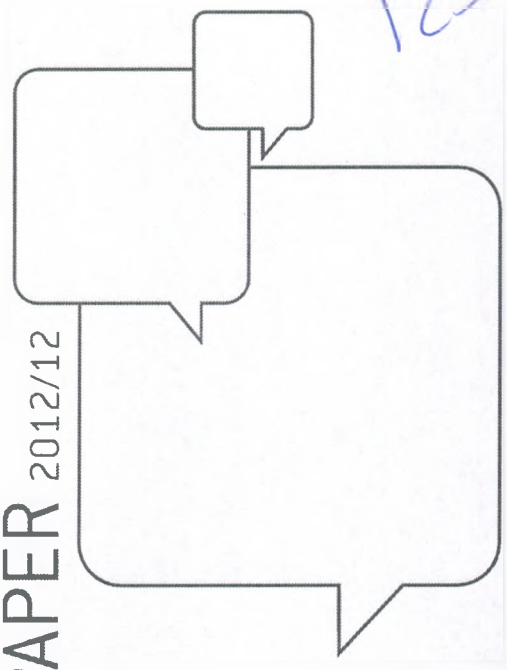
125



BRUEGEL WORKING PAPER 2012/12

THE SIMPLE MACRO-ECONOMICS OF NORTH AND SOUTH IN EMU

SILVIA MERLER* AND JEAN PISANI-FERRY

Highlights

The euro area today consists of a competitive, moderately leveraged North and an uncompetitive, over-indebted South. Its main macroeconomic challenge is to carry out the adjustment required to restore the competitiveness of its southern part and eliminate its excessive public and private debt burden. This paper investigates the relationship between fiscal and competitiveness adjustment in a stylised model with two countries in a monetary union, North and South. To restore competitiveness, South implements a more restrictive fiscal policy than North.

We consider two scenarios. In the first, monetary policy aims at keeping inflation constant in the North. The South therefore needs to deflate to regain competitiveness, which worsens the debt dynamics. In the second, monetary policy aims at keeping inflation constant in the monetary union as a whole. This results in more monetary stimulus, inflation in the North is higher, and this in turn helps the debt dynamics in the South.

Our main findings are:

- The differential fiscal stance between North and South is what determines real exchange rate changes. South therefore needs to tighten more. There is no escape from relative austerity.
- If monetary policy aims at keeping inflation stable in the North and the initial debt is above a certain threshold, debt dynamics are perverse: fiscal retrenchment is self-defeating;
- If monetary policy targets average inflation instead, which implies higher inflation in the North, the initial debt threshold above which the debt dynamics become perverse is higher. Accepting more inflation at home is therefore a way for the North to contribute to restoring debt sustainability in the South.
- Structural reforms in the South improve the debt dynamics if the initial debt is not too high. Again, targeting average inflation rather than inflation in the North helps strengthen the favourable effects of structural reforms.

* Bruegel,
** Director of Bruegel,

The authors are grateful to Zsolt Darvas and Guntram Wolff for detailed comments on an earlier version of this paper. The opinions expressed in this paper are the authors' alone.

JULY 2012

1 Introduction[1]

The euro area today consists of a competitive, moderately leveraged North and an uncompetitive,over-indebted South[2] . Its main macroeconomic challenge is to carry out the adjustment required to restore the competitiveness of its Southern part and eliminate the excessive public and private debt burden it suffers from.

This is bound to be a very demanding process, not only because adjusting without the nominal exchange rate is notoriously difficult, but also because there is an intrinsic contradiction between the competitiveness and deleveraging aims. Simply put, real exchange rate adjustment within a monetary union can only take place through relative deflation, but deflation increases the debt burden and puts solvency at risk. It is a sort of 'doomed if you do, doomed if you don't' challenge: without real exchange rate adjustment, Southern countries have no hope to return to sustainable growth and generate the income they need to repay their debts; but the very process of eliminating the real exchange-rate misalignment endangers public and private deleveraging.

