EMU@10: Coping with Rotating Slumps

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Abstract

On the eve of the financial and economic crisis of 2008/09, the European Economic and Monetary Union (EMU) could look back to a decade of remarkable macroeconomic stability. Somewhat surprisingly, though, inflation differentials across member states have been substantial and persistent, causing large cumulative changes in relative price levels. This paper presents a stylized theoretical model of a monetary union which demonstrates how persistent inflation differentials can arise from inflation inertia in conjunction with the loss of monetary control on the national level. The interaction of inflation and output dynamics which is at the core of the model generates a pattern of 'rotating slumps' (a term coined by Blanchard 2007b). A number of implications are derived from the model which shed light on the observed behavior of cyclical conditions and inflation rates in the euro area. The paper concludes that the monetary-fiscal framework of EMU does not pay adequate attention to the need of dealing with internal macroeconomic tensions within the euro zone.

Preliminary. Comments welcome

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1. Introduction[1]

"EMU@10" is the cyber title chosen by the European Commission in May 2008 for a 328-page report published to commemorate and celebrate the 10th anniversary of the final decision to introduce a single currency for the European Union. The actual launch of the Euro took place on 1st January 1999 and marked the last phase of the transition to Europe's Economic and Monetary Union (EMU). The May 2008 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]

Any assessment of the functioning of a currency union must address two distinct issues: One is the aggregate performance of the union, as measured by real growth, inflation and employment. The other is the relative performance of individual member countries. Overall stability of the price level in EMU as a whole would give little cause to celebrate if it resulted from averaging out high inflation in one part of the union and deflation in another. In the run-up to EMU, much ink was spilt over the question whether or not the euro zone constitutes an optimum currency area. The key consideration in deciding this issue is 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. The theory of optimum currency areas singles out the flexibility of wages and prices, the ease of structural adjustments, the extent of cross-country fiscal transfers and the mobility of labor as the crucial determinants of how much asymmetric turbulence a currency union can withstand.[3] The vast majority of studies concluded at the time that Europe does not constitute an optimum currency area or at least is a much less suitable candidate for a common currency than the United States.

Ten years into its existence, the euro zone was so far spared the type of asymmetric shock that almost ripped apart the European Monetary System in the early 1990s in the wake of German reunification. Contrary to the warnings of sceptics such as Feldstein (1997), monetary union

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[1]   The author acknowledges valuable comments on a previous draft from participants at the 23rd Freiburg/Nagoya Joint Seminar in Nagoya, Japan.
[2]   European Commission (2008), p. 3.
3   See e.g. De Grauwe (2007).

did not sow disharmony and disintegration in Europe. As the European Commission points out, business cycles have actually become more tightly synchronized across member countries since the early days of EMU. What the Commission does acknowledge, however, is the indisputable and systematic divergence of national price levels. This phenomenon might appear somewhat surprising 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 "EMU@10" report has to say on this:

> "*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 dubbed "*rotating slumps*" by Blanchard (2007b). Another implication is that the elimination of structural rigidities, desirable as they may be on other grounds, does not help cope with macroeconomic disparities within the euro zone.

The contribution of this paper is mainly theoretical. In order to develop the argument, however, section 2 will first discuss some relevant facts pertaining to national business cycles and inflation rates in the euro area. Subsequently, section 3 presents a stylized model of a monetary union with inertial inflation. The model is designed to study the behavior of output and inflation on the aggregate level of the union as well as in the individual member countries. It demonstrates how a pattern of "rotating slumps" affecting individual countries can arise in a

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

monetary union under the seemingly calm surface of union-wide macro stability. In section 4, a number of implications are derived from the model which, it is argued, shed light on the observed behavior of cyclical conditions and inflation rates in the euro area. Section 5 concludes.

2. Macroeconomic Disparities in EMU: Some Empirical Observations

When EMU started in 1999, a number of critics predicted a turbulent future for Europe, both economically and politically. A loss of monetary stability, a lack of fiscal discipline, slow growth, rising unemployment and increasing political unrest were among the dire consequences predicted to follow from the introduction of the Euro. It did not happen. To be sure, internal tensions did surface repeatedly as some countries felt the one-size-fits-all monetary policy of the European Central Bank (ECB) did not properly take into account their particular situation and some national governments put pressure on the ECB to change course - usually in the direction of a more expansionary stance.

The most conspicuous indicator of uneven macroeconomic performance across the euro zone economies is the divergence of nominal unit cost and price levels. Figure 1, as most of the subsequent charts borrowed from the European Commission (2008), displays the cumulated change in relative unit labor cost from 1999 to 2007. For each country the change is given relative to the aggregate of the euro zone. Clearly, shifts in relative competitive positions across the euro area since 1999 have been substantial. While Ireland and the Mediterranean rim have experienced unit labor cost increases far above EMU average, Germany at the other extreme was able to improve its competitive position by more than 10% vis-à-vis the euro area at large. Relative changes in consumer prices and other measures of the price level convey a similar picture.

Of course, there is no reason to expect national price levels to move perfectly in step in a monetary union. For example, countries engaged in catch-up growth should experience above average inflation rates and as a consequence an appreciation of their real exchange rates (the Balassa-Samuelson effect). But as Figure 2 makes clear, the relative price changes within the euro area cannot easily be explained away as an equilibrium phenomenon along these lines. Had above-average price increases been driven by above-average productivity gains in the

tradables sector, they could be expected to go together with above-average net export growth. In fact the reverse is true. With the exception of Ireland whose growth miracle was exactly of the type just described, changes in real effective exchange rate show a robust negative correlation with the contribution of net exports to GDP growth.
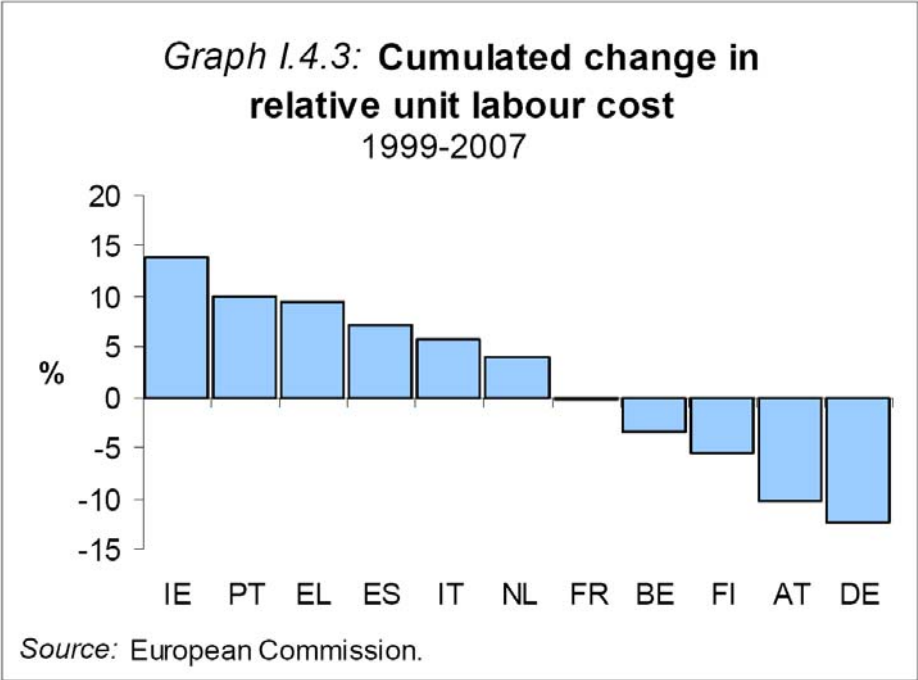

Graph I.4.3: **Cumulated change in relative unit labour cost**
1999-2007

Source: European Commission.

