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The new fiscal rules for the EMU. Threats from heterogeneity and interdependence*

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Abstract

This paper examines the reform of fiscal rules in the European Economic and Monetary Union (EMU), in particular the Stability and Convergence Plans (SCP) of public debts. The focus is on factors of heterogeneity and interdependence in the key variables of growth and interest rates. By means of dynamic models of the debt/GDP ratio in a multi-country setup, the paper shows how these factors may jeopardize the main goal of fostering convergence and keeping debt/GDP ratios equalized and stable over time, especially in case of uncoordinated implementation of large SCPs across member countries. Controlling for these factors in practice may be quite demanding, but the key flaw is that they are almost entirely ignored in the SGP institutional framework that therefore requires a different approach.

JEL: H6, E6

Keywords: European Economic and Monetary Union, Stability and Growth Pact, Sovereign debts

1. Introduction

In the eye of the sovereign debt storm provoked by the 2008-10 world crisis, the member states of the European Monetary Union (EMU) agreed upon, and the EU Commission adopted in September 2010, a revision of the Stability and Growth Pact (SGP) which resets the fiscal rules of member states. The Commission (IP/10/1199) presented this revision as part of "the most comprehensive package of legislative measures" aimed at the "reinforcement of economic governance in the EU and the euro area since the launch of the Economic and Monetary Union". Subsequently, a more ambitious comprehensive reform on "Stability, coordination and governance in the Economic and Monetary Union" with a treaty status was approved in December 2011 (EU 2011, http://ec.europa.eu/economy_finance/economic_governance/index_en.htm). Such a far-reaching re-regulation has been prompted by strong speculative attacks against the Euro Zone as a whole, but it is also motivated by the worrisome leaks that the crisis has opened up in the EMU institutional construction, and which are largely responsible for unleashing the speculators' bets against the survival of the EMU itself. A key tenet of the reform is that fiscal stabilization will be a long and painful endeavour that will engage all major member states for a number of years to come, during which their creditworthiness in the financial markets will have to be underpinned by a tighter institutional framework and credible consolidation plans. As a result, "the SGP will become more 'rule based' and sanctions will be the normal consequence to expect for countries in breach of their commitments" (EU Commission, IP/10/1199).

The aim of this paper is not a "normative" discussion of the pros and cons of the reform or of alternative proposals. Rather, the aim is a "positive" analysis of one of its

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new elements in the so-called *corrective part*: each year member states should submit a Stability and Convergence Plan (SCP), a key component of which is commitment to debt control and convergence towards a defined target. Member states in excess of the 60% debt/GDP ratio in the previous three years should reduce it at a pace defined in 1/20th of the excess per year.

Whilst the shift of focus from current budget deficits to medium-long term debt management is welcome and long awaited, the feasibility of the SCPs has to be examined more carefully. SCPs will be designed and applied according to the spirit of the Maastricht Treaty, or what we may by and large define the "Brussels Consensus", treats each single member country as an independent, isolated entity, fully responsible for its own conduct and results. According to several observers two are the major faults in this approach that the crisis has dramatized. One is the original conceptual mistake inherent in the "rules + sanctions" approach in a context of sovereign governments under democratic control. The other is the total lack of consideration of the systemic dimension of national fiscal policies in a monetary union, where 'systemic' means that *heterogeneity and interdependence* across member countries are key factors (e.g. De Grauwe, 2011). The paper highlights why and how these factors may impinge upon SCPs.

In the first issue of the new *Annual Growth Survey* (EU Commission, 2011a), the Commission acknowledges the heterogeneity issue, since "EU Member States experienced highly different fiscal and external conditions, which call for tailor-made policies" (p. 9). In other words, different countries facing different initial conditions and debt dynamic paths will have to adopt different policies. At first sight, this does not seem to be a major problem within the country-by-country framework of the SCPs. However, heterogeneity may have important consequences because EMU members are required, and hence are expected by investors, to manage their sovereign debts in such a way that they smoothly converge towards the common Promised Land of the 60% of GDP (or below). As is well known, the recipe for easier debt control wants a nominal trend growth rate greater than the long-term interest rate on outstanding debt. The paper will show that heterogeneous debt motion laws across countries in this respect entail different speeds of adjustment, different fiscal efforts, and, what is more important, clusters of stable *vis-à-vis* unstable steady-state debt levels. As a consequence, even if all members were one day able to hit the 60% debt/GDP ratio, thereafter they would react to asymmetric as well as symmetric shocks in different, maybe divergent ways. Hence, 'S'tability in SCP cannot be taken for granted. Some countries would find it easier to keep their debt on target, others ought to engage in active fine tuning of their primary balance.