In abstracto the problem does not seem to be without solution. What determines the evolution of the real exchange rate between North and South is only relative inflation, whereas it is absolute inflation that, alongside growth, affects debt sustainability. From a social planner's perspective the challenge is to choose both relative and absolute inflation optimally. In this respect inflation in the North is a variable of paramount importance.

This reading of the euro-area macroeconomic challenges emphasises interdependence between North and South. However, adjustment in the Southern part of the euro area has so far not been envisaged in this way. Rather, it is very much a one-sided process. Macroeconomic adjustment goals have been assigned to Southern deficit countries, either within the framework of macro-financial assistance packages (for Greece, Portugal and Ireland) or through standard EU surveillance procedures (for Spain and Italy), but no such goals have been assigned to Northern European countries. The implicit assumption behind this approach is that budgetary adjustment in Southern Europe will deliver both fiscal sustainability and a return to competitiveness, without the North having to deviate from its preferred policy course.

Increasingly however, it is realised that competitiveness is a relative concept and that economic conditions in the North affect the adjustment process in the South. Important indications of a new stance were declarations by German Finance Minister Wolfgang Schäuble [3] and a widely noted evidence to parliament by the Bundesbank chief economist Jens Ulbrich who said that in a scenario where Southern Europe would regain competitiveness, "Germany could in the future have an inflation rate somewhat above the average within the European monetary union, although monetary policy will have to ensure that inflation overall in the EMU is consistent with the goal of price stability and that inflation expectations remain firmly anchored"[4] .

[1]We are grateful to Zsolt Darvas and Guntram Wolff for detailed comments on an earlier version of this paper. The usual disclaimer applies

[2]Detailed empirical evidence supporting this claim is presented in Merler and Pisani-Ferry (2012)

[3]http://www.ft.com/intl/cms/s/0/54aa8246-9772-11e1-83f3-00144feabdc0.html#axzz21eQQxCKM

[4]FT - 9th May 2012 : "Bundesbank signals softening on inflation"

Against this background, this paper investigates the relationship between fiscal and competitiveness adjustment. We start from a stylised model with two countries in a monetary union, North and South, and consider medium-term adjustments. The initial conditions are that North is undervalued in real terms with respect to South. To correct this misalignment, South implements a more restrictive fiscal policy than North (fiscal policy is restrictive in both countries, as both have to restore the sustainability of public finances, but South tightens more).

We consider two scenarios. In the first one monetary policy aims at keeping inflation constant in the North. The South therefore needs to deflate to regain competitiveness. This worsens the dynamics of its public debt, opening the question of whether fiscal adjustment undertaken in this context can ultimately be self-defeating. In the second scenario monetary policy aims at keeping inflation constant in the monetary union as a whole. This results therefore into more monetary stimulus, inflation in the North is higher, and this in turn helps the debt dynamics in the South.

To keep the model simple, we consider public debt only in the model, though the logic is the same for private debt. This avoids representing explicitly the budget constraint of the private sector. Also, we assume that governments have only one instrument at their disposal, namely fiscal policy, and that South assigns it to competitiveness as it cannot act through other means such as wage, tax or structural policies. The implication is that "austerity" is driven by real exchange-rate objectives rather than by sustainability concerns only (or in other words that competitiveness is the most binding constraint).

One may dispute whether this assignment is a realistic one. We posit it is to a large extent. First, it is true that governments have other instruments at their disposal, including structural reforms, but at a few years' horizon real exchange-rate realignment still takes place along a Phillips curve. Structural reforms may help increase the responsiveness of wages to labour market conditions (we consider such effects below) but in the short- to medium-run they merely augment the impact of macroeconomic policy. Second, competitiveness remains in most Southern European countries a binding constraint. Indeed a striking characteristic of the current euro-area situation is that relative prices are far from having adjusted in response to uneven economic conditions (Wolff, 2012). This is a major reason why policymakers in the EU are reluctant to relax the budgetary objectives set to Southern European countries.