Figure 1:   Shifts in relative competitive positions due to the persistent divergence of price levels
Source: European Commission (2008), p. 54[5]

As the model in the next section will spell out, the link between nationally differing inflation rates, real exchange rates and net exports is 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 eventually back into line with the rest of the currency area - and vice versa for countries whose inflation rates fall below the average.

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[5] The EMU countries are denoted as follows: IE: Ireland, PT: Portugal, EL: Greece, ES: Spain, IT: Italy, NL: Netherlands, FR: France, BE: Belgium, FI: Finland, AT: Austria, DE: Germany.
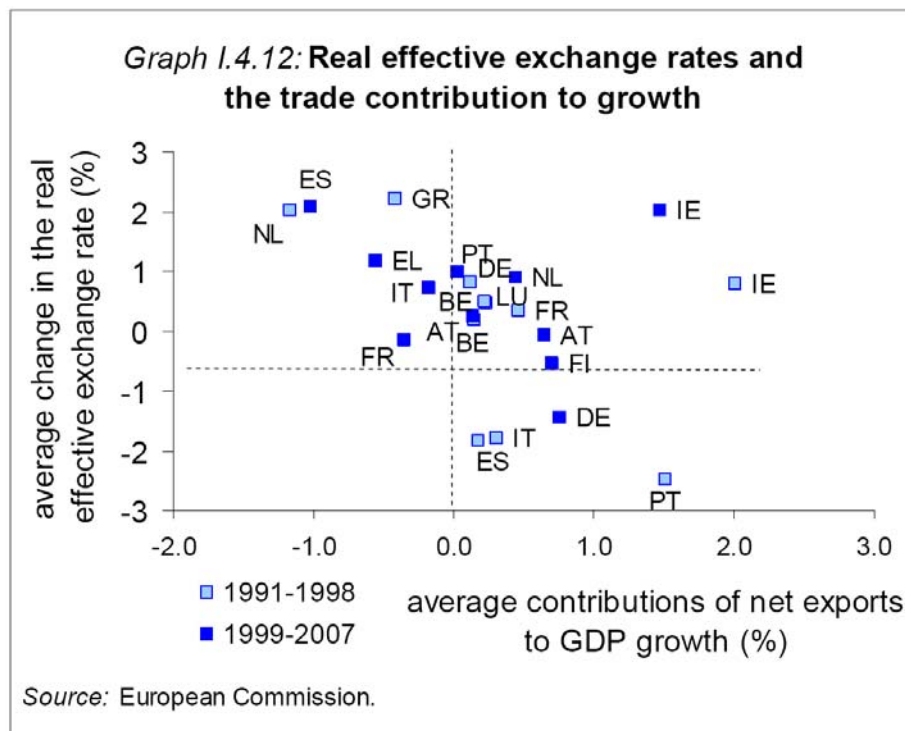
Figure 2: **Shifts in relative competitive positions appear to be robustly correlated with net exports**
Source: European Commission (2008), p. 58[6]

However, there is another link between inflation and the demand side of an economy: the real interest rate. Since all members of a currency area share a common nominal interest rate, differences in inflation rates translate one-to-one into real interest rate differentials. Thus, the very same inflation differences which were shown to produce changes in real exchange rates within EMU above, have also led to sizable real interest rate differentials between EMU members - displayed in figure 3. Real interest rate differentials are a potentially destabilizing force in a currency area since 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 destabilize the system. The argument thus became known as the 'Walters Critique'.[7]

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[6] In this Graph, a positive rate of change of the real effective exchange rate denotes a real appreciation.
[7] See Walters (1990) for an exposition and Miller/Sutherland (1990) for a theoretical discussion.
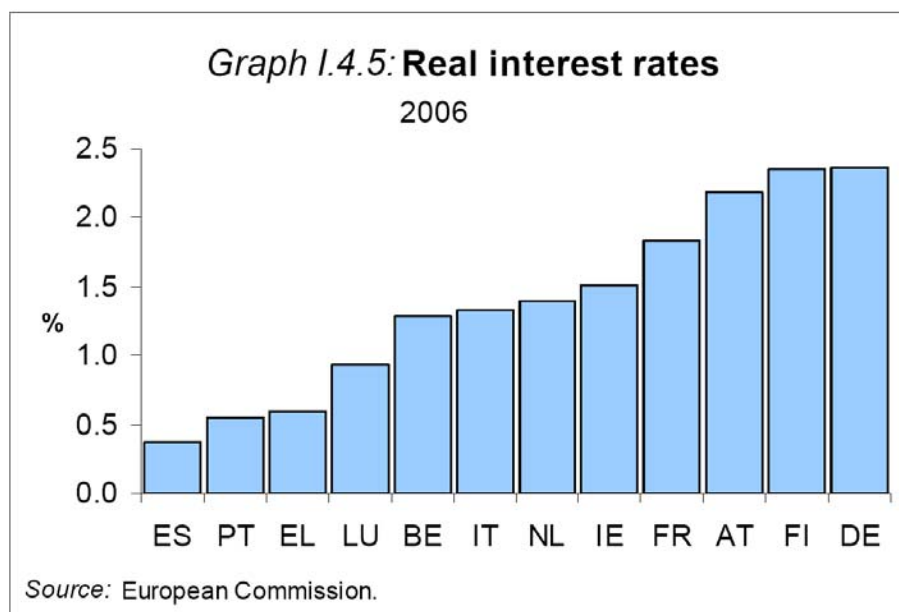
Figure 3:   Real interest rates in the euro area, 2006
Source: European Commission (2008), p. 54

Interest rates are known to affect goods markets through a number of transmission channels involving a broad range of assets. One of these assets is real estate which has caught public attention by its role in the financial and economic crisis that has taken hold of the world economy since 2007. As is widely agreed by now, inappropriately low real interest rates were a key factor in the housing booms preceding the crisis. 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.[8] His chart, showing the link between a measure of housing investment and cumulated deviations from the Taylor rule over a five year period up to the end of 2006, is reproduced here as Figure 4.