Heterogeneity may also be problematic as soon as we realize that it is coupled with interdependence. Broadly speaking, interdependence means that the debt motion law of one country depends on that of the others. Since, according to the Commission, "although the degree of urgency is not the same in all Member States, consolidation remains a key priority for all" (EU Commission, 2011b, p. 11), the key question is whether and how simultaneous debt consolidation plans can be successful in a context of heterogeneous and interdependent countries, or else, whether 'C'onvergenge in SCP is achievable. The paper will point out two dimensions of interdependence in debt dynamics, a *financial* and a *real* one. The former operates via risk premia, the latter via cross-correlations of GDPs. It will be seen that under both dimensions interdependence may jeopardize convergence of consolidation plans.

It may be argued that "technicians" in the official institutions are well aware that these factors may impinge upon consolidation plans (see e.g. Kanda, 2011; IMF, 2012). Indeed, the common practice is to draw SCPs projecting the trend values of nominal growth and interest rates as if each country were in isolation, and treating deviations from projections as ex-post shocks to which the path of primary balances should be adjusted. However, the idea of controlling for these "complications" at the implementation level may be quite demanding, and possibly unsuccessful. I shall give examples of this. Ex-post disappointments of consolidation plans, which are in fact ex-ante misspecification errors of the plan, may be quite costly and undermine the "political ownership" of the fiscal rules. Hence our main concern here is with the institutional level, where the key flaw is that heterogeneity and interdependence are ignored in the original conception of the EMU fiscal rules and subsequent reforms.

The paper is organized in two parts. In the first part (section 2), I introduce the basic, single-country model of public debt dynamics. Though simple, this model contains all the essential ingredients that are necessary to understand the SCP problem: in particular, (i) the *convergence* to the debt target, (ii) the related *fiscal effort*, and (iii) the *stability* of the debt target. In the second part (sections 3 and 4), the model is used to point out where and how considerations of heterogeneity and interdependence in growth and interest rates may change results and the ensuing policy implications.

2. Stability and convergence plans. The basic tool kit.

This section provides the basic tool kit for the design and implementation of SCPs. This consists of the well-known system of two equations that tracks the evolution of public debt of a single country in isolation (see e.g. EU Commission, 2011b, p. 89)

$$D_t = D_{t\text{-}1} - B_t \tag{1}$$

$$B_t = B'_t - i_t D_{t\text{-}1} \tag{2}$$

where $D_{t\text{-}1}$ is the outstanding public debt, B_t is the current budget balance, B'_t is the current primary balance, and i_t is the current interest rate paid on the outstanding debt. All variables are expressed in nominal terms.

These expressions are easily converted into GDP ratios, obtaining

$$d_t = \frac{1+i_t}{1+n_t} d_{t-1} - b'_t \tag{3}$$

where small-case letters for fiscal variables denote GDP ratios, and n_t is the current nominal growth rate of GDP[1].

Equation 3 states that d_t grows over time owing to two factors:

- an interest rate greater than the nominal growth rate, $i_t > n_t$, and/or
- primary deficits, $b'_t < 0$

It can be used to devise the budget policy necessary to achieve some fiscal aggregate target, such as debt stabilization or the speed of debt reduction. In this respect, the standard assumption is that i_t and n_t are exogenous variables; hence the government has one single control variable, b'_t.

As regards the use of the primary balance as control variable, equation 3 can be rewritten in terms of debt/GDP variations, $\Delta d_t \equiv d_t - d_{t-1}$, so that

$$\Delta d_t = \frac{i_t - n_t}{1 + n_t} d_{t-1} - b'_t \tag{4}$$

If n_t is a small fractional number (say less than 0.1), as is usually the case, equation 4 can be safely approximated by

$$\Delta d_t = (i_t - n_t) d_{t-1} - b'_t \tag{5}$$

2.1. Implementing the SCP

With the help of equation 3 we can examine the main elements in a stylized SCP targeted to the debt ratio $d^* = 60\%$.

