tensions associated with these imbalances have revived the old debate on whether or not the euro zone constitutes an optimum currency area. The key consideration in deciding this issue has traditionally been the frequency and extent of asymmetric shocks hitting the currency area and the ability of individual countries to cope with them after having given away their monetary policy autonomy. However, the actual experience of EMU up to 2008 has not been shaped by sharp asymmetric shocks, but rather by persistently diverging trends in a number of key macroeconomic indicators (Saint-Paul 2010). Most conspicuously, unit labor costs and price levels have shown a consistent pattern of divergence across the eurozone. This pattern has created large shifts in relative cost competitiveness which largely coincide with corresponding changes in net exports. Also, with a common nominal interest rate, the persistent inflation differentials have resulted in equally persistent real interest rate differentials.[3]

The large and systematic divergence of national price levels might appear somewhat puzzling in view of the expectation that the single currency would enhance the transparency of markets and prices and thereby foster the convergence of price levels and inflation rates. Here is what the anniversary report of the European Commission has to say on this phenomenon:

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1 I am grateful to two anonymous referees for valuable comments. Also, I have benefited from discussions at the 23rd Freiburg/Nagoya Joint Seminar in Nagoya and at research seminars of the Verein für Socialpolitik (Makroökonomischer Ausschuss), the University of Siena, and the Swiss National Bank.

2 European Commission (2008), p. 3.

3 All these developments have been widely documented. See e.g. European Commission (2008) or European Central Bank (2008).

> "*There have been substantial and lasting differences across countries* in terms of inflation and unit labour costs. The tendency for persistent divergences between euro-area member states has been due in part to a lack of responsiveness of prices and wages, which have not adjusted smoothly across products, sectors and regions. This has led to accumulated competitiveness losses and large external imbalances, which in EMU require long periods of adjustment. Essentially, this protracted adjustment reflects the fact that structural reforms have been less ambitious than in the run-up to the euro. As is the case within the EU as a whole, product markets within the euro area are still only partially integrated and cross-border provision of services remains underdeveloped."[4]

In brief, the European Commission attributes the macroeconomic disparities in wages, prices and competitiveness to an essentially *microeconomic* failure of markets to operate smoothly. The present paper takes issue with this diagnosis and argues that the phenomenon of persistent inflation differentials within the euro area should rather be seen as the expression of a *macroeconomic fragility* stemming from the loss of monetary control on the national level. According to this interpretation, the persistent divergence of price levels is related to an equally persistent pattern of desynchronized cyclical fluctuations in Europe - a pattern documented and dubbed "*rotating slumps*" by Blanchard (2007b).[5] Moreover, the analysis indicates that the elimination of structural rigidities, desirable as they may be on other grounds, should not be expected to alleviate macroeconomic disparities within the eurozone.

Stability problems of monetary unions have been addressed in the literature before. Of course, the dynamic properties of any model of output and inflation behavior in a monetary union critically depend on the precise specification of the adjustment process at work. Spahn (2003) has a model of a small open economy in which inflation inertia is captured by a purely backward-looking adjustment of the inflation rate to the prevailing output gap. This results in a strictly unstable system. Kirsanova et al. (2005) also have a completely backward looking Phillips curve, but in addition also an endogenous fiscal policy, with government spending responding to inflation, the real exchange rate and government debt. Not surprisingly then, overall stability depends on the fiscal feedback behavior in complex ways. The inclusion of forward looking inflation expectations in the Phillips curve does not change the results dra-

4 European Commission (2008), p. 6 (emphasis in the original).

5 The evidence on the effect of the European Monetary Union on business cycle synchronization among member states is not clear-cut. The European Commission (2008) notes a fall in the standard deviation of output gaps, but this leaves open the issue of causality as this has been a world-wide phenomenon. Van Arle et al. (2008) do not find a statistically significant influence of the introduction of the euro on business cycle synchronization in the eurozone. However, in line with the 'rotating slumps' hypothesis, they identify distinct clusters of member countries, each displaying similar cycle characteristics.

matically as long as the specification maintains an element of backward looking. Wickens (2007), in contrast, constructs a New Keynesian model with purely forward looking expectations of inflation and also arrives at a strictly unstable difference equation despite the presence of a stabilizing competitiveness effect. The European Economic Advisory Group (2007), studying the case of Ireland, makes the point that endogenous migration of workers who respond to labor market conditions delays the emergence of wage adjustments and adds to procyclical spending patterns, thus exacerbating whatever destabilizing forces may have been at work in the first place.

This paper constructs a stylized two-country model of a monetary union with a hybrid Phillips curve, containing both a forward-looking and a backward-looking element (section 2). It is designed to portray both the aggregate macroeconomic behavior of the union and relative output and inflation dynamics in the individual member countries. For this purpose, inertial inflation, which is absent from the widely used New-Keynesian Phillips curve, turns out to be an indispensable feature of the model.[6] Starting from that premise, the paper demonstrates how a pattern of "rotating slumps" affecting individual countries can arise under the seemingly calm surface of union-wide macro stability. A number of implications of the analysis are spelled out and discussed. Section 3 addresses the role of national fiscal policies in dealing with the rotating slumps problem. Section 4 concludes.

2. A Stylized Model of 'Rotating Slumps'

2.1 The model

The model considered in this section is a stripped-down, symmetric two-country, or two-region, model of a monetary union. Each country is essentially characterized by two relationships: a demand equation and a Phillips curve with inertial core inflation.[7] In addition, there is a representation of expectations and an equation describing the adjustment of core inflation. With ($i = 1,2$) for the two regions, there is a total of eight equations:

(1) $$y_i = d_i + g_i - \partial_0 \left(i - \pi_i\right) - \partial_1 \left(p_i - p_j\right) - \mu\left(y_i - y_j\right) \quad \text{Demand} \left(i,\ j = 1,\ 2;\ i \neq j\right)$$

6 Blanchard (2007a,b) has highlighted the importance of inflation inertia in his account of the boom-bust cycle of Portugal.