2 Set-up

The economy consists of two countries of unequal size, North (N) and South (S). Initially South is uncompetitive with respect to North, so it needs to devalue in real terms over the medium term. For countries that start from a severe misalignment position, the time horizon for the correction is likely to be of the order of magnitude of 5 years. Here, however, we concentrate on the short-term effect of the the adjustment, considering a period (T) of 2 years. This focus is admittedly partial, but the short term effects of adjustment under different conditions is an interesting issue to look at in the context of the euro area, where distressed countries are initiating this process.

Variables

B public debt (*b,* debt-to-GDP ratio)
D primary public deficit (*d*, deficit-to-GDP ratio)
S primary structural deficit (*s*, deficit-to-GDP ratio)
F net foreign assets (*f*, NFA-to-GDP ratio)
P price level (π, inflation; *p,* log level)
Q real exchange rate relative to the other country (increase denotes *appreciation*) ; (*q*, log level)
X net exports (CA less investment income; *x*, CA-to-GDP ratio)
Y output (*g*, growth rate in real terms; *y,* log level)
i nominal interest rate (monetary policy rate)
r real interest rate (short term)
j nominal bond rate

The baseline level of variable Z at time T is denoted $\overline{Z_T}$. Log levels are in lower cases and log differences are represented as $\dot{z}_T = z_T - \overline{z}_T$.Superscripts $i = n; s$ indicate the 2 countries.

Accounting Equations

$$\dot{q}_{s,T} = \dot{p}_{s,T} - \dot{p}_{n,T}; \quad \dot{q}_{n,T} = -\dot{q}_{s,T} \tag{A1}$$

$$B_{i,,T} = B_{i,0}(1+j) + D_{i,T} \tag{A2}$$

Equation (A1) simply defines the real exchange rate. Equation A2 is the standard public debt accumulation equation.

Reduced-form equations

$$y_{i,T} = -\varepsilon_i q_{i,T} + \phi s_{i,T} - \psi r_{i,T} \tag{1}$$

$$p_{i,T} = \gamma_i y_{i,T} \tag{2}$$

$$d_{i,T} = s_{i,T} - \delta y_{i,T} \tag{3}$$

Equation (1) gives the products market equilibrium, equation (2) is a reduced Phillips curve and equation (3) gives the budget deficit as a function of the fiscal impulse and automatic stabilisers. We allow for the parameters γ (Phillips curve coefficient) and ε (elasticity of output with respect to the real exchange rate) to differ across countries.

The two countries are part of a monetary union (EA), where monetary policy is decided by a common central bank. The two countries therefore face the same *nominal* interest rate i_E but given the existence of inflation differentials, their real interest rates will differ. Real interest rate in region i will therefore be:

$$r_{i,T} = i_{E,T} - p_{i,T} \tag{4}$$

The nominal interest rate is decided by the central bank looking at the aggregate product market equilibrium, which comes from the aggregation of $y_{s,T}$ and $y_{n,T}$ with weights α and $(1-\alpha)$ respectively.

Recalling that $q_{s,T} = -q_{n,T}$, it is possible to write the product market equilibrium for the aggregate EA as :

$$y_{E,T} = \alpha y_{s,T} + (1-\alpha) y_{n,T} = -\left[\alpha\varepsilon_s - (1-\alpha)\varepsilon_n\right] q_{s,T} + \phi s_{E,T} - \psi r_{E,T} \tag{5}$$

where $r_{E,T} = \alpha r_{s,T} + (1-\alpha)\, r_{n,T} = i_{E,T} - \alpha p_{s,T} - (1-\alpha) p_{n,T} = i_{E,T} - p_{E,T}$
and $s_{E,T} = \left[\alpha s_{s,T} + (1-\alpha)\, s_{n,T}\right]$