As persistent real interest differentials and changes in relative price levels affect economic activity in euro area member states in opposite directions, the question arises of what this has done to the synchronization of national business cycles. The European Commission looks at the standard deviation of euro-area output gaps to assess the synchronization issue. What it finds is that business cycles were more synchronized in the decade following the introduction of the Euro than in the decade preceding it. The convergence of cyclical positions appears to have set in well before the start of EMU. After a peak in the early 1990s, the standard devia-

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[8] 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.

tion of output gaps has trended downward ever since. Of course, any such assessment raises a number of measurement issues and the "EMU@10" report is careful to spell them out. One of them concerns the relation between the dispersion of output gaps and their absolute size. Clearly, the 1980s and early 1990s were more turbulent times macroeconomically than the first decade of the euro. Therefore, Figure 5 contrasts the declining standard deviation of output gaps with the evolution of the coefficient of variation which appears to be almost constant or to follow a slight upward trend. This suggests that the synchronization of cyclical conditions in the euro area has not grown stronger with the advent of the euro, once the absolute size of output gaps is taken into account.
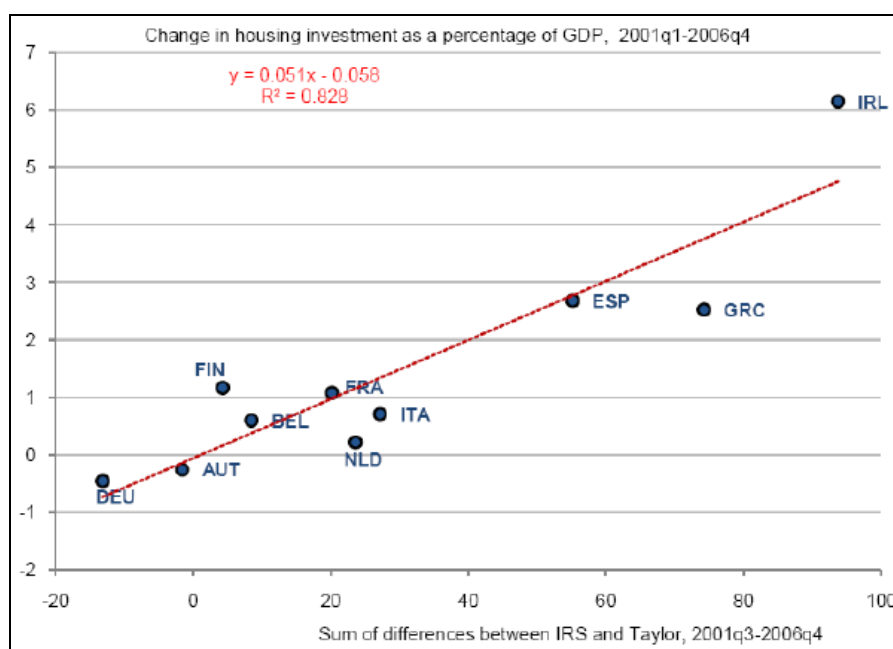

Figure 4:   The relationship between housing investment and deviations from the Taylor rule in Europe
Source: Taylor (2009), p. 8

Another concern is that the standard deviation does not capture the persistence of cyclical imbalances. If the same countries experience positive or negative deviations from the average euro-area output gap over extended periods of time, such deviations may add up to serious macroeconomic imbalances without the standard deviation of output gaps showing any sign of increased turbulence.[9] Similarly any pattern of 'rotating slumps' as hypothesized by Blanchard would not necessarily be detected by a measure of output gap dispersion. To get a

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[9] This point is usefully emphasized, among others, by Dullien and Fritsche (2007).

sense of persistent cyclical patterns, a good starting point is to look at national GDP growth rates and output gaps over time. Figure 6 does this for a small group of euro area countries. The sample of countries is made up of the extreme cases of figure 1: Ireland and the Mediterranean periphery, which have seen the biggest increases in unit labor cost 1999-2007, plus Germany from the other end of this ranking.
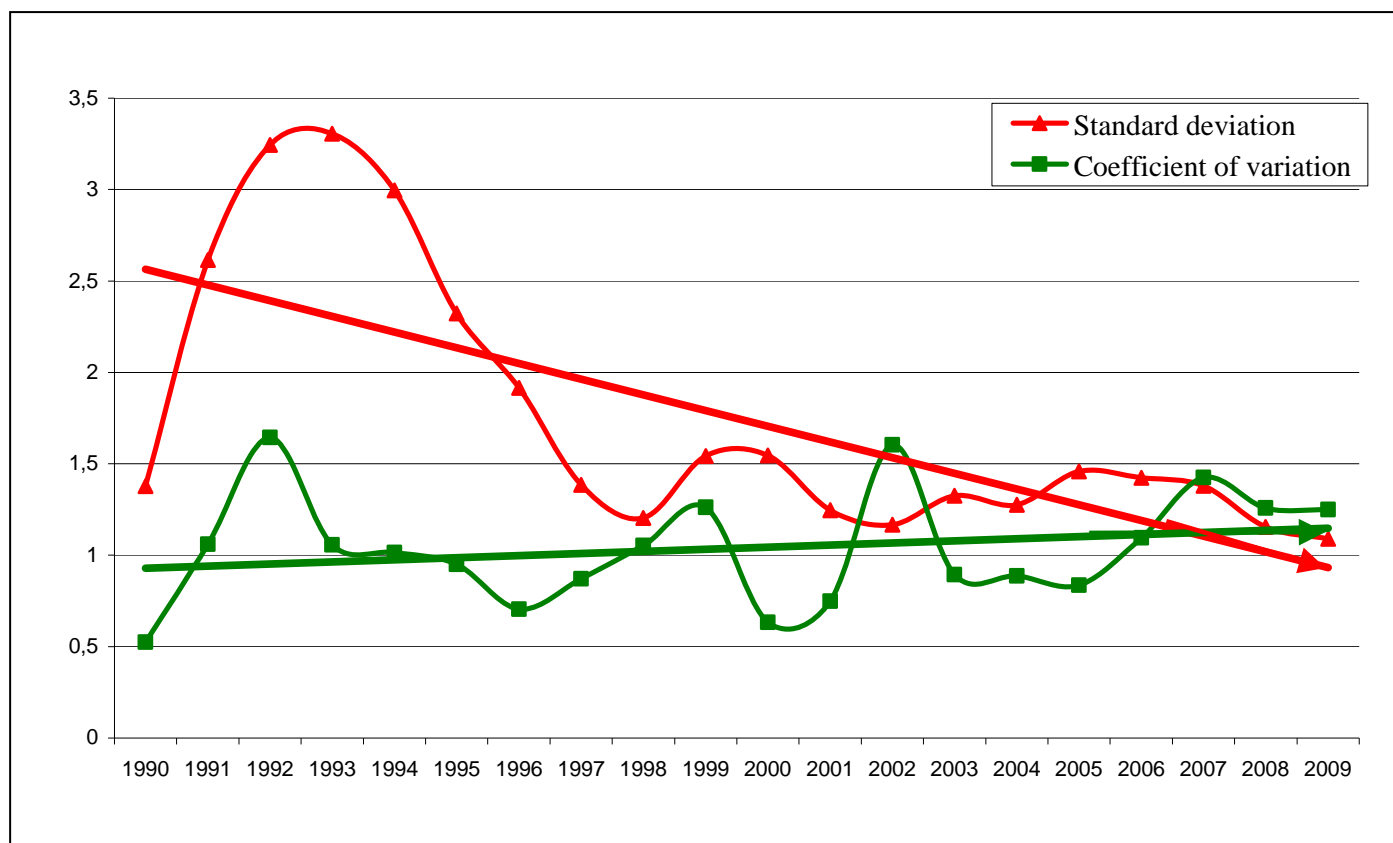

Figure 5: **The dispersion of output gaps in the euro area, 1990-2008**
Source: OECD

The upper panel of Figure 6 reveals large and persistent differentials in real GDP growth. Ireland, Spain and Greece display growth rates significantly above the euro-area average throughout a period extending from the mid-1990s to 2007. Portugal experienced an extended boom in the years preceding the start of EMU, but then lost momentum, its growth rate falling back below the euro-area average. Germany, in contrast, was the "laggard of Europe" (Sinn 2003) throughout 1995-2005.[10] By 2008, growth rates have converged to a relatively narrow band.