7 'Core inflation' in this context is not to be interpreted as headline inflation, excluding food and energy items, as usually defined, but rather as shorthand for the backward-looking inertial component of inflation.

(2) $\pi_i = \bar{\alpha}\left(y_i - \bar{y}_i\right) + \varphi \pi_i^C + \left(1-\varphi\right)\pi_i^e$ Phillips curve

(3) $\pi_i^e = \pi_i = \alpha\left(y_i - \bar{y}_i\right) + \pi_i^C \quad , \quad \alpha \equiv \bar{\alpha} / \varphi$ Rational expectations

(4) $\dot{\pi}_i^C = \gamma\left(\pi_i - \pi_i^C\right)$ Gradual adjustment of core inflation

v: Output; $y - \bar{y}$: Output gap; d: autonomous private spending; g: government spending; i: Nominal interest rate; π: Inflation rate; p: Log of price level; π^C: Core inflation (inertial)

Demand is assumed to depend on the real interest rate, on competitiveness and on relative income. The nominal interest rate variable i carries no subscript as it is determined by the central bank on the level of the monetary union as a whole and applies to both countries. In contrast, fiscal policy is assumed to be determined nationally. Relative income appears in the demand equation because each country's net exports are assumed to depend on the other country's output (positively) as well as on its own output (negatively). The parameter μ captures the strength of intra-union trade linkages. Competitiveness is measured by the relative price levels of the two countries, thus abstracting from the dimension of competitiveness vis-à-vis the rest of the world outside the monetary union. Other sources of demand shocks, either domestic or foreign, could easily be added, but are suppressed.

The proper specification of the Phillips curve has been subject to considerable debate in the macroeconomic literature recently. As pointed out by a number of authors such as Gordon (2008), the currently dominant framework of the New Keynesian Phillips Curve with forward looking expectations is plagued by its neglect of inherent inflation persistence whereas the older approach with backward-looking inertia is ill-suited to deal with episodes of very high and volatile inflation. The equations (2)-(4) represent a 'hybrid' specification with the rational expectation of current inflation and a backward-looking core inflation term both entering the Phillips curve. As pointed out above, the inertial adjustment of inflation differentials is a key aspect of the experience of the first decade of EMU. In the model, this same persistence is a key driver of the cyclical dynamics of the two countries.

The solution of the 8-equations model (1)-(4) is greatly facilitated by its symmetry. As suggested by Aoki (1981), the best way to proceed with such a model is to solve first separately for inter-regional differences and union-wide aggregates of output and inflation. From these, solutions for each individual region are derived easily. In fact, it turns out that the aggregates and the differences are all we need to understand the key properties of the system.

2.2 The aggregate behavior of the monetary union

Turning first to the behavior of the monetary union as a whole, it is useful to define the following aggregate variables:

$y = y_1 + y_2$	$\bar{y} = \bar{y}_1 + \bar{y}_2$	Aggregate output, aggregate potential output
$d = d_1 + d_2$		Aggregate autonomous private spending
$g \equiv g_1 + g_2$		Aggregate fiscal stance
$\pi = \frac{1}{2}(\pi_1 + \pi_2)$	$\pi^C = \frac{1}{2}(\pi_1^C + \pi_2^C)$	Aggregate inflation, aggregate core inflation

Before aggregate output and inflation can be determined, the behavior of the nominal interest rate must be specified which is set by the central bank of the monetary union. In line with current practice in the theory of monetary policy, [8] it is assumed that the central bank sets the interest rate so as to minimize a quadratic loss function in the output gap and the inflation gap, where the latter is the difference between the current inflation rate and the inflation target (π^T) of the central bank, and where the constraint imposed by the aggregate Phillips curve must be observed:

(5) $$Min\ L = (y - \bar{y})^2 + \bar{\beta}(\pi - \pi^T)^2,$$ Central Bank Loss Function

subject to

(6) $$\pi = \frac{\alpha}{2}(y - \bar{y}) + \pi^C$$ Aggregate Inflation

The equation for aggregate inflation results from straightforward aggregation of the national inflation rates as specified in (3). The first order condition for the monetary policy optimum defines a linear inverse relation between the output gap and the inflation gap:

(7) $$y - \bar{y} = -\beta(\pi - \pi^T), \qquad \beta \equiv \alpha\bar{\beta}/2$$ Monetary Policy Behavior (MP line)

[8] For a simple textbook representation, see Carlin/Soskice (2006), Ch. 3.

This relationship is illustrated by a falling line in (π,y) space, labelled the MP (‘Monetary Policy’) line in Figure 1, below. The slope of the MP line evidently depends on the shape of central bank preferences and on the slope of the short-run Phillips curve.

With this specification of monetary policy behavior, the aggregate macroeconomic behavior of the monetary union can now be seen to result from the interaction of aggregate demand, aggregate inflation and monetary policy. Aggregate demand and the adjustment of aggregate inflation are the aggregate counterparts of equations (1) and (4):

(8) $y \equiv y_1 + y_2 = d + g - 2\partial_0 (i - \pi)$ Aggregate Demand

(9) $\dot{\pi}^C = \gamma \left(\pi - \pi^C\right)$ Adjustment of Aggregate Core Inflation

Note that the competitiveness variable ($p_1 - p_2$) and relative income ($y_1 - y_2$) do not appear in (8) as mutual net exports cancel out in the aggregation. Combining the aggregate demand equation with the MP line (7), optimal monetary policy turns out to amount to an interest rate rule implementing a flexible inflation targeting strategy:

(10) $i = \pi + \frac{d + g - \bar{y}}{2\delta_0} + \frac{\beta}{2\delta_0}(\pi - \pi^T)$ Interest Rate Rule