Let (d_0, b'_0) denote the initial levels of the debt and the associated primary balance ratios, and $d_0 > d^*$. The typical SCP consists of a target $\Delta d^*_t < 0$ year by year[2]. Given the observed values of i_t, n_t, this implies a target for b'_t:

$$b'(\Delta d^*_t) = (i_t - n_t) d_{t-1} - \Delta d^*_t \tag{6}$$

The SCP yields a sequence of targets on primary balances according to equation 6. Given $d_{t-1} > 0$ and $\Delta d^*_t < 0$, unless n_t exceeds i_t, this plan typically requires primary surpluses, also known as "fiscal effort". Hence, the fiscal effort of the SCP increases with the interest rate, the initial debt ratio and the year debt cut, whereas it decreases with nominal growth.

[1] An alternative formulation decomposes the nominal growth rate into the real growth rate and the inflation rate Then, the coefficient of equation 0 results reformulated in real terms. In principle, the two formulations are equivalent.

[2] For instance, $\Delta d^*_t = (d^* - d_{t-1})/T$,where T is the number of years. According to the new rules, $T = 20$.

It may be added that the SCP, being a medium-term plan, will necessarily be based on forecasts of i_t and n_t. To this effects, let i, n be the expected trend values of the interest rate and the nominal growth rate, while i_t and n_t can be thought of as random deviations from trend values. As a consequence, for any $i_t \neq i$, $n_t \neq n$, the actual adjustment of the debt ratio will be $\Delta d_t \neq \Delta d^*_t$. If the random deviations from trend values are uncorrelated and have zero mean, over- and under-adjustments of the debt ratio will tend to compensate over time, so that the SCP is fulfilled on a "cyclically-adjusted" basis[3].

Finally, equation (6) can be used to compute the end-state of the SCP, namely when $d_t = d_{t-1} = d^*$, $\Delta d^*_t = 0$, and i_t, n_t are on their trend values:

$$b'(d^*) = (i - n)d^* \tag{7}$$

Note that if $i > n$, keeping the debt ratio on target implies a *permanent primary surplus*.

2.2. Stability and convergence further examined

Should all countries exceeding the 60% debt ratio implement the SCP? At the initial conditions (d_0, b'_0), the government faces three possible scenarios: (i) the debt ratio will not change, (ii) it will increase, (iii) it will decrease over time. In case (i), the debt ratio is at its steady state (s-s) $\bar{d}$, which occurs if the trend values i, n, satisfy

$$(i - n)\,\bar{d} - b'_0 = 0 \tag{8}$$

Cases (ii) or (iii) occur, respectively, according to whether the slope of the debt's dynamic path at the initial level d_0,

$$\partial d_t / \partial d_{t-1} \,|_{d0} = \frac{1 + i}{1 + n} \tag{9}$$

is greater or smaller than 1, that is to say, $i > n$ or $i < n$. If the debt ratio is at its s-s and $i > n$, the s-s is unstable, otherwise it is stable. An unstable s-s entails that any shock will make the ratio diverge from the initial level; this, however, may occur upwards or downwards depending on the shock.

In summary, a country may face the strict necessity of activating a SCP only if its debt ratio is on an increasing path, or dwells in an unstable s-s. However, given the normative nature of the 60% debt ratio, it is likely that all countries with outstanding debt greater than 60% of GDP will be required to activate a SCP, regardless of whether they are in a stable s-s or not.

[3] The "rule of thumb" is that the government should instead reset the plan if the deviation from targets persists for at least three years.

Yet, for the 60% debt ratio to have normative force, it should ideally be a s-s. Since the debt path is linear, the stability condition is invariant and is given by 9. If debt is shocked upwards, it will be self-correcting, along the path given by $b'(d^*)$, only if $i < n$. Otherwise, the government will have to intervene on its primary balance according to rule 6. In other words, instability of the debt target entails the government's ability to implement a sort of rapid "fine tuning" of its primary balance, a requirement that can be rather problematic. Recall that, in this framework, i, n, and hence the stability condition, are not under the direct control of each individual government.