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[10]   The negative growth differential in the case of Germany comes across as rather small. One should bear in mind, however, that Germany makes up one third of the euro-area average.
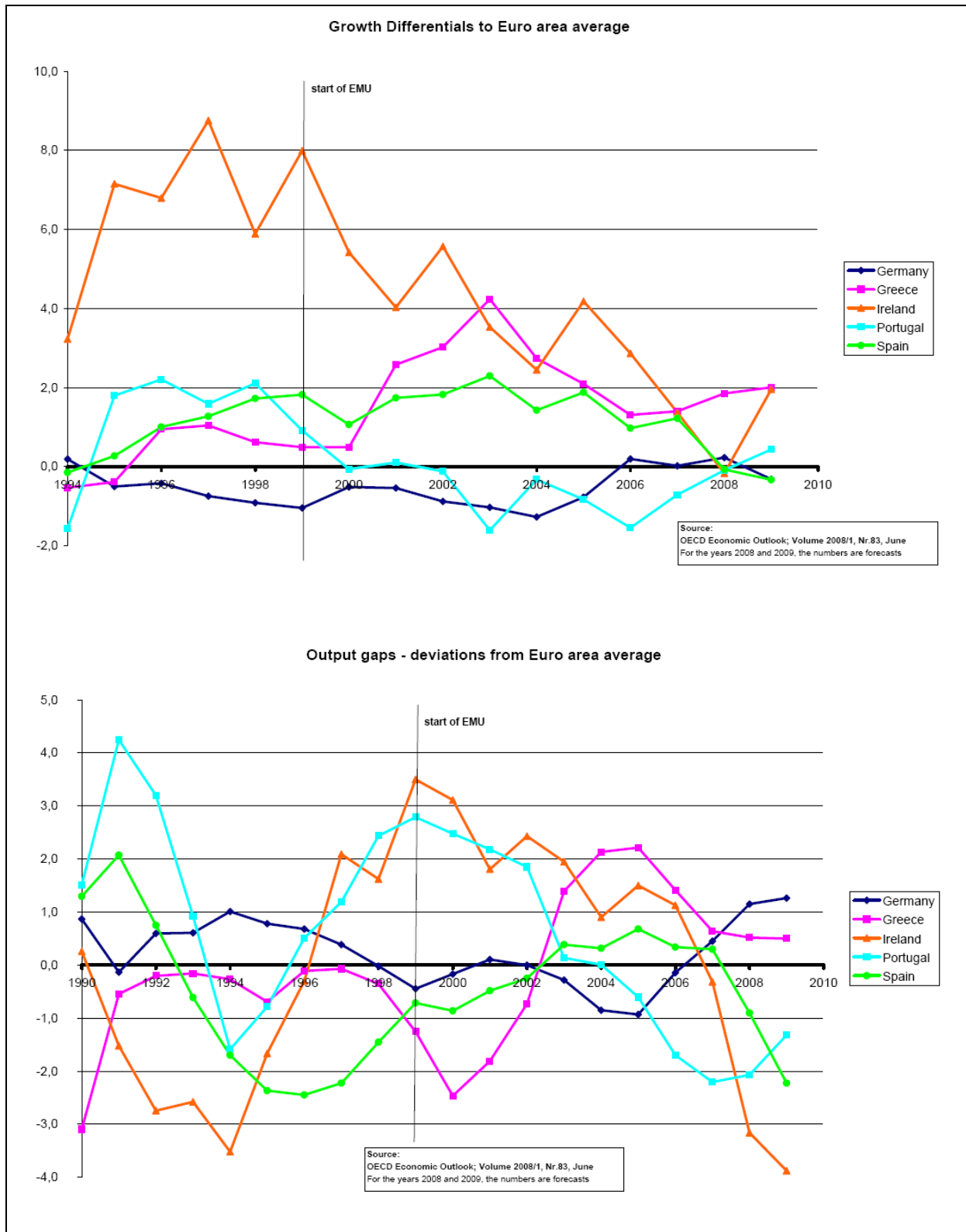
Figure 6:   Relative growth rates and output gaps (selected countries)
Source: OECD Economic Outlook Nr. 83, June 2008 (for the years 2008 and 2009, the numbers are forecasts).

The lower panel of Figure 6 plots output gaps for the same five countries, again as deviations from the euro-area average, to illustrate the cyclical component of the comparative growth performance. For all the countries shown, one can see a clear pattern of cycles exhibiting considerable persistence. Ireland and the Mediterraneans all begin an extended recovery from a relative cyclical trough ahead of the start of EMU; in the case of Greece the recovery starts in 2000, the year of Greece's entry into EMU. This pattern contrasts with the experience of Germany whose relative cyclical position continually deteriorated from 1994 onwards. What has the appearance of a convergence of growth rates in recent years in the upper panel of Figure 6, looks very much like a reversal of relative cyclical positions in the lower panel: Just as Germany stages a recovery starting in 2005, the output gaps of Ireland, Portugal and Spain head downwards and are posed to fall below the euro-area average. This reversal of cyclical positions strongly evokes Blanchard's notion of "rotating slumps".

The question naturally arises how this apparent pattern of persistent, desynchronized cycles can be explained and whether it is related to the persistent inflation differentials discussed above. To explore this issue, a stylized model of the dynamics of inflation differences and country-specific business cycles within a currency area is given in the next section. The story suggested by the model is essentially one of demand-side dynamics driven by inflation inertia. A good example for the macroeconomic significance of inertial inflation is provided by the experience of Portugal.[11] In the second half of the 1990s, the prospect of EMU membership drove down interest rates, stimulated investment and thereby created an economic boom. As observed above, this boom faded after 1999. While the principal cause of the downturn was a drop in private domestic spending, net exports were a drag, too, reflecting the loss of competitiveness brought about by strong wage growth during the boom years. Interestingly, however, the rate of increase of Portuguese unit labor cost continued to outstrip euro-area inflation even as real GDP growth fell sharply relative to the rest of Europe. This inertial behavior of inflation clearly exacerbated the swing from boom to bust. A very similar mechanism appears to have been at work in Spain where wages are tightly linked to inflation so that competitiveness continued to be lost vis-à-vis the euro area even when demand growth slowed down sharply.

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[11]   See Blanchard (2007a,b)

3. A Stylized Model of 'Rotating Slumps'

The model considered in this section is a stripped-down, symmetric two-country, or two-region, model of a monetary union. Each region is essentially characterized by two relationships: a demand equation and a Phillips curve with inertial core inflation. In addition, there is a representation of expectations and an equation describing the adjustment of core inflation.