The central bank must raise the real interest rate above the equilibrium level $\frac{d + g - \bar{y}}{2\delta_0}$ whenever inflation rises above target (and vice versa if inflation falls below target). The nominal interest rate thus must move more than one-for-one with changes in the inflation rate (the famous Taylor principle) and thereby ensures dynamic stability. The inflation rate gradually converges towards its target value as can be seen from the dynamics of the inflation rate implied by (6), (7) and (9) for any given levels of $\bar{y}$ and π^T:

(11) $\dot{\pi} = -\frac{\alpha\beta\gamma}{\alpha\beta + 2}\left(\pi - \pi^T\right)$ Inflation Dynamics

The stable equilibrium is at $\pi = \pi^T$, with the speed of convergence depending on the extent of inflation inertia (γ), on the central bank’s aversion against inflation (β) and on the slope of the short-run Phillips curve (α). The aggregate behavior of the Monetary Union is illustrated in Figure 1. In the lower panel, MP represents central bank behavior (eq. 7) and PC is the

Phillips curve, drawn here for the case that core inflation equals the inflation target of the central bank. Their point of intersection represents the stable equilibrium with inflation on target and the output gap equal to zero. In the upper panel, AD represents aggregate demand as a falling function of the real interest rate. The arrows along AD illustrate the continual interest rate adjustments that are required to keep the monetary union on its optimal path towards equilibrium.

The system is thrown out of equilibrium whenever it is hit by an aggregate supply or demand shock. Since a demand shock (a shift in the AD curve) does not confront the central bank with a trade-off between its objectives of inflation control and output stabilization, the optimal monetary policy response to such a shock is an adjustment of the interest rate so as to offset the shock perfectly.[9] In the case of an aggregate supply shock, which displaces the aggregate Phillips curve, the optimal interest rate response is chosen so as to drive inflation back to target along the MP line.

Figure 1: The Behavior of the Aggregate Monetary Union

about here

2.3 The behavior of output and inflation differentials

The next step is the analysis of the relative macroeconomic performance of the two countries which make up the monetary union. As the argument proceeds, the following definition of relative variables will prove convenient:

$$\tilde{x} \equiv x_1 - x_2 \qquad \text{for } x = y, \bar{y}, d, g, \pi, \pi^C, p$$

Using this notation, relative output and inflation are easily determined by subtracting the output and inflation equations (1)-(4) of the two countries from each other:

$$(12) \qquad \tilde{y} = \tilde{d} + \tilde{g} + \partial_0 \tilde{\pi} - 2\partial_1 \cdot \tilde{p} - 2\mu \tilde{y}$$

$$= \frac{1}{1+2\mu} \cdot \left[\tilde{d} + \tilde{g} + \partial_0 \tilde{\pi} - 2\partial_1 \cdot \tilde{p}\right] \qquad \text{Output Differential}$$

$$(13) \qquad \tilde{\pi} \equiv \pi_1 - \pi_2 = \alpha\left(\tilde{y} - \tilde{\bar{y}}\right) + \tilde{\pi}^C \qquad \text{Inflation Differential}$$

9 This is a standard result in New Keynesian models of monetary policy. Ignoring lags in the monetary transmission process, this response perfectly insulates the system from demand shocks. See Clarida, Galí, Gertler (1999).

(14) $\dot{\tilde{\pi}}^C = \gamma\left(\tilde{\pi} - \tilde{\pi}^C\right)$ Differential Adjustment of Core Inflation

Relative output in (12) can be seen to depend positively on relative autonomous demand, positively on relative inflation (real interest rate effect), and negatively on the relative price level (competitiveness effect). The inflation differential in (13) reflects the relative cyclical positions of the two countries as well as the difference in their core inflation rates. It is important to note that the nominal interest rate does not affect the differential behavior of the monetary union as it is common to the two countries and affects them in the same way (by the symmetry assumption). Thus, interest-rate policy, while an effective tool for the management of aggregate output and inflation of the aggregate system, is of no use for dealing with macroeconomic disparities within the union.

As for aggregate output and inflation above, there is an equilibrium for relative output and inflation as well. In addition, the disequilibrium adjustment behavior of the output and inflation differentials can be determined from the dynamics implied by equations (12)-(14). Both the equilibrium and disequilibrium properties of the differentials are best understood by taking the time derivatives of (12) and (13). Holding constant the exogenous variables $\tilde{d}$, $\tilde{g}$ and $\tilde{\tilde{y}}$, and noting that $\dot{\tilde{p}} \equiv \tilde{\pi}$, the two differential equations are

(12’) $\dot{\tilde{y}} = \dfrac{1}{1+2\mu}\left(\partial_0\,\dot{\tilde{\pi}} - 2\partial_1 \cdot \tilde{\pi}\right)$ Change of Output Differential

(13’) $\dot{\tilde{\pi}} = \alpha\,\dot{\tilde{y}} + \dot{\tilde{\pi}}^C = \alpha\,\dot{\tilde{y}} + \alpha\,\gamma\left(\tilde{y} - \tilde{\tilde{y}}\right)$ Change of Inflation Differential

Making use of (13) and (14) to substitute for $\dot{\tilde{\pi}}^C$, (12’) and (13’) are readily solved for the simultaneous dynamics of the output and inflation differentials within the monetary union ($\dot{\tilde{y}}$ and $\dot{\tilde{\pi}}$):

(15) $$\begin{bmatrix}\dot{\tilde{y}}\\ \dot{\tilde{\pi}}\end{bmatrix} = \left(1+2\mu-\alpha\,\partial_0\right)^{-1}\cdot\begin{bmatrix}\alpha\,\partial_0\gamma & -2\partial_1\\ \alpha\,\gamma\left(1+2\mu\right) & -2\alpha\,\partial_1\end{bmatrix}\begin{bmatrix}\tilde{y}-\tilde{\tilde{y}}\\ \tilde{\pi}\end{bmatrix}$$