The parameter ϕ in equation (1) gives the response of output to fiscal impulses (constant interest-rat multiplier) and ψ is the semi-elasticity of output to real interest rate changes. For simplicity we assume the same ϕ and ψ for both North and South. For real exchange rate changes within the area not to affect aggregate output, the following relation must hold:

$$[\alpha\varepsilon_s - (1-\alpha)\varepsilon_n] = 0 \tag{6}$$

This constraint can be interpreted as imposing that price elasticity of trade within the area are identical and trade shares inversely proportional to the size of the economy. Imposing (5) implies that aggregate output is a function of the aggregate fiscal stance and the aggregate real interest rate:

$$\dot{y}_{E,T} = \phi\dot{s}_{E,T} - \psi\dot{r}_{E,T} \tag{7}$$

Note that the area-wide nominal interest rate translates into different real interest rates, depending on countries' inflation rate. The real interest rate ultimately depends on the real exchange rate::

$$\begin{aligned}
\dot{r}_{s,T} &= \dot{i}_{E,T} - \dot{p}_{s,T} = \dot{r}_{E,T} + (\dot{p}_{E,T} - \dot{p}_{s,T}) = \dot{r}_{E,T} - (1-\alpha)\dot{q}_{s,T} \\
\dot{r}_{n,T} &= \dot{r}_{E,T} - \alpha\dot{q}_{n,T} = \dot{r}_{E.T} + \alpha\dot{q}_{s.T}
\end{aligned}$$

3 Two Scenarios

Imagine that by the time (T), South needs to achieve a certain competitiveness adjustment, the magnitude of which can be derived in different ways from external balance constraints. Assume the competitiveness adjustment has to be delivered through the only instrument the country has full control on - fiscal policy.In what follows we investigate how fiscal consolidation impacts competitiveness on one hand and the debt dynamics on the other hand under two different scenarios. The first scenario is one in which monetary policy targets price stability in the North, and the adjustment in the South is a one-sided process. Under the second scenario instead the central bank targets price stability in the area as a whole. Given that South needs to depreciate relatively to North, the second scenario implies appreciation in North that helps the process of rebalancing.

3.1 Monetary Policy

Assume that monetary policy aims at *keeping inflation constant in the North*, meaning $\dot{p}_{n,T} = 0$ and consequently $\dot{q}_{s,T} = \dot{p}_{s,T}$. Stable inflation in the North implies:

$$\dot{p}_{n,T} = \gamma_{n,T}\dot{y}_{n,T} = \gamma_{n,T}\left[-\varepsilon_n \dot{q}_{n,T} + \phi \dot{s}_{n,T} - \psi\left(\dot{r}_{E,T} - \alpha \dot{q}_{n,T}\right)\right] = 0$$

Solving for $\dot{r}_{E,T}$the expression above, we can derive the area-wide real interest rate as a function of prices and fiscal stance in the North.

$$\dot{r}_{E,T} = \frac{\phi}{\psi}\dot{s}_{n.T} + \frac{\alpha\psi - \varepsilon_n}{\psi}\dot{q}_{n,T} \tag{8}$$

and the nominal interest, considering that rate is $\dot{q}_{n,T} = -\dot{q}_{s,T}$:

$$\dot{i}_{E,T} = \dot{r}_{E,T} + \dot{p}_{E,T} = \dot{r}_{E,T} + \alpha \dot{p}_{s,T} = \frac{\phi}{\psi}\dot{s}_{n,T} + \frac{\varepsilon_n}{\psi}\dot{q}_{s,T}$$

If monetary policy instead targets *price stability for the area as a whole*, the interest rate can be easily derived from the aggregate product market equilibrium and it corresponds to the rate that keeps output at potential, given an overall fiscal stance. Given that average inflation is equal to zero by definition under this scenario, nominal and real interest rates coincide.

$$\dot{y}_{E,T} = \phi \dot{s}_{E,T} - \psi \dot{r}_{E,T} = 0 \;\Rightarrow\; \dot{r}_{E.T} = \frac{\phi}{\psi}\,\dot{s}_{E,T} = \dot{i}_{E,T} \quad (\text{as } \dot{p}_{E,T} = 0) \tag{9}$$

3.2 Fiscal Adjustment

The budgetary adjustment that South needs to implement to achieve a given competitiveness adjustment can be derived from its product market equilibrium:

$$\dot{y}_{s,T} = \frac{\dot{p}_{s,T}}{\gamma_s} = -\varepsilon_s \dot{q}_{s,T} + \phi \dot{s}_{s,T} - \psi \dot{r}_{s,T}$$