Individual regions $\left(i, j = 1, 2 \quad ; \quad i \neq j\right)$

(I1) $\qquad Y_i = D_i - \partial_0\left(i - \pi_i\right) - \partial_1\left(p_i - p_j\right) - \mu\left(Y_i - Y_j\right)$ $\qquad$ Demand

(I2) $\qquad \pi_i = \overline{\alpha}\left(Y_i - \overline{Y}_i\right) + \varphi\,\pi_i^C + \left(1 - \varphi\right)\pi_i^e$ $\qquad$ Phillips curve

(I3) $\pi_i^e = \pi_i = \alpha\left(Y_i - \overline{Y}_i\right) + \pi_i^C \quad , \quad \alpha \equiv \overline{\alpha}/\varphi$ $\qquad$ Rational expectations

(I4) $\qquad \dot{\pi}_i^C = \gamma\left(\pi_i - \pi_i^C\right)$ $\qquad$ Adjustment of core inflation

Y: Output; $Y - \overline{Y}$: Output gap; D: Autonomous demand; 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 on the level of the monetary union as a whole and applies to both regions. The parameter μ captures the extent of intra-union trade linkages. Competitiveness is measured by the relative price levels of the two regions, thus abstracting from the dimension of competitiveness vis-à-vis the rest of the world outside the monetary union. In the same way, other sources of demand shocks from the rest of the world are not represented explicitly, but captured by the catch-all autonomous demand variable D_i. Variables such as expected future income that would be suggested by an explicit microeconomic foundation of spending behavior are equally 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 (I2)-(I4) 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 (I1)-(I4) 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. Turning first to the behavior of the monetary union as a whole, it is useful to define the following aggregate variables:

$$Y = Y_1 + Y_2 \qquad\qquad \overline{Y} = \overline{Y}_1 + \overline{Y}_2 \qquad\qquad \text{Aggregate output, aggregate potential output}$$

$$D \equiv D_1 + D_2 \qquad\qquad\qquad\qquad\qquad \text{Aggregate autonomous demand}$$

$$\pi = \frac{1}{2}\left(\pi_1 + \pi_2\right) \qquad \pi^C = \frac{1}{2}\left(\pi_1^C + \pi_2^C\right) \qquad \text{Aggregate inflation, aggregate core inflation}$$

Before aggregate output and inflation can be determined, the behavior of the nominal interest rate must be specified. The interest rate is set by the central bank of the monetary union and is thus determined outside of the system (I1)-(I4). In line with current practice in the theory of monetary policy, it is assumed that the central bank sets the interest rate so as to minimize a quadratic loss function in the output gap and inflation, subject to the constraint imposed by the aggregate Phillips curve. As is well known,[12] the first order condition for the monetary policy optimum defines a linear inverse relationship between 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. This relationship is illustrated by a falling line in (π,Y) space, labelled the MP ('Monetary Policy') line in Figure 7, below. The slope of the MP line depends on the shape of central bank preferences and on the slope of the short-run Phillips curve.

With the addition of 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 as represented by the system (A1)-(A6). The equations for aggregate demand and aggregate inflation (A1-A3) result from straightforward aggregation of (I1), (I3) and (I4).

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

The Aggregate Behavior of the Monetary Union

(A1) $Y \equiv Y_1 + Y_2 = D - 2\partial_0(i - \pi)$ Aggregate Demand

(A2) $\pi = \dfrac{\alpha}{2}(Y - \overline{Y}) + \pi^C$ Aggregate Inflation

(A3) $\dot{\pi}^C = \gamma(\pi - \pi^C)$ Adjustment of Aggregate Core Inflation

(A4) $Y - \overline{Y} = -\beta(\pi - \pi^T)$ Monetary Policy Behavior (MP line)

For any given levels of $\overline{Y}$ and π^T, taking the time derivative of (A2) and using (A2)-(A4) to substitute for $\dot{\pi}^C$ yields

(A5) $\dot{\pi} = \dfrac{\alpha\gamma}{\alpha\beta + 2}(Y - \overline{Y})$ Inflation Dynamics

Combining (A1) and (A4), optimal monetary policy behavior can be represented as an interest rate rule implementing a flexible inflation targeting strategy:

(A6) $i = \pi + \dfrac{D - \overline{Y}}{2\delta_0} + \dfrac{\beta}{2\delta_0}(\pi - \pi^T)$ Interest Rate Rule

The Aggregate Behavior of the Monetary Union is illustrated in Figure 7. In the lower panel, MP represents central bank behavior (eq. A4) and PC is the Phillips curve, drawn under the assumption that core inflation equals the inflation target of the central bank. Their point of intersection marks an equilibrium with zero output gap and zero inflation gap (i.e. inflation on target). In the upper panel, AD represents aggregate demand as a falling function of the real interest rate. 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.[13] In the case of an aggregate supply shock, i.e. a shock to the aggregate Phillips curve, the optimal interest rate response is chosen so as to keep the economy on the MP line. At any point on the MP line, the dynamics of the inflation rate is

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[13]   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).

governed by equation (A5) which implies that inflation keeps falling as long as output falls short of potential output whereas inflation rises whenever there is a positive output gap. As is evident from the lower panel of Figure 7, the dynamic behavior of inertial inflation, together with the flexible inflation targeting strategy of the central bank, ensures the stability of the system. Output and inflation both converge towards their equilibrium levels monotonically, the adjustment speed being essentially determined by the parameter γ which captures the extent of inflation inertia. The arrows in the upper panel of Figure 7 illustrate the continual interest rate adjustments that are required to keep the the monetary union on its path towards equilibrium.
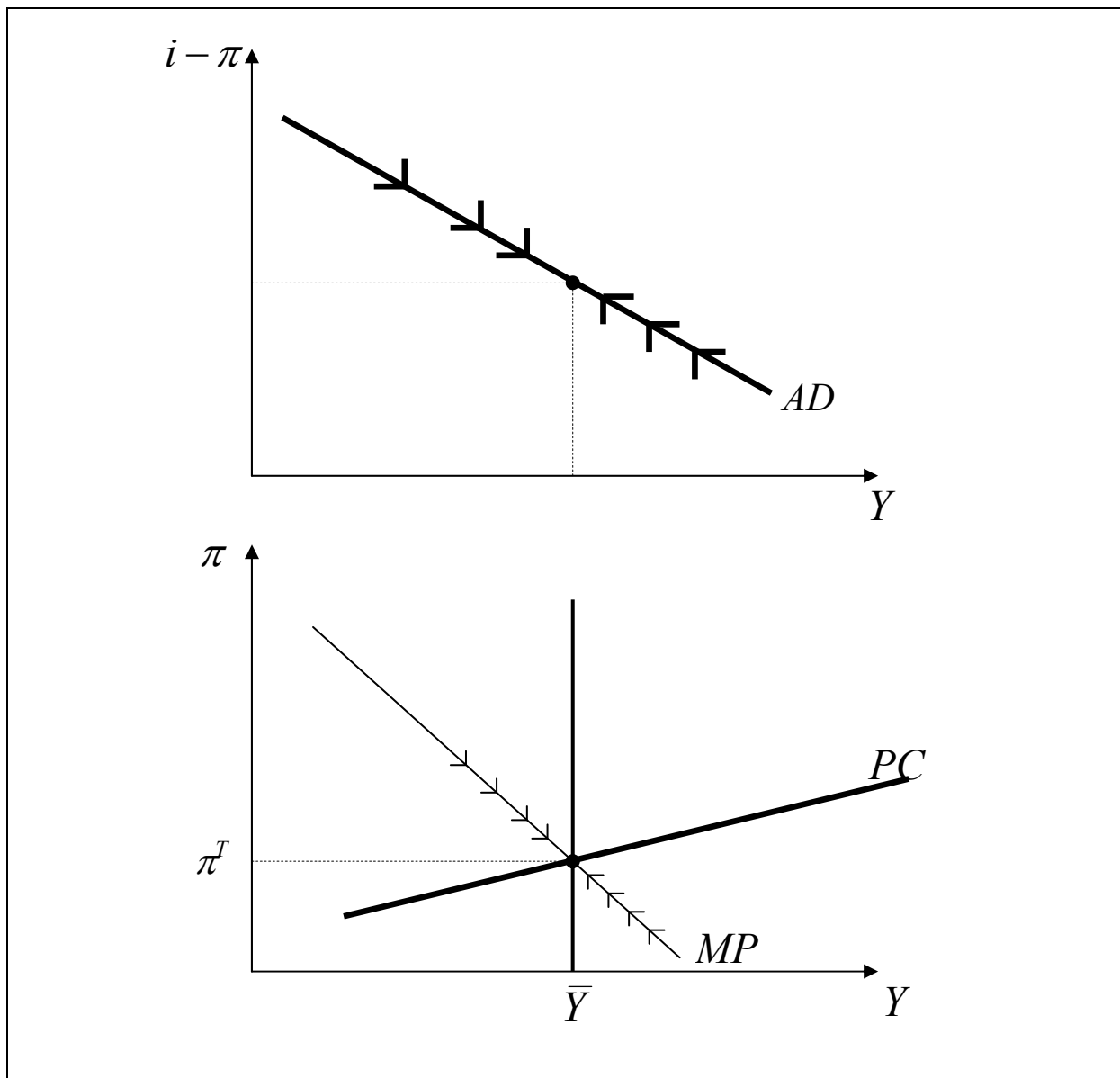