Equilibrium is defined by the stationarity of $\tilde{y}$ and $\tilde{\pi}$ ($\dot{\tilde{y}} = \dot{\tilde{\pi}} = 0$).Setting both equations in (15) equal to zero yields equilibrium values for $\tilde{y}$ and $\tilde{\pi}$ which in turn can be plugged into (12) to retrieve the equilibrium relative price level (or real exchange rate) $\tilde{p}$:

$$
\left.
\begin{aligned}
\tilde{y} &= \tilde{\bar{y}} \\
\tilde{\pi} &= 0 \\
\tilde{p} &= \frac{1}{2\partial_1}\left[\tilde{d} + \tilde{g} - (1+2\mu)\tilde{\bar{y}}\right]
\end{aligned}
\right\} \qquad (16) \quad \text{Equilibrium Conditions for } \tilde{y},\ \tilde{\pi},\ \text{and } \tilde{p}
$$

Equilibrium obviously requires any cross-country differences in inflation or in the output gaps to vanish. From the aggregate system we know that this means that both inflation rates must be equal to π^T and both output gaps must be zero. Since both countries share the same real interest rate in equilibrium, the equilibrium real exchange rate must adjust to accommodate any differences between the two countries that may arise on the supply side ($\tilde{\bar{y}}$) or on the demand side ($\tilde{d} + \tilde{g}$).

The disequilibrium dynamics of the system is driven by the feedback loops between inflation and output which can be read off equations (12) and (13). While relative output affects the rate of change of relative prices via the Phillips curve mechanism (13), price developments feed back into relative output via two distinct routes. First, any change in the relative price level $\tilde{p}$ affects competitiveness and hence net exports. This link constitutes a potentially important stabilizing force in a monetary union. As countries with above-average inflation rates suffer a deterioration of their relative competitive positions, this will cut into net exports and thereby provide the dampening effect on demand pressure that is required to bring inflation back into line with the rest of the currency area - and vice versa for countries whose inflation rates fall below the average.

The second channel of transmission between inflation and real output involves the real interest rate. Unlike the competitiveness channel, this is a destabilizing element in a currency area whose member states share a common nominal interest rate: The countries with the highest inflation rates get the lowest real interest rates, which tends to exacerbate the inflationary pressure that was at the root of excess inflation in the first place. This mechanism was recognized as a potentially destabilizing and dangerous force long before EMU was created. When the United Kingdom agonized over the decision to join the European Monetary System in the late 1980s, Sir Alan Walters, at the time a leading economic adviser to Prime Minister Margaret Thatcher, strongly warned against joining, mainly on the grounds that existing real interest differentials would widen and thus destabilize the system. The argument thus became known as the ‘Walters Critique’.[10]

As is widely agreed by now, inappropriately low real interest rates were a key driving force in the housing booms of the 2000s that preceded the financial crisis of 2008 in a number of countries. Taylor (2009) points out that this is true not just for the United States, but also for Europe. Using his own Taylor rule as a yardstick, he presents evidence that the strongest housing booms occurred where real interest rates differed most from their appropriate levels.[11] The strong feedback between housing investment, real interest rate differentials and inflation differentials points to the continued relevance of the ‘Walters Critique’.

Due to the simultaneous presence of stabilizing and destabilizing forces in the adjustment dynamics, it is not clear a priori that the equilibrium of the output and inflation differentials, as opposed to the equilibrium of aggregate output and inflation, is stable. Since the competitiveness effect is a level effect involving $\tilde{p}$ whereas the real-interest-rate effect is a rate-of-change effect involving $\tilde{\pi}$, some observers have concluded that - as the European Commission (2008) put it in its “EMU@10” Report - “ultimately the competitiveness channel will *inevitably* overtake the real interest rate channel”.[12] However, judged by the dynamics of this model, there is nothing inevitable about that. Formally, the necessary and sufficient stability conditions for the differential equations system (15) are given by

$$(17) \qquad \left.\begin{array}{rcl} \alpha\partial_0 & < & 1+2\mu \\ \partial_0\gamma & < & 2\partial_1 \end{array}\right\} \qquad \text{Stability Conditions}$$

Evidently, stability hinges on the magnitudes of a number of parameters. The following four are particularly noteworthy:

1. For stability, the competitiveness channel must not be too weak (δ_1 not too small).

2. For stability, the real interest rate channel must not be too strong (δ_0 not too large).

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10 See Walters (1990) for an exposition and Miller/Sutherland (1990) for a theoretical discussion.

11 The role of the house price channel in creating a destabilizing boom-bust cycle is also emphasized by Roubini et al. (2007) and by the European Economic Advisory Group (2007), Ch. 2.

12 European Commission (2008), p. 52 (emphasis added).

3. Closer trade integration, as measured by μ, improves the stability properties of the system. This is good news in view of the evidence that intra-EMU trade has strongly increased in importance since the introduction of the Euro.[13] Whether and to what extent the common currency actually caused the expansion of intra-EMU trade is subject to some current debate, but not a central concern in the present context.