In the subsequent sections we will see how the explicit consideration of the multi-country context of the EMU raises some issues that may become quite critical when we move from the "country-by-country" approach towards EMU-wide fiscal plans. These issues mainly relate to the heterogeneity of member countries and their interdependence.

3. Heterogeneity

As far as the debt dynamic laws presented above are concerned, there are important sources of heterogeneity across member countries. Heterogeneity raises the well-known issue of "one size doesn't fit all" that plagues policy design in a monetary union. This issue is typically associated with monetary policy, but it is no less important for fiscal policy as soon as national governments are subject to uniform rules.

3.1. Stability and Convergence Plans across heterogeneous countries

Let us look at the basic debt/GDP dynamic equation 4, and let m indicate any member country. Heterogeneity may concern the following variables

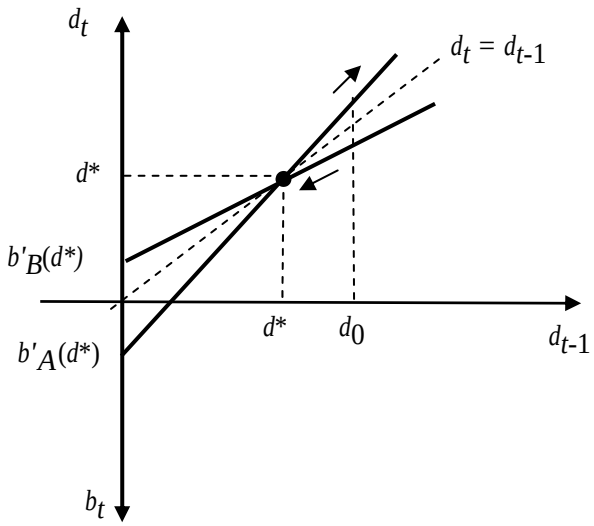
- the initial debt/GDP ratio d_{mt-1}
- the interest rate i_{mt}
- the nominal growth rate n_{mt}, which can further be decomposed into real growth g_{mt} and inflation π_{mt}.

Consequently, heterogeneous countries under these dimensions will face

- different initial conditions and debt paths
- different fiscal efforts along the SCP path
- different end-state conditions regarding the stability of the debt target

In principle, these differences may appear unimportant for the implementation of SCPs on a country-by-country basis. However they may turn out to be important in practice as they may jeopardize the idea, encapsulated in the name, that SCPs are a means to induce faster fiscal convergence and stability across countries. To grasp this point, see Figure 1 that reproduces the debt dynamic diagram for two countries.

Figure 1. Divergent debt dynamics of two countries



Country *A* is characterized by $i_A > n_A$, whereas country *B* has $i_B < n_B$. *At the debt target d**, the two countries are on divergent debt paths. If both receive the same debt shock upwards, country *A* tends to diverge from *d** while *B* tends to return to *d** without additional fiscal effort. Hence SCPs *per se* are not a sufficient condition for "Stability and Convergence".

A related policy issue is that country *A* should permanently maintain a larger fiscal effort than *B* ($b'_A(d^*) > 0$, $b'_B(d^*) < 0$; see also equation 7). From the normative point of view – e.g. regarding the compliance with the rules– the issue is the extent to which this extra-burden is justified in terms of national responsibility. In other words, the extent to which the determinants of debt dynamics, such as growth and interest rates, are fully and exclusively under the control of national governments.

3.2. Heterogeneity in the EMU

In order to gauge the relevance of heterogeneity let us first look at the pre-crisis experience of the EMU member countries. The determinants of their debt dynamics in the period 2000-08 are reported in Table 1 (analysis is limited to the first-in group of 12 countries up to Greece). A non trivial amount of heterogeneity was present. Nonetheless, contrary to widespread opinions, the picture is not one of unfettered fiscal indiscipline but rather of slow fiscal convergence (see also De Grauwe, 2010). The last column of the table is the difference between the debt ratio in 2008 and 2000: the Union as a whole slightly reduced the ratio by 0.4 points of GDP as well as its dispersion across countries. However, an important element to be considered is that the Union on average enjoyed favourable conditions for debt reduction and stability, with yearly nominal growth (5.1%) exceeding the interest rate by 0.7 points.