Under the first scenario - with monetary policy targeting $\dot{p}_{n,T} = 0$ - the real interest rate in South is:

$$\dot{r}_{s,T} = \dot{i}_{E,T} - \dot{p}_{s,T} = \frac{\phi}{\psi}\dot{s}_{n,T} - \left(1 - \frac{\varepsilon_n}{\psi}\right)\dot{q}_{s,T}$$

Substituting this into the product market equilibrium and solving for the South's fiscal stance we get a positive relationship between the real exchange rate adjustment and the required relative fiscal adjustment. Expression (10) tells us that the differential fiscal adjustment South has to implement depends on the required real exchange rate correction. In other words fiscal policy in the North is assigned to debt sustainability whereas fiscal policy in the South is assigned to restoring competitiveness.

$$\dot{s}_{s,T} - \dot{s}_{n,T} = \frac{1 + \gamma_s(\varepsilon_s + \varepsilon_n) - \psi\gamma_s}{\gamma_s\phi}\dot{q}_{s,T} \tag{10}$$

In the second scenario, with the central bank targeting average inflation, the real interest rate in South is now a function of the aggregate fiscal stance:

$$\dot{r}_{s,T} = \dot{i}_{E,T} - \dot{p}_{s,T} = \frac{\phi}{\psi}\dot{s}_{E,T} - \dot{p}_{s,T} = \frac{\phi}{\psi}(\alpha\dot{s}_{s,T} + (1-\alpha)\dot{s}_{n,T}) - \dot{p}_{s,T}$$

Substituting this real interest rate into the the product market equilibrium and recalling that

$$\begin{cases} \dot{q}_{s,T} = \dot{p}_{s,T} - \dot{p}_{n,T} \\ \dot{p}_{E,T} = \alpha\dot{p}_{s,T} + (1-\alpha)\dot{p}_{n,T} = 0 \end{cases} \Rightarrow \dot{p}_{s,T} = (1-\alpha)\dot{q}_{s,T}$$

We can then express the budgetary adjustment as function of $\dot{q}_{s,T}$. Again, the relationship between competitiveness adjustment and fiscal adjustment is positive:

$$\dot{s}_{s,T} - \dot{s}_{n,T} = \frac{(1-\alpha)(1-\psi\gamma_s) + \gamma_s\varepsilon_s}{\gamma_s\phi(1-\alpha)}\dot{q}_{s,T} \tag{11}$$

If we set $[\alpha\varepsilon_s - (1-\alpha)\varepsilon_n] = 0$ (as assumed) the two expressions found in (10) and (11) are the same, meaning that inflation in the North has no effect on the fiscal adjustment required in the South for a given competitiveness adjustment.

3.3 Debt Dynamics

We now turn to the analysis of debt dynamics in the South to understand the effects of fiscal retrenchment and real exchange rate adjustment. The direct effect of adjustment is that it reduces the budgetary deficit and thereby public debt. However it also reduces domestic output and inflation, which exert a negative effect on the debt dynamics. The final result will depend on the relative magnitude of the two effects.

We again make the distinction beetween the two scenarios presented in section 3. Even though the budgetary retrenchment needed is the same under the two scenario, debt dynamics differ.

The debt dynamics in the South is described by:

$$b_{s,T} - b_{s,0} = (j - g_{s,T} - \pi_{s,T})b_{s,0} + d_{s,T}$$

Taking differences from the baseline yields:

$$\dot{b}_{s,T} = -\left[\dot{y}_{s,T} + \dot{p}_{s,T}\right] b_{s,0} + \dot{d}_{s,T} = -\left[\dot{y}_{s,T} + \dot{p}_{s,T}\right] b_{s,0} + \dot{s}_{s,T} - \delta\dot{y}_{s,T} \tag{12}$$