4. Interestingly, the extent of nominal rigidity in the system appears to work in favor of stability. There are two parameters in the model that express nominal rigidity: One of them is α, the slope parameter of the short-run Phillips curve which reflects both the sensitivity of price-setting to economic activity and the extent of its backward-looking nature.[14] The other parameter capturing nominal rigidity is γ, the speed of adjustment of core inflation. The steeper the slope of the short-run Phillips curve is, and the quicker the adjustment of core inflation, the more flexible nominal wages and prices are in responding to positive and negative output gaps. Such flexibility is widely said to be an important prerequisite for the smooth operation of a currency area. Interestingly, here this turns out to be true only for the aggregate behavior of the union as the speed of convergence to its steady state increases with price flexibility (as can be seen from eq. 11 above). In contrast, the degree of price flexibility is detrimental to the dynamic stability of output and inflation differentials. Although surprising in the light of the optimum currency area literature, doubts about the stabilizing effect of nominal price flexibility have a long tradition in Keynesian macroeconomic thinking, dating back to Keynes himself.[15]

The dynamic behavior of the simultaneous differential equation system (15) is illustrated by the phase diagram in Figure 2. The $\dot{\tilde{y}} = 0$ and $\dot{\tilde{\pi}} = 0$ lines are the stationarity loci for the output and inflation differentials, respectively. Both are upward sloping as implied by the equation system (15). As drawn, the relative slopes satisfy the first of the two stability conditions (17), which by itself is not sufficient for stability, however. When the system is in disequilibrium, the inflation differential $\tilde{\pi}$ moves towards the $\dot{\tilde{\pi}} = 0$ stationarity locus whereas the output differential $\tilde{y}$ moves away from the $\dot{\tilde{y}} = 0$ line. The trajectory starting at point A indi-

13 See European Central Bank (2008), section 5.
14 See equations (2) and (3) above.
15 Keynes (1936), Ch. 19. Influential formal analyses along this line of reasoning include Tobin (1975, 1993) and De Long and Summers (1986). These papers make no particular reference to the logic of currency areas, though. Angeloni and Ehrmann (2004) demonstrate empirically that an increase in the slope of the Phillips curve increases the size and duration of euro area inflation differentials.

cates the qualitative nature of the adjustment process which is set in motion when the system is in disequilibrium. The oscillations of the output and inflation differentials converge towards the equilibrium at $\tilde{y} = \tilde{\pi} = 0$ only if both of the stability conditions (17) are satisfied.

Figure 2: The Differential Behavior of the Monetary Union

about here

2.4 Implications of the analysis

Clearly, the stability properties of a dynamic model of output and inflation differentials in a monetary union depend on a large number of specification choices on which there may be ample reason to disagree. But whether or not the system does ultimately converge to its equilibrium, the key insight here is that the adjustment process is inherently fragile and protracted. In the light of this analysis, we should not be surprised to observe persistent inflation differentials and slow-motion boom-bust cycles, resembling “rotating slumps”, in the individual member states of a monetary union.

The operation of the model can be illuminated by considering the example of an expansionary asymmetric demand shock hitting country 1[16]. Starting from a position of overall equilibrium, the shock leads to an increase in the output and inflation gaps of that country along its short-run Phillips curve. To keep inflation and output of the aggregate monetary union on track, the central bank must raise interest rates, thereby causing a recession in country 2. A point will be reached like point A in Figure 2 where the overall monetary union may have remained in an equilibrium with zero output and inflation gaps, but where the booming country will have experienced faster output growth and higher inflation than the rest of the union. However, from point A on, when both the $\dot{\tilde{y}} = 0$ and $\dot{\tilde{\pi}} = 0$ line have been crossed, and in the absence of further exogenous demand changes, relative output and relative inflation of country 1 are set to enter a phase of protracted decline. Eventually the trajectory will cross the $\tilde{\pi}$-axis whereupon the relative cyclical positions of the two countries will be reversed. In point B the inflation differential changes sign as well. The adjustment process thus swings back well beyond the initial (and final) equilibrium of the system.

16 As examples, the building booms in a number of peripheral EMU countries in the 2000s come to mind. So does the German reunification boom of the early 1990s which predated the creation of the EMU, but caused considerable tensions in the fixed-exchange rate structure of the European Monetary System then in force.

The persistent shifts in relative prices building up in the course of the adjustment process following an initial shock are an endogenous feature of the system's dynamics. Talk of such relative price changes "causing" macroeconomic imbalances in a monetary union is misplaced, therefore.[17] The emanating dynamic pattern is neither accidental nor caused by particular structural rigidities, let alone policies, but a consequence of the inertial momentum of inflation in conjunction with the loss of national monetary policy autonomy which leaves disequilibria unattended on the national level that would not be tolerated by the central bank on the level of the monetary union as a whole.

3. What Role for Fiscal Policies?

The preceding analysis suggests that the stability of macroeconomic aggregates in a currency area is less difficult to maintain than the internal balance of relative output and prices. The reason is that the latter cannot be affected by the centralized monetary policy. The stabilization of relative output and the prevention of excessive movements in relative prices in a monetary union require tools that can be targeted to individual countries. This is where national fiscal policies come in. Two questions arise in this context: Is the adjustment pattern displayed in Figure 2 suboptimal in any well-defined way? And if so, what can fiscal policies do about it? This section develops a sketch of how the monetary-fiscal framework of a monetary union can be designed to contain both aggregate fluctuations and internal cyclical disparities of output and inflation.

In a monetary union, monetary policy is centralized by definition whereas fiscal policies remain decentralized and thus capable of affecting the member countries differentially. Thus, the natural assignment is to give monetary policy responsibility for aggregate stability and fiscal policy responsibility for containing internal cyclical imbalances. For the purpose of defining what exactly it is that fiscal policy should achieve in such a framework, the following discussion relies on the same normative standard that has been applied to monetary policy above. More specifically, the fiscal authorities are assumed to minimize the same loss function for their individual countries as the one the central bank is minimizing for the monetary union as a whole (equation (5) above):

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[17] Germany, for example, has frequently been accused of pursuing an intentional beggar-thy-neighbor strategy as its negative inflation differential vis-à-vis the rest of the eurozone has substantially improved its competitiveness since 1999 (Cesaratto 2010, Flassbeck/Spiecker (2007).