Table 1. Determinants of debt dynamics, EMU12, average year values 2000-08

	$d(2000)$	Nominal growth rate	Long term interest rate[a]	$i_{mt}-n_{mt}$	$d(2008)-d(2000)$
Austria	58.8	5.6	4.4	-1.2	3.8
Belgium	107.6	4.1	4.4	0.3	-17.8
Finland	43.8	4.6	4.4	-0.2	-9.7
France	57.3	3.9	4.3	0.4	10.1
Germany	59.7	2.5	4.3	1.8	6.2
Greece	101.8	8.7	4.7	-2.5	-2.6
Ireland	37.7	8.0	4.4	-3.6	6.4
Italy	109.2	3.8	4.6	0.8	-3.4
Luxembourg	6.4	7.8	4.1	-3.7	7.1
Netherlands	53.8	4.9	4.4	-0.5	4.4
Portugal	55.9	4.0	4.5	0.5	7.9
Spain	59.2	7.1	4.4	-2.7	-19.5
EMU12[b] (mean)	59.1	5.1	4.4	-0.7	-0.4
EMU12[b] (st. dev.)	28.9	1.9	0.1	2.7	-3.11

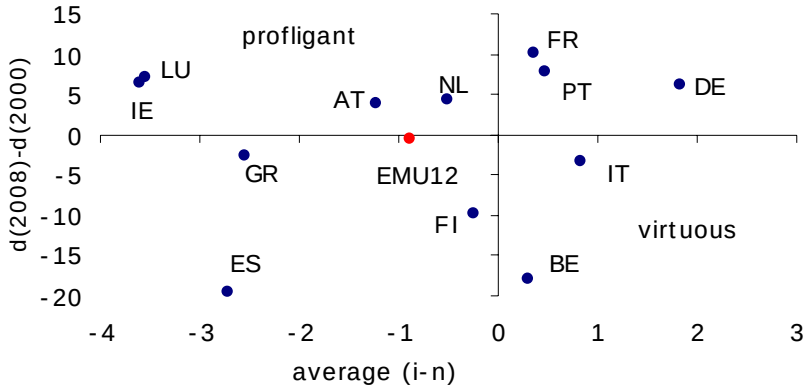
[a] *Yield on 10-year government bonds*

[b] *Non-weighted average of national data*

Source: Eurostat, AMECO database.

Yet 5 countries faced *unfavourable* conditions ($i_m - n_m > 0$) with Germany suffering a substantial 1.8% gap, and only 5 of the countries succeeded in reducing their ratio (including the top debtors Italy and Belgium), while the others increased it. These indicators are summarized in Figure 2, which represents the correlation between the average growth/interest gap (horizontal axis) and the change in the debt ratio.

Figure 2. Relationship between the change in the debt/GDP ratio and the average growth/interest gap, EMU12 countries, 2000-2008



Source: Eurostat, AMECO database

The four quadrants of the graph identify different groups of countries. The north-east and south-west quadrants identify "fair performers", that is, countries that either worsened their debt ratio facing unfavourable interest-growth gaps or improved it facing favourable interest-growth gaps. The south-east quadrant identifies "good

performers" (notably the two high-debt countries), that is, countries that reduced their debt ratio facing unfavourable conditions. The north-west quadrant identifies "bad performers", the countries that increased their debt/GDP ratio in spite of favourable conditions.

In a situation with low dispersion of interest rates, heterogeneity of debt performances in fact mostly depended on nominal growth rates whose standard deviation was sizeable (1.9%). Nominal growth rates can be decomposed into the real and the price components (see Table 2).