Figure 7:   The Behavior of the Aggregate Monetary Union

The next step is the analysis of the differential behavior of the model, i.e. of the relative macroeconomic performance of the two countries which make up the monetary union. It will turn out that the stability properties of relative output and inflation are much less benign than those of aggregate output and inflation. As the argument proceeds, the following definition of relative variables will prove convenient:

$$\tilde{x} \equiv x_1 - x_2 \qquad \text{for } x = Y, \overline{Y}, D, \pi, \pi^C, p$$

Using this notation, relative output is easily established by subtracting the output equations of the two countries (I1) from each other. The same procedure, applied to the equation pairs (I3) and (I4), yields expressions for the inflation differential between the two countries and for the relative adjustments of the inertial core inflation rates - equations (D1-D3) in the box below.

Relative output in (D1) 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 (D2) 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 in the case of aggregate output and inflation above, the dynamic behavior of output and inflation differentials can be determined by expressing their time derivatives as functions of their prevailing levels. Its dynamic properties are best understood by inspecting its equilibrium and stability conditions. Equilibrium is defined by the stationarity of $\tilde{Y}$ and $\tilde{\pi}$ ($\dot{\tilde{Y}} = \dot{\tilde{\pi}} = 0$). According to (DD4), this requires any cross-country differences in inflation or in the output gaps to vanish. Imposing this requirement on (D1) delivers an equilibrium value for the real exchange rate $\tilde{p}$. Since both countries share the same real interest rate in equilibrium, the equilibrium real exchange rate must adjust to accommodate any differential movements of autonomous demand ($\tilde{D}$) relative to potential output ($\tilde{\overline{Y}}$) in the two countries.

The Differential Behavior of the Monetary Union

(D1) $\tilde{Y} = \tilde{D} + \partial_0 \tilde{\pi} - 2\partial_1 \cdot \tilde{p} - 2\mu \tilde{Y}$

$= \dfrac{1}{1+2\mu} \cdot \left[\tilde{D} + \partial_0 \tilde{\pi} - 2\partial_1 \cdot \tilde{p} \right]$ Output Differential

(D2) $\tilde{\pi} \equiv \pi_1 - \pi_2 = \alpha \left(\tilde{Y} - \tilde{\tilde{Y}} \right) + \tilde{\pi}^C$ Inflation Differential

(D3) $\dot{\tilde{\pi}}^C = \gamma \left(\tilde{\pi} - \tilde{\pi}^C \right)$ Differential Adjustment of Core Inflation

Turning to the dynamics of the system, we take the time derivatives of (D1) and (D2) and use (D2) and (D3) to substitute for $\dot{\tilde{\pi}}^C$. For any given $\tilde{\tilde{Y}}$, and noting that $\dot{\tilde{p}} \equiv \tilde{\pi}$, this yields

(DD1) $\dot{\tilde{Y}} = \dfrac{1}{1+2\mu} \left(\partial_0 \dot{\tilde{\pi}} - 2\partial_1 \cdot \tilde{\pi} \right)$ Change of Output Differential

(DD2) $\dot{\tilde{\pi}} = \alpha \dot{\tilde{Y}} + \dot{\tilde{\pi}}^C = \alpha \dot{\tilde{Y}} + \alpha \gamma \left(\tilde{Y} - \tilde{\tilde{Y}} \right)$ Change of Inflation Differential

(DD1) and (DD2) are now readily solved for the differential dynamics of the monetary union ($\dot{\tilde{Y}}$ and $\dot{\tilde{\pi}}$):

(DD3) $\begin{bmatrix} \dot{\tilde{Y}} \\ \dot{\tilde{\pi}} \end{bmatrix} = \left(1 + 2\mu - \alpha \partial_0 \right)^{-1} \cdot \begin{bmatrix} \alpha \partial_0 \gamma & -2\partial_1 \\ \alpha \gamma (1+2\mu) & -2\alpha \partial_1 \end{bmatrix} \begin{bmatrix} \tilde{Y} - \tilde{\tilde{Y}} \\ \tilde{\pi} \end{bmatrix}$

Setting both equations in (DD3) equal to zero yields the equilibrium values of $\tilde{Y}$ and $\tilde{\pi}$ which in turn can be plugged into (D1) to retrieve the equilibrium relative price level $\tilde{p}$:

(DD4)
$$\left. \begin{array}{c} \tilde{Y} = \tilde{\tilde{Y}} \\[2mm] \tilde{\pi} = 0 \\[2mm] \tilde{p} = \dfrac{1}{2\partial_1} \left[\tilde{D} - (1+2\mu)\tilde{\tilde{Y}} \right] \end{array} \right\}$$
Equilibrium Conditions for $\tilde{Y}$, $\tilde{\pi}$, and $\tilde{p}$

In addition, the necessary and sufficient stability conditions of the equilibrium (DD4) can be derived from the differential equations system (DD3):

(DD5)
$$\left. \begin{array}{ccc} \alpha \partial_0 & < & 1 + 2\mu \\[2mm] \partial_0 \gamma & < & 2\partial_1 \end{array} \right\}$$
Stability Conditions

The simultaneous differential equation system (DD3) is represented by the phase diagram in Figure 8. For simplicity, and in line with the model's symmetry, the figure is drawn under the assumption $\tilde{\tilde{Y}} = 0$, but the model can be used to analyze asymmetric shocks to potential output as well, in which case $\tilde{\tilde{Y}}$ would move away from zero.

From the phase diagram, the stability properties of the system are not obvious and indeed, the two stability conditions (DD5) reveal that stability is anything but guaranteed. Intuitively, the ambiguity is easy to rationalize as the output differential and the inflation differential are linked by two feedback loops, one stabilizing (the relative price effect), and one destabilizing (the real interest rate effect). The latter, as pointed out above, was the focus of the 'Walters Critique'. Since the relative price 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 put it in "EMU@10" - "ultimately the competitiveness channel will *inevitably* overtake the real interest rate channel".[14] However, as the analysis of this model demonstrates, there is nothing inevitable about that. Rather, stability hinges on the magnitudes of various parameters. According to (DD5), four different factors interact in determining whether or not the system is stable - the first two of which are straightforward:

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).