(18) $$Min\ L_i = (y_i - \bar{y}_i)^2 + \bar{\beta}(\pi_i - \pi^T)^2, \quad i = 1,2$$ Fiscal Policy Loss Functions[18]

Taking into account the constraint of the national Phillips curves given by equation (3) above, a similar first order condition is obtained for the fiscal authorities as was derived for the central bank in equation (7) above:

(19) $$y_i - \bar{y} = -\alpha\bar{\beta}\left(\pi_i - \pi^T\right),$$ Optimal Fiscal Policy Behavior ($i = 1,2$)

Since aggregate output and inflation are the concern of the central bank, fiscal authorities should exclusively target output and inflation differentials and keep them in a relation to each other which is obtained in a straightforward way by subtracting $y_2 - \bar{y}$ from $y_1 - \bar{y}$ in (19):

(19') $$\tilde{y} - \tilde{\bar{y}} = -\alpha\bar{\beta}\,\tilde{\pi},$$ Optimal Relative Fiscal Policy (RFP line)

This relationship is illustrated by a falling line in ($\tilde{\pi}$, $\tilde{y}$) space, labelled RFP ('Relative Fiscal Policy') in Figure 3. The RFP line is obviously a close relative of the MP line in Figure 1 above. If fiscal policies obey the optimality criterion (19'), they have a highly stabilizing effect on output and inflation differentials. This can be seen by taking the time derivative of (19') and combining it with the dynamics of the inflation differential as implied by equations (13) and (14) to derive the adjustment equation for the output differential:

(20) $$\dot{\tilde{y}} = -\frac{\alpha^2\bar{\beta}\gamma}{1+\alpha^2\bar{\beta}}(\tilde{y} - \tilde{\bar{y}})$$

Thus, the trajectory with optimal fiscal policy has the output and inflation differentials converge monotonically along the RFP line to a stable equilibrium with zero output gaps and a zero inflation differential ($\tilde{\pi} = \tilde{y} - \tilde{\bar{y}} = 0$). As in the case of optimal monetary policy in the aggregate monetary union, the speed of adjustment towards equilibrium is increasing in the price flexibility parameters α and γ.

The shape of the trajectory resulting in the case of passive fiscal policy, derived in Figure 2 above, is displayed in Figure 3 once more for comparison. While the equilibrium is the same in both cases, the stability properties of the respective disequilibrium adjustment paths differ

18 This specification ignores additional objectives that fiscal policy might pursue, such as fiscal sustainability. Also, the specification does not allow for disagreements between monetary and fiscal authorities about policy objectives. For an analysis of that case, see Dixit/Lambertini (2001).

markedly. In addition, since the RFP line represents an optimality condition, any adjustment path leading away from the RFP line is inefficient. For example, if an asymmetric demand shock creates an output differential, displacing the system from an initial equilibrium to point B in Figure 3, the optimal fiscal policy response would offset the shock and thereby move the system back to equilibrium right away. In the absence of the appropriate policy response, however, the inherent dynamics of the system would at first carry the system further away from its equilibrium in a south-west direction along the no-policy trajectory before a turning point is reached eventually.

Figure 3: The Differential Behavior of the Monetary Union with Optimal Fiscal Policy

about here

The precise reaction function which the national fiscal authorities should adopt to achieve the benign outcome portrayed by the RFP line is obtained by plugging condition (19') into the relative demand equation (12):

(21) $$\tilde{g} = -\tilde{d} + 2\delta_1 \tilde{p} - \left[\delta_0 + \alpha\bar{\beta}(1+2\mu)\right]\tilde{\pi}$$ Fiscal Policy Reaction Function

Again, this reaction function does not pin down absolute levels of government spending, but defines the appropriate relative fiscal stances of the two countries. The reaction function has fiscal policies respond to all changes that disturb the balance of cyclical conditions in the monetary union: exogenous changes in relative private spending ($\tilde{d}$), changes in competitiveness ($\tilde{p}$), and changes in the intra-union inflation differential ($\tilde{\pi}$). Thus, while monetary policy targets aggregate inflation, fiscal policies should assume a role in targeting the inflation differential.

More generally, if the responsibility for the macroeconomic stabilization of the aggregate monetary union is assigned to the central bank, the fiscal policy response to asymmetric disturbances requires the authorities of both countries to change their fiscal stance and to do so in opposite directions. This assignment of responsibilities may imply, for example, that relatively booming countries must run substantial budget surpluses. The implementation of such an assignment would most likely create difficult coordination problems both vertically, between the national fiscal authorities and the supranational monetary authority, and horizontally, among the national governments. However, the proper design of such coordination and its institutional underpinnings are beyond the scope of the present paper.[19]

4. Conclusion

The main message of this paper is that the macroeconomic management of a monetary union would be ill-advised to focus its attention on the aggregate performance of the union alone. If unaided by nationally targeted demand policies, a monetary union can be a dynamically fragile construct. The European Monetary Union, in the first decade of its existence, has experienced distinct, non-synchronized cyclical fluctuations in its individual member countries. The model in this paper demonstrates how such 'rotating slumps' can arise in a simple supply-and-demand framework with inertial inflation and how, as a corollary, persistent inflation differentials can lead to substantial shifts in relative prices across countries. Such intra-union disparities are perfectly consistent with reasonable stability of aggregate output and inflation in the monetary union.

The model supports the notion, well known from the optimum currency area literature, that increased trade integration reduces the vulnerability of a monetary union to internal macroeconomic tensions. But it contradicts the widely held view that the persistent macroeconomic disparities which have plagued the European Monetary Union since its creation reflect a continuing lack of flexibility of labor and goods markets. Quite to the contrary, it is shown that increased price flexibility exacerbates the dynamic stability problem associated with the fluctuations of output and inflation differentials in a monetary union.