Table 2. Decomposition of nominal growth rates, EMU12, average year values 2000-08

	Inflation rate	Real growth rate
Austria	3.4	2.3
Belgium	2.1	2.0
Finland	1.5	3.1
France	2.1	1.9
Germany	1.0	1.5
Greece	4.7	4.0
Ireland	3.0	5.0
Italy	2.5	1.2
Luxembourg	3.5	4.3
Netherlands	2.7	2.2
Portugal	2.7	1.3
Spain	3.8	3.3
EMU12[a] (mean)	2.6	2.5
EMU12[a](st. dev.)	0.86	1.2

[a] *Non-weighted average of national data*
Source: Eurostat, AMECO database

The decomposition indicates that the real component provided the bulk (63%) of the standard deviation across countries. This is not surprising. There are two reasons why country-specific inflation rates in a monetary union could be regarded as a minor issue, at least in a long-run perspective. The first is that inflation is largely out of the control of each single government owing to the action of the single central bank; the second is that it should reasonably be equalized across countries.

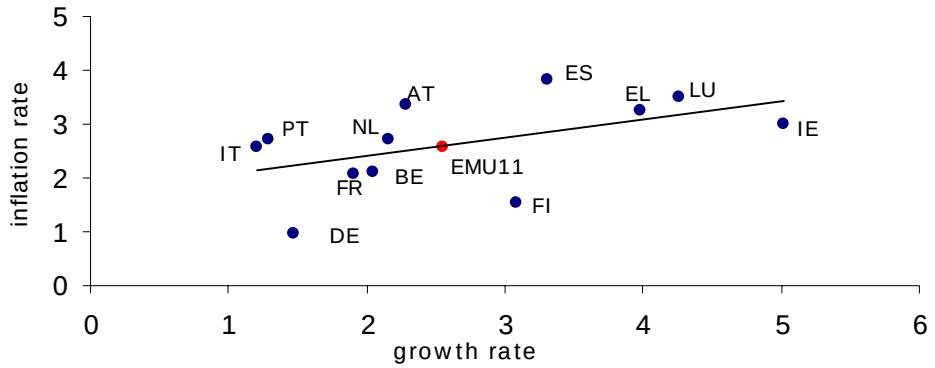
Inflation reduces the fiscal effort associated with debt reduction; hence the devolution of monetary sovereignty to a supernational central bank guarantees against abuses of "seignorage". However, in the EMU the latter presumption has so far materialized to a lesser extent than expected; the contribution of inflation differentials to the standard deviation of nominal growth has not been negligible.

National inflation rates may still be related to local factors other than monetary policy, and these factors may create a correlation between the inflation rate and the growth rate. In a Keynesian, Old and New, perspective, we may expect such a correlation to be positive over the typical business-cycle horizon. However, there is large agreement with the Neoclassical, Old and New, claim that correlation is zero in the long run.

If we look at the cross-country data for the first nine years of the EMU (see Figure 3), we can see that 7 countries had above-average inflation; of these, 4 were also fast GDP runners. Of the 5 countries with below-average inflation, 4 were also slow

GDP runners. The overall pattern is mixed, and a strong correlation is not detectable. However, 8/12 of the cases fit the hypothesis of positive correlation between growth and "non monetary" inflation, with a magnification of nominal growth differentials.[4]

Figure 3. Cross-country correlation of inflation rates and real growth rates, EMU 12, 2000-08



Source: Eurostat, AMECO database

If the pre-crisis experience of the EMU seems to suggest that non trivial heterogeneity of debt dynamic conditions did not prevent a slow process of fiscal convergence across countries, the dramatic worsening of such conditions should also be taken into account. Two factors are prominent: the persistent *reduction and divergence* in the growth rates; the parallel sharp *increase and divergence* of interest rates across most countries' sovereign debts (see Table 3).

Table 3. Statistics of interest-rate spreads with Germany in the EMU12, 2000-2012 (average monthly yields on 10-year government bonds, percent)