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.[15] 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 backward-looking nature.[16] The

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[14]   European Commission (2008), p. 52 (emphasis added).
[15]   See European Central Bank (2008), section 5.
[16]   See equations (I2) and (I2') above.

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. While such flexibility is widely said to be an important prerequisite for the smooth operation of a currency area, here it turns out to be detrimental to the dynamic stability of the system. 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.[17]
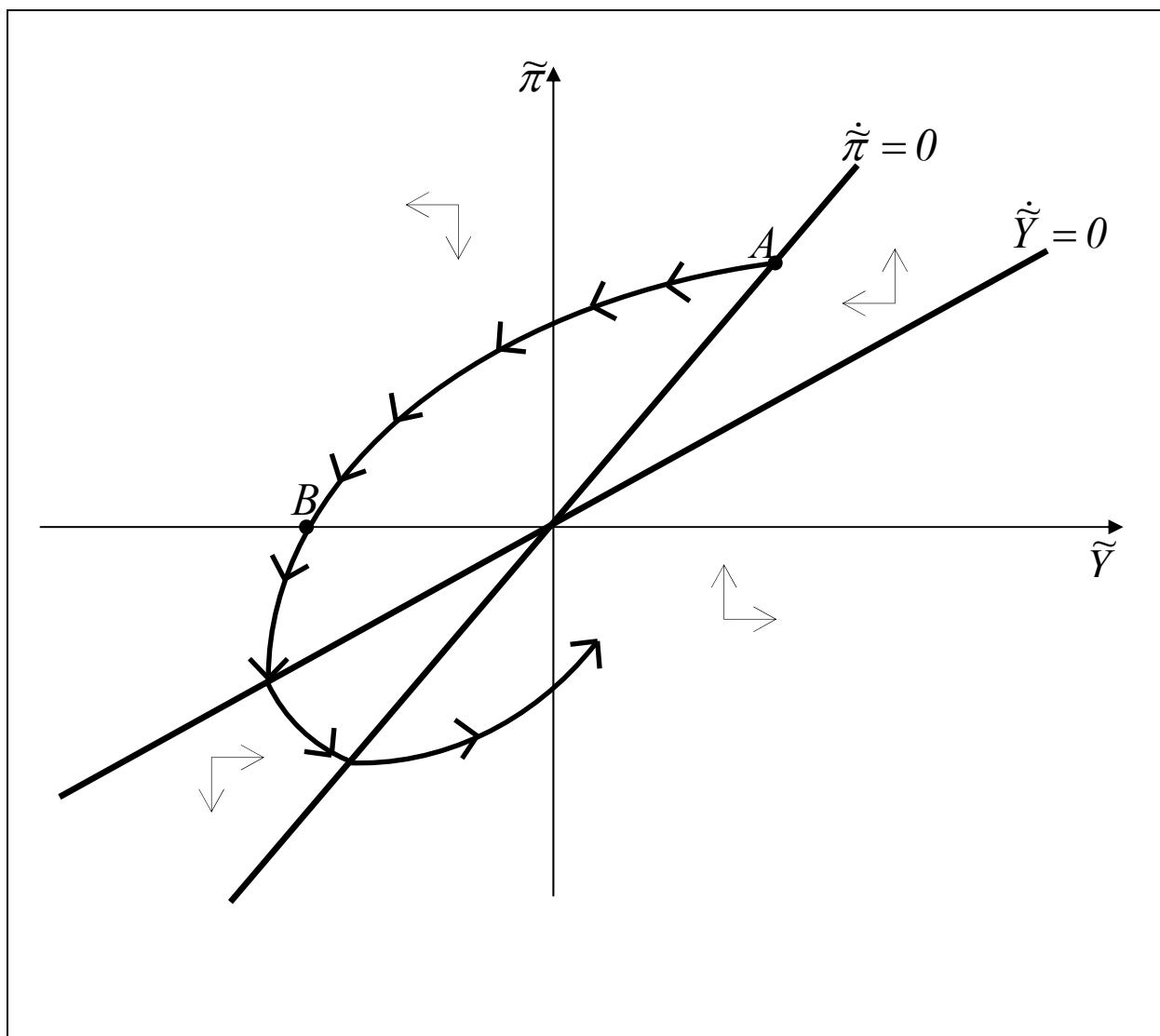

Figure 8:   The Differential Behavior of the Monetary Union

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[17]   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.

4. Some implications of fragile adjustment

Of course, the stability properties of any model of output and inflation dynamics 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 dramatically 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 still 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.

In sum, the details of the adjustment pattern predicted by 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 the message of the analysis in the preceding section does not really depend on the signs of the inequalities in (DD5). Rather, the key insight is that the adjustment process is inherently fragile and protracted even if the system does ultimately converge to its equilibrium. In the light of this analysis, we should not be surprised to observe persistent inflation differentials and growth cycles in the individual member states of EMU. The phenomenon is neither accidental nor caused by particular structural rigidities, but a consequence of the loss of national monetary policy autonomy in the presence of continued inflation inertia. Disequilibria are left unattended on the national level that would not be tolerated by the central bank on the level of the monetary union as a whole. In fact, this is the first of a number of implications of the model of this paper that are worth emphasizing:

1.   A stylized story of rotating slumps

While the strategy of flexible inflation targeting pursued by the central bank can ensure dynamic stability and monotonic adjustment towards equilibrium on the aggregate level in principle (Figure 7), the absence of countercyclical demand management on the national level creates a risk of persistent national output and inflation cycles (Figure 8). As long as reasonable stability prevails on the aggregate level, cycles in output differentials amount to 'rotating slumps'. The severe slump that followed upon the financial crisis in 2008 serves as a reminder, however, that monetary policy may have a hard time maintaining aggregate macroeconomic stability if the currency area is hit by an exceptionally large shock. If such a shock affects the individual member states unevenly, it might in addition add to output-gap and inflation disparities as well.

2.   A stylized story of post-unification Germany

The trajectory which is drawn in Figure 8, starting in point A on the $\dot{\tilde{\pi}} = 0$ demarcation line can be interpreted as a stylized representation of the relative macroeconomic performance of Germany after its idiosyncratic reunification boom of the early 1990s. To be sure, the interpretation of the model in terms of Germany's pre-EMU experience strains the logic of the model somewhat since the Bundesbank was still in control of German interest rates at that time. But the implications for Germany's *relative* macroeconomic behavior still stand, at least in relation to those countries which did not leave the EMS under the pressure of the currency speculation set off by the asymmetries in the EMS. The 1989-91 boom moved Germany's output gap and inflation rate above the levels prevailing in neighbouring Europe and thus created a situation such as the one represented by point A in figure 8. Therefore, a protracted period of disinflation and below-potential growth was inevitable. But by virtue of the laws of motion of $\tilde{Y}$ and $\tilde{\pi}$, both the relative output gap and the inflation differential were bound to overshoot their equilibrium levels during adjustment. In this way, the initial overvaluation of the real exchange rate eventually turned into an undervaluation. The regained competitiveness then helped to start a recovery of output growth.[18]

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[18]   It goes without saying that this stylized account neglects many other forces that may have been at at work as well - such as developments in Germany's export markets.