A fundamental principle of economic policy says that policy instruments should be assigned to the tasks for which they are most effective. In the context of a monetary union, this means that monetary policy should be exclusively concerned with the overall macroeconomic stability of the union. Fiscal policies, in turn, should be used for smoothing macroeconomic disparities within the currency area to which the centralized monetary policy by construction cannot tend.[20] The fiscal policy reaction function, developed in Section 3 above, translates this general principle into a specific policy rule which contains the volatility of national out-

[19] The literature on policy coordination in a monetary union is large, see e.g. Uhlig (2002) and for a recent literature survey Beetsma/Giuliodori (2010).

[20] As events in 2008-09 have demonstrated, however, such a clean separation of tasks between monetary and fiscal policy may need to be amended if monetary policy loses traction in a deep recession.

put gaps and inflation rates and ensures the dynamic stability of a monetary union. Interestingly, price flexibility which weakens dynamic stability in the absence of stabilizing fiscal policies, accelerates the elimination of inflation differentials and national output gaps if the fiscal policy rule is in place.

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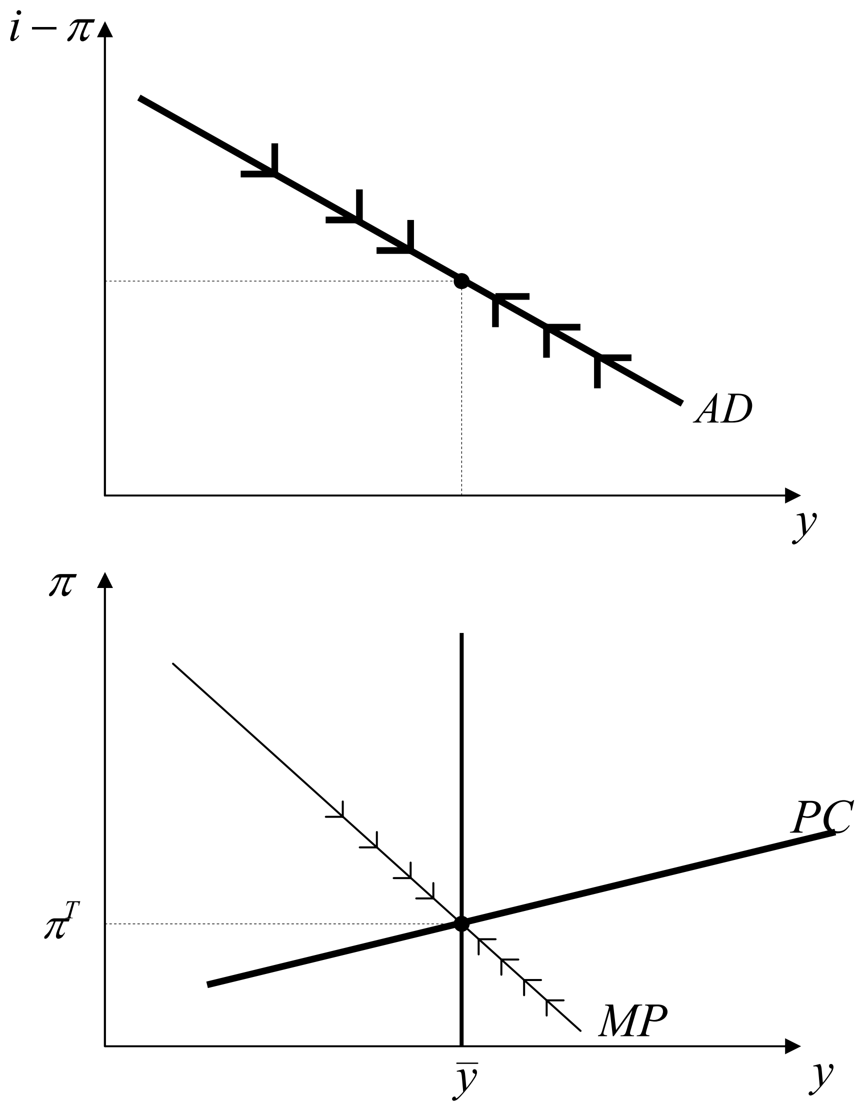