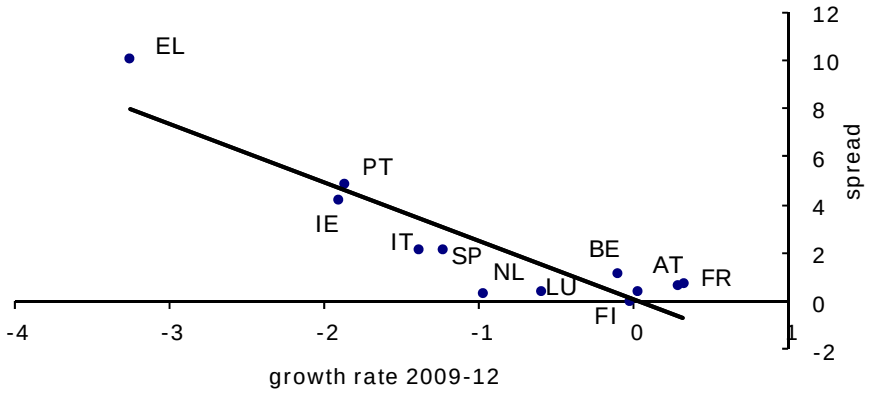
	2000-2008		2009-2012	
	mean	s.d.	mean	s.d.
Austria	0.162	0.14	0.71	0.31
Belgium	0.196	0.15	1.15	0.64
Finland	0.133	0.12	0.40	0.17
France	0.100	0.07	0.63	0.37
Greece	0.414	0.28	10.13	8.07
Ireland	0.155	0.21	4.23	2.27
Italy	0.312	0.19	2.19	1.42
Luxemb.	0.165	0.27	0.40	0.80
Netherl.	0.096	0.09	0.37	0.17
Portugal	0.234	0.16	4.86	3.96
Spain	0.156	0.14	2.19	1.45
Area average	0.193	0.09	2.27	2.32

Source: ECB, Interest rate statistics, online database

[4] "Non monetary" explanations of inflation look at fiscal variables. From the macroeconomic models with excess demand-side effects of fiscal policy to the more sophisticated "fiscal theory of the price level", the essential message is that a higher inflation path is due to fiscal deficits (present and future). However, 3 of the 4 high-growth-high-inflation EMU countries most of the time remained in surplus (Ireland) or well below the 3% deficit threshold.

A critical fact emerges if we plot the spreads against the growth rates, namely that over the crisis period 2009-12, slower or negative growth countries have also experienced higher average spreads (see Figure 4). This fact has been documented by scholars who point out that the euro-debt crisis *is* a crisis of laggard countries in productivity and growth[5]. In fact, market operators report that different growth prospects have been a major motivation behind their portfolio choices of EMU sovereign debts. Though the link between heterogeneous growth rates and spreads is unclear (see below, par. 4.1 for a suggested interpretation), the evidence is such that (i) the interest rate should be regarded as an *endogenous* variable along the debt dynamic path, and (ii) it is likely to act as an *amplifier* of divergence of debt paths across slow and fast growing countries.

Figure 4. Average year growth rates and average monthly spreads of 10-year government bonds, EMU12, 2009-12



Source. Tables 2 and 3

3.3. Is growth convergence a policy aim?

We have seen that countries on a low growth path will face harder convergence towards the debt target, with higher interest rates and heavier fiscal effort; also, they will more likely discover that the debt target is an unstable achievement. In fact, it is widely believed that growth, among the other variables presented above, will play a major role in the success of SCPs. Giavazzi (2010) has criticized the SGP reform since it relies too much on stricter rules and too little on fostering growth. The first issue of the *Annual Growth Survey* (EU Commission, 2011a) is entirely devoted to pro-growth policies, and the surveillance on (real) macroeconomic imbalances appears prominently among the new tools of European governance (EU Commission, 2010). Higher growth across Europe is of course a valuable aim, especially, though not exclusively, for fiscal consolidation. But what our analysis points out is more than that: are *uniform* growth rates a *sine-qua-non* condition in a monetary union? Is there any economic tendency towards this outcome? Or is there any welfare foundation that justifies this as a public policy goal?

Table 4 reports basic data on dispersion of real growth rates across US states and EMU member countries. The latter persistently display higher dispersion, but also show

[5] These scholars usually point out that euro-countries under financial distress also run large current account deficits: e.g. Gros (2011), Gros and Alcidi (2011), Lane (2012), EU Commission (2010).

a tendency to reduce it. Overall, the EMU picture does not seem pathological with respect to a long-established monetary union like the United States.