3.   *Suboptimal adjustment of output and inflation in individual countries*

Using a standard central bank objective function of the type outlined above as a yardstick, the adjustment behavior of the system as implied by the laws of motion in Figure 8 are unambiguously suboptimal. Again referring to the trajectory which starts in point *A*, the adjustment paths of national output and inflation in both countries clearly violate the first order condition that defines the optimal trade-off between the two variables - even when aggregate output and inflation are optimally balanced.

4.   *Dubious convergence criteria for EMU accession*

The adjustment dynamics generated by the model suggest that the convergence criteria of the Maastricht Treaty which any would-be member must pass before being allowed into EMU might well fall short of what they were designed to achieve. The idea was to make sure that the new member would be well served by the monetary policy stance of the ECB. One of the criteria effectively requires an inflation rate close to the lower end of the range of European inflation rates during the year preceding accession to EMU. One year is a relatively short period of time. A country that is credibly committed to EMU membership may easily find itself on a trajectory leading away from equilibrium, but still may meet the inflation convergence criterion as the trajectory crosses the $\widetilde{Y}$ axis (point *B*). Subsequent tensions are then sure to follow, however, as the economy moves on along its trajectory.

5.   *German beggar-thy-neighbor policy?*

Critical voices in Germany maintain that the negative inflation differential by which Germany improved its competitiveness vis-à-vis the euro area since 1999 constitutes a beggar-thy-neighbor strategy of wage dumping and should therefore be ended.[19] Proponents of this view usually call for higher wage increases reflecting productivity growth plus the target inflation rate of the ECB. It is true that the boom-bust cycle generated by persistent inflation differentials and the concomitant long swings in relative prices are costly to the individual countries involved. But the beggar-thy-neighbor charge in the particular case of a falling relative price level is misplaced. The argument focuses on the partial expenditure-switching effect of rela-

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[19]   E.g. Flassbeck/Spiecker (2007).

tive prices, neglecting the wider repercussions in the currency area. In particular, it neglects the endogeneity of monetary policy on the aggregate level. The point is best seen in the model by considering an expansionary asymmetric demand shock hitting country 1. Starting from a position of overall equilibrium, the shock leads to an increase in the output and inflation gaps of that country. 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. Country 2 thus suffers an output loss even though it experiences a fall in its relative inflation rate, i.e. a gain in competitiveness. As is evident from Figure 8, there is no unique relationship between changes in relative prices and relative outputs. Rather, the covariation of the two endogenous variables depends on the shocks that drive them and on the phase of the ensuing adjustment process. To infer beggar-thy-neighbor behavior from changes in relative prices is not correct.

6.   *Support for a 'two-handed' approach in unemployment policy*

The model also sheds light on the relation between supply-side and demand-side policies to fight unemployment. On a conceptual level, their respective roles are easily defined: Supply-side reforms must be used to combat structural unemployment, demand-side policies should take care of cyclical unemployment. In practice, however, the two types of policies are inter-twined or, more accurately, they must support each other. Again, Figure 8 allows to illustrate the point. Suppose that, contrary to what was assumed so far, the equilibrium of the monetary union is initially in point *B*. Country 1 now implements supply-side reforms that push down the natural unemployment rate and, by the same token, raise potential output. As a consequence, the new equilibrium of the system shifts to the right where the $\dot{\tilde{Y}} = 0$ and the $\dot{\tilde{\pi}} = 0$ loci intersect as drawn. Both the aggregate potential output of the monetary union and the potential output of country 1 have increased. What happens to actual output, however, depends on the response of demand-side policies. If the central bank recognizes the change in potential output, its best response is to accommodate it so as to let actual aggregate output increase in line with aggregate potential output.[20] But that does nothing for the reconciliation of relative output with the change in relative potential output. Absent corrective measures on the level of the individual countries, actual relative output, instead of catching up with relative potential output, will start wandering off southwest along the trajectory drawn through point

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[20]   See Clarida/Galì/Gertler (1999) for details. In their model, forward-looking consumers increase their demand in step with potential output so that accommodation on the part of the central bank amounts to leaving the interest rate unchanged.

B. It thus becomes evident that output (and hence employment) will not react to necessary supply-side reforms in the desired way - or only after long and costly adjustment - unless the supply-side measures are supplemented by appropriate demand-side stimulus. This is what Blanchard et al. (1986) once called the "two-handed approach": supply and demand policies must work hand in hand if the desired results are to materialize.[21]

7.   A currency area requires countercyclical fiscal policies on the national level

All of the above implications suggest one important common conclusion: The stabilization of relative output and the prevention of excessive volatility in relative prices in a currency area require tools that can be selectively targeted to individual countries. This is where national fiscal policies come in. What exactly it is that fiscal policies should do critically depends on the constraints fiscal policy-makers face as well as on additional objectives they may pursue. What sounds easy and straightforward in principle, may be hard to implement in practice. Since it is *relative* fiscal policies that must be adjusted to take care of imbalances in relative output and relative inflation rates, difficult international coordination issues are likely to arise with regard to the allocation of the burden of adjustment. Solving coordination issues, in turn, can become complicated if sustainability concerns and other political imperatives come into play. But none of these practical difficulties should be allowed to gloss over the need for national fiscal policies to address the internal macroeconomic disparities in a currency area.

5. Conclusion

The major results of this paper have been summarized above. The conclusion can thus be kept short. The main point 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. As this paper has demonstrated, a monetary union, if unaided by nationally targeted demand policies, can be a dynamically fragile construct. Cyclical fluctuations can occur in individual countries and substantial inflation differentials can persist even when the central bank is highly successful at keeping the aggregate economy on a stable path.

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[21]   For a more detailed discussion of how to implement a two-handed approach, see Jerger/Landmann (2007).

The natural demand-side instrument for targeting macroeconomic disparities in a currency area is countercyclical national fiscal policy. The provisions of the Maastricht Treaty and of the Stability and Growth Pact tend to downplay this point. Their focus is almost entirely on the issue of fiscal sustainability. The escape clauses that they contain for the case of major adverse shocks are not well adapted to the problem of slow-moving, persistent cycles in relative prices and output. And contrary to what the European Commission suggests in "EMU@10", the further reduction of structural rigidities on labor and goods markets, while desirable on its own, is not a solution for the persistent inflation differentials and for the 'rotating slumps' that characterize the first decade of EMU. Quite to the contrary, the extent of macroeconomic disparities could actually get worse.

An important principle of economic policy is to devote policy instruments to the tasks for which they are best suited. In the present context, this means that monetary policy should be exclusively concerned with the overall macroeconomic balance of the currency area. Fiscal policies, in turn, should focus on smoothing macroeconomic disparities within the currency area to which the centralized monetary policy by construction cannot tend. As the 2008-09 financial and economic crisis demonstrates, however, circumstances can arise in which monetary policy is not powerful enough to fight a severe slump on its own (as it hits the zero-interest lower bound, in particular). Then fiscal policy must come to rescue on the aggregate level as well, which raises issues of policy coordination among highly open economies quite different from those involved in the management of macroeconomic disparities among the individual member states. In the EMU, as the current crisis has caused a deep recession of aggregate output, concerns about the dispersion of relative macroeconomic conditions across the union have been pushed to the background. However, since some of the member states of the union appear to have been hit by the crisis harder than others, the question of how to cope with macroeconomic disparities is likely to resurface rather sooner than later.

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