Figure 1: The Behavior of the Aggregate Monetary Union

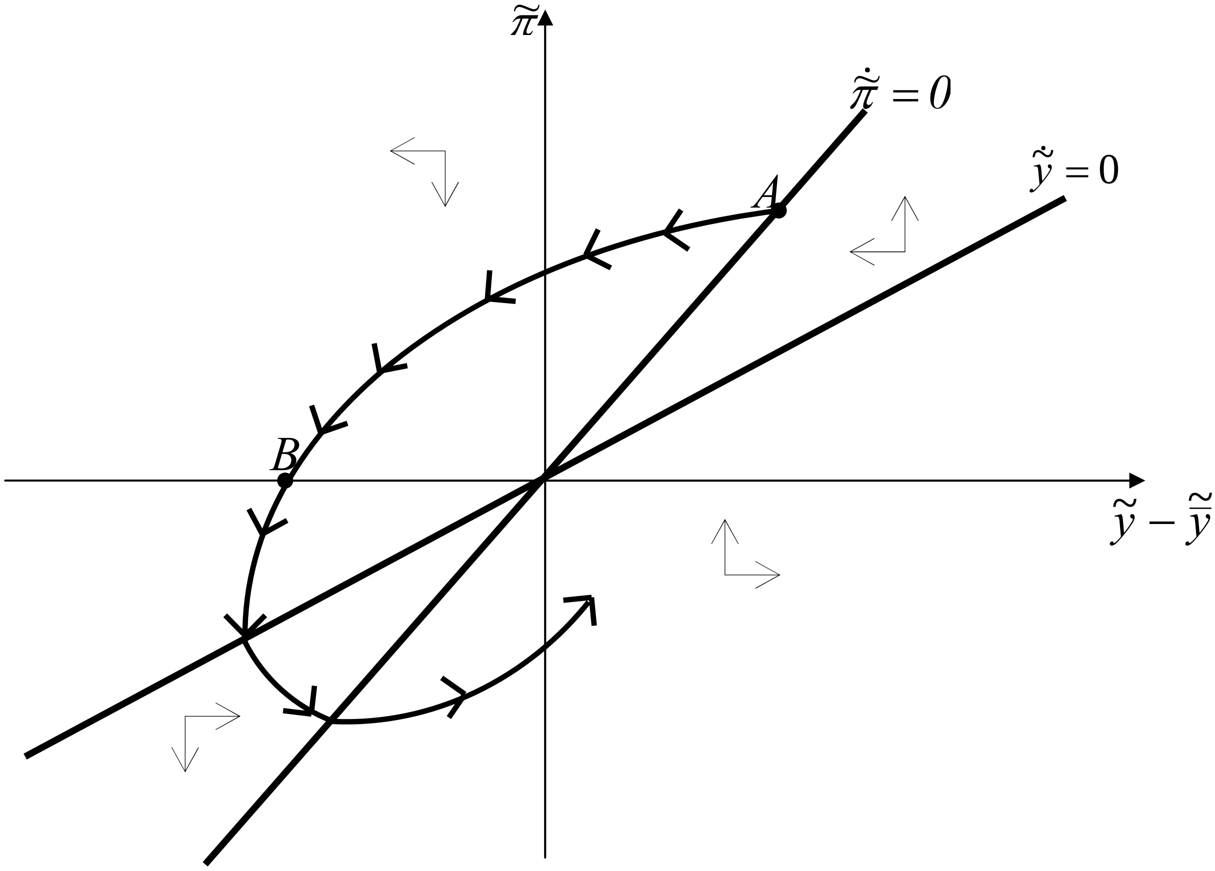

Figure 2: The Differential Behavior of the Monetary Union

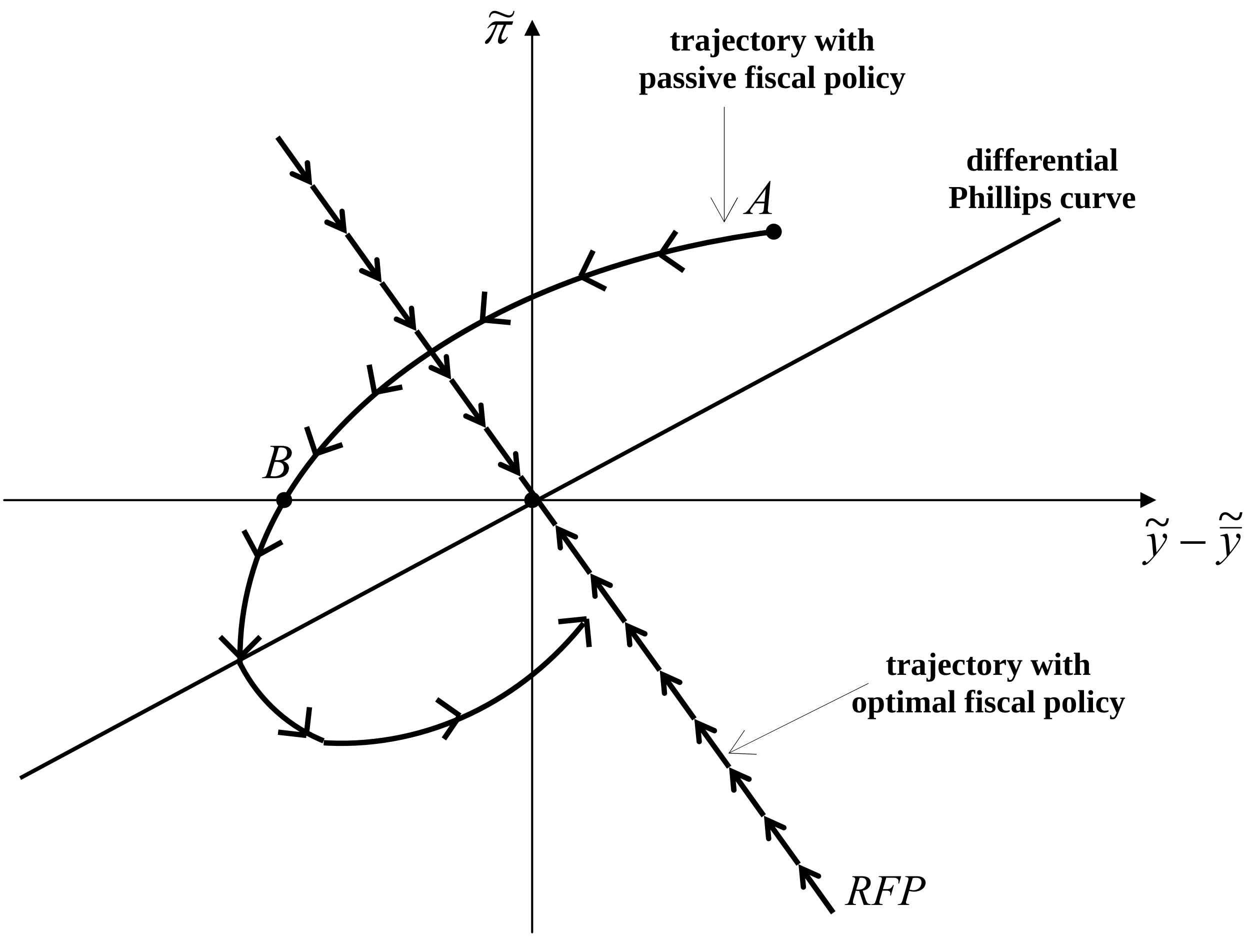

Figure 3: The Differential Behavior of the Monetary Union with Optimal Fiscal Policy