Under the first scenario ($\dot{p}_{n,T} = 0$), if we substitute the expression for $\dot{s}_{s,T}$ derived in (10) into (12) and recall that $\dot{p}_{s,T} = \dot{q}_{s,T}$ we get:

$$\dot{b}_{s,T} = -\left[\frac{1}{\gamma_s} + 1\right] b_{s,0}\dot{q}_{s,T} + \left[\frac{1 - \psi\gamma_s}{\gamma_s\phi} + \frac{\varepsilon_s + \varepsilon_n}{\phi} - \frac{\delta}{\gamma_s}\right] \dot{q}_{s,T} + \dot{s}_{n,T}$$

now recalling that $[\alpha\varepsilon_s - (1-\alpha)\varepsilon_n] = 0$ and consequently $(\varepsilon_s + \varepsilon_n) = \varepsilon_s + \frac{\alpha}{1-\alpha}\varepsilon_s = \frac{\varepsilon_s}{1-\alpha}$, we obtain:

$$\dot{b}_{s,T} = \underbrace{-\left[\frac{1}{\gamma_s} + 1\right] \dot{q}_{s,T} b_{s,0}}_{stock} + \underbrace{\left[\frac{1 - \psi\gamma_s}{\gamma_s\phi} + \frac{\varepsilon_s}{\phi(1-\alpha)} - \frac{\delta}{\gamma_s}\right] \dot{q}_{s,T}}_{flow} + \dot{s}_{n,T} \tag{13}$$

Expression (13) shows that the effect of real exchange rate depreciation on the debt dynamics can be decomposed into a stock and a flow component. Assuming $\gamma_s = \phi = 1$ and $\varepsilon_s = \delta \simeq 0.5$, given that $(1-\alpha) < 1$ the flow component will typically be positive, suggesting that in the absence of debt stock fiscal retrenchment geared to competitiveness adjustment improves the debt dynamics (unless we assume a significant expansion in the North, which is not in the cards).

The stock component - that represents the negative effect of domestic disinflation on the outstanding stock of debt - is always worsening the debt dynamics. In a country that has independent monetary policy, the effect of fiscal retrenchment on prices could be at least partially offset by the monetary policy, but this is not the case in this scenario, because monetary policy is assumed to be targeting inflation in the North. The overall effect of the stock and flow component is not immediately evident and the derivative with respect to $\dot{q}_{s,T}$ has an ambiguous sign:

$$\frac{\partial}{\partial \dot{q}_{s,T}} = -\left[\frac{1}{\gamma_s}+1\right] b_{s,0} + \left[\frac{1-\psi\gamma_s}{\gamma_s\phi} + \frac{\varepsilon_s}{\phi(1-\alpha)}\right] - \frac{\delta}{\gamma_s} \gtrless 0$$

For competitiveness adjustment ($\dot{q}_{s,T} < 0$) to improve the debt dynamics we need $\frac{\partial}{\partial \dot{q}_{s,T}} > 0$ which translates into a condition on the initial level of debt :

$$b_{s,0} < \frac{\gamma_s}{1+\gamma_s}\left[\frac{1-\psi\gamma_s}{\gamma_s\phi} + \frac{\varepsilon_s}{\phi(1-\alpha)} - \frac{\delta}{\gamma_s}\right] = \widehat{b}_{s,0} \tag{14}$$

Expression (14) tells us that that there exists a threshold level of $b_{s,0}$ that determines the outcome of competitiveness adjustment on the debt dynamics. For any initial level of debt larger than $\widehat{b}_{s,0}$, the real exchange adjustment (no matter what its size is) worsen the debt dynamics. For all initial debt level lower than $\widehat{b}_{s,0}$, the opposite holds.

In the second scenario, substituting $\dot{s}_{s,T}$ from (10) into the debt dynamics and recalling that $\dot{p}_{s,T} = (1-\alpha)\,\dot{q}_{s,T}$ we get:

$$\dot{b}_{s,T} = -\left[\frac{1}{\gamma_s}+1\right](1-\alpha)\,b_{s,0}\dot{q}_{s,T} + \left[\frac{(1-\alpha)(1-\psi\gamma_s)+\gamma_s\varepsilon_s}{\gamma_s\phi(1-\alpha)} - \frac{\delta}{\gamma_s}(1-\alpha)\right]\dot{q}_{s,T} + \dot{s}_{n,T} \tag{15}$$

A first thing to notice id that the component of the stock and flow term where depreciation worsen the debt dynamics is smaller here than in (12) as $(1-\alpha) < 1$. The sign of the derivative with respect to $\dot{q}_{s,T}$ again is undecided:

$$\frac{\partial}{\partial \dot{q}_{s,T}} = -\left[\frac{1}{\gamma_s}+1\right](1-\alpha)\,b_{s,0} + \left[\frac{(1-\alpha)(1-\psi\gamma_s)+\gamma_s\varepsilon_s}{\gamma_s\phi(1-\alpha)} - \frac{\delta}{\gamma_s}(1-\alpha)\right] \gtrless 0$$

and again $\frac{\partial}{\partial \dot{q}_{s,T}} > 0$ translates into a condition on the initial debt level:

$$b_{s,0} < \underbrace{\frac{1}{1-\alpha}}_{<1} \underbrace{\frac{\gamma_s}{1+\gamma_s}\left[\frac{(1-\alpha)(1-\psi\gamma_s)+\gamma_s\varepsilon_s}{\gamma_s\phi(1-\alpha)} - \frac{\delta}{\gamma_s}\right]}_{\widehat{b}_{s,0}} + \underbrace{\frac{\delta}{1+\gamma_s}\frac{\alpha}{1-\alpha}}_{>0} = \widetilde{b}_{s,0} \tag{16}$$

Given that $\frac{1}{1-\alpha} > 1$ and $\frac{\delta}{1+\gamma_s}\frac{\alpha}{1-\alpha} > 0$, the debt threshold found in (16) is higher than the debt threshld found in (14): $\widetilde{b}_{s,0} > \widehat{b}_{s,0}$ In the second scenario - with appreciation through inflation in the North - competitiveness adjustment is beneficial to the debt dynamics at a higher initial level of debt. This means that for all those countries whose initial debt level satisfies $b_{s,0} \in (\widehat{b}_{s,0}; \widetilde{b}_{s,0})$, the real exchange rate adjustment improve the debt dynamics rather than worsen it.

3.4 Numerical calibration

To have an idea of the order of magnitude of the two debt thresholds, we calibrate the parameters in equations (14) and (16) on the basis of available model simulations. Our basis for the calibration is the extensive comparison recently produced by major international institutions (Coenen et al. 2012). We focus on a two-year horizon to leave time for price-quantity interactions to set in. We set the following values fo the parameters:

- α, the share of the South in total GDP of the area (based on actual data), is set at *0.35*
- ψ, the responsiveness of output to the interest rate, is set at *0.5* (Coenen et al. 2012)
- δ, the sensitivity of the deficit to output, is set at *0.5* following EC (2005)
- ϕ, the fiscal multiplier, is set at *1*, following Coenen et al (Coenen et al. 2012)

We allow for different values of the Phillips curve coefficient (γ) and the elasticity of output to the real exchange rates (ε_s). This results in two cases:

- *High price responsiveness - low output responsiveness,* with $\gamma = 0.75$ and $\varepsilon_s = 0.1$
- *Low price responsiveness - high output responsiveness,* with $\gamma = 0.25$ and $\varepsilon_s = 0.3$

The values for γ come again from recent estimates (Coenen et al. 2012) and the calibration of ε is based on simulations of exchange arte shocks performed by OECD (OECD 2010).

In the first case we find that both debt thresholds (14) and (16) are very low: 14% of GDP if monetary policy targets price stability in the North and 37% of GDP if the target is price stability for the area as a whole.

In the second case, with low price responsiveness and high output responsiveness, the threscholds increase considerably to 39% of GDP and to 82% of GDP respectively. This simple calibration does not pretend to fulfill empirical accuracy but it is aimed at suggesting orders of magnitude for the debt thresholds that are close to actual observations.

3.5 The effect of structural reforms

Structural reforms are often regarded as key to improving both competitiveness and growth thereby impacting the budgetary equation also. Here we focus on the effect of increasing γ, the coefficient of the Phillips curve. A change in γ can be interpreted as the effect of structural labour and product market reforms, aiming at improvements. It is therefore interesting to study the derivative of the debt dynamics with respect to it.

Under the first scenario, the derivative of the debt dynamics with respect to γ_s yields:

$$\frac{\partial \dot{b}_{s,T}}{\partial \gamma_s} = \left\{ \frac{1}{\gamma_s^2} \dot{q}_{s,T} b_{s,0} - \frac{1}{\gamma_s^2 \phi} \dot{q}_{s,T} + \frac{\delta}{\gamma_s^2} \dot{q}_{s,T} \right\} \gtrless 0$$

$$b_{s,0} = \frac{1 - \delta\phi}{\phi} \tag{17}$$

This debt level is apparently different from the one in (14). However, $\partial / \partial \gamma_s = 0$ means that the level of debt found here is the particular one at which γ_s is neutral to the debt dynamics. Therefore substituting $\gamma_s = 0$ in equation (14) we obtain exactly the same expression. For any debt level smaller than (17), the derivative is negative, meaning that structural reforms (increasing γ_s) improve the debt dynamics.

The same exercise can be done assuming we are in the second scenario. In this case the derivative of the debt dynamics with respect ot γ_s becomes:

$$\frac{\partial \dot{b}_{s,T}}{\partial \gamma_s} = \left\{ \frac{1}{\gamma_s^2} (1 - \alpha) \dot{q}_{s,T} b_{s,0} - \frac{1}{\gamma_s^2 \phi} \dot{q}_{s,T} + \frac{\delta}{\gamma_s^2} (1 - \alpha) \dot{q}_{s,T} \right\} \gtrless 0$$

And the corresponding debt threshold (corresponding to the one found in (15) provided that γ_s is set to zero):

$$b_{s,0} = \frac{1 - \delta\phi\,(1 - \alpha)}{\phi\,(1 - \alpha)} \tag{18}$$

Again, for all levels of debt below the threshold, structural reform improve the debt dynamics whereas the opposite holds for initial debt levels larger than the threshold. The limit debt level found in (18) is larger than the one found in the case of no inflation in the North. This suggests that inflation in the North has a second positive effect, namely to render structural reform beneficial for the debt dynamics at higher level of debt.

4 Conclusions

Our analysis suggests a number of interesting results.

- The current policy assignment in the euro area can be summarized as one in which the competitive North aims at restoring fiscal sustainability through budgetary consolidation whereas the uncompetitive South uses budgetary retrenchment to restore both sustainability and competitiveness;
- Indeed, the differential fiscal stance between North and South is what determines real exchange rate changes. South therefore needs to tighten more than North to regain competitiveness. There is no escape from relative austerity.
- In a scenario where monetary policy aims at keeping inflation stable in the North, competitiveness improvement in the South implies very low inflation or deflation. This worsens the debt dynamics. We find that if the initial debt is above a certain threshold, debt dynamics is even perverse: fiscal retrenchment is self-defeating;
- If monetary policy targets average inflation instead, which implies higher inflation in the North for any given real exchange rate adjustment, the debt dynamics turns more favourable and the initial debt threshold above which it becomes perverse is higher. Accepting more inflation at home is therefore a way for the North to contribute to restoring debt sustainability in the South.
- Structural reforms in the South improve the debt dynamics if the initial debt is not too high. Again, targeting average inflation rather than inflation in the North helps strengthen the favourable effects of structural reforms.

283

5 References

Coenen, G. and various authors (2012) - "Effects of Fiscal Stimulus in Structural Models", American Economic Journal: Macroeconomics 2012, 4(1): 22 - 68

European Commission (2005) - "New and updated budgetary sensitivities for the EU budget surveillance", DG Ecfin, September

Hervé, K. et al, OECD (2010) - "The OECD's new global model", Economics department working paper No 768, May

Merler, S. and Jean Pisani-Ferry (2012) - "Anatomy of a divide", forthcoming Bruegel

Pill, H. et al (2012) - "Achieving fiscal and external balance (parts 1 to 4)", Goldman Sachs European Economic Analyst 2012

Wolff, G. (2012) - "Arithmetic is absoute: Euro Area adjustment", Bruegel Policy Contribution $2012|09, May$