Table 4. Growth statistics. US states and EMU12 member countries, 1990-2008

	US states	EMU12 members
1990-2000		
Min-Max	-1.4-6.9	1.6-7.1
Average	3.5	3.0
Standard dev.	1.6	1.6
2000-2008		
Min-Max	-0.4-4.1	1.3-5.0
Average	2.1	2.5
Standard dev.	0.9	1.2

Source: Statistical Abstract of the United States, and AMECO database

Indeed, convergence to uniform growth rates is a rather peculiar requirement. None of the available explanations of growth attaches particular importance or a normative role to uniform growth rates across different countries. The conventional wisdom among growth scholars holds that convergence, if it occurs, is a slow process even among regions in one national economy, and much slower than implied by theoretical models where mobility of labour, capital and technical knowledge should lead low-income regions to "catch up" with high-income ones (see e.g. Barro and Sala-i-Martin, 1991; Sala-i-Martin, 1996; Romer, 1994).

Traditional growth theory predicts that countries with similar technology and preferences will tend towards uniform *per capita* GDP *levels*, which imply uniform GDP growth rates only if population growth, too, is equal across countries. Implied by this long-run tendency (the so-called "σ-convergence") is the so-called "β-convergence": the fact that, starting with unequal per-capita income distribution across countries, low-income countries grow faster - net of population - than high-income ones (Sala-i-Martin, 1996).

The so-called New Growth Theories have shown that if we abandon the assumption that the technical coefficient in the production function is constant, or that its changes are exogenous, and if we try to explain s-s growth as an endogenous process (e.g. as a function of human capital accumulation), we may obtain divergence of per-capita income levels over time (σ-divergence), which entails that rich countries may grow faster than poor ones (β-divergence). Moreover, endogenous growth may differ across countries for reasons other than human capital accumulation, such as different adoption rates of innovations or different R&D investments, and as a consequence countries may differ not only in their growth paths but also in their s-s values (see Bernard and Jones, 1996). Unequal GDP growth rates may well be associated with (i) rich countries identical in all respects other than population growth, or (ii) poorer countries "catching up" with richer ones, or (iii) rich countries getting richer, or (iv) different paths of technical progress.

The uniform growth presumption seems tailored to the first scenario. Since population growth is conditioned by per-capita income levels, a small club of almost equally rich countries very similar in human and physical capital endowment and

accumulation is more likely to display uniform GDP growth rates.[6] This feature may be added to those that qualify an optimal currency area, and its absence boils down to the original objection that the EMU in its current extension is bound to fail because it is not an optimal currency area. However, this conclusion is at variance with the historical evidence that the OCA requirements are rarely met in practice, while it is of little help in the search for the right institutional design of the EMU.

4. Interdependence

There are good reasons to believe that the determinants of debt dynamics are also interdependent across countries. The issue can be addressed by distinguishing between *financial* and *real* interdependence, where the former refers to interest-rate determination and the latter to GDP interdependence.

4.1. Financial interdependence

Research on the determinants of intra-EMU interest rates and spreads is still in a state of flux[7], but the different levels of debt/GDP ratios, and their different speeds, by and large appear as one of the determinants of interest-rate spreads. As shown by e.g. Tamborini (2013), according to basic portfolio theory risk premia and spreads are *relative variables* that reflect the *relative size* of stocks. The author shows that the optimal portfolio allocation across two countries' sovereign debts *A* and *B* implies the following interest-rate spread

$$i_{At} - i_{Bt} = \alpha d_{At-1} - \beta d_{Bt-1} \tag{13}$$

where $\alpha = \rho(\sigma^2_A - \sigma_{AB})$, $\beta = \rho(\sigma^2_B - \sigma_{AB})$, ρ is the coefficient of risk aversion, and σ^2_A, σ^2_B, σ_{AB} are the variances and covariances of the returns to the two sovereign bonds.

Clearly, the benchmark for euro sovereign debt portfolios is provided by the German *Bund*, (say country *B*) so that spreads *increase* for those countries whose debt/GDP ratio *grows faster or shrinks more slowly* than that of Germany.[8] This factor may explain why growth rates affect spreads perversely (see above, par. 3.2) since higher-debt/lower-growth countries will also face higher spreads which will further push debt ratios upwards.

Substituting the domestic interest rate with the interest-rate differential 13, the debt motion law of country *A* becomes

$$\Delta d_t = \alpha d^2_{At-1} + (i_{Bt} - \beta d_{Bt-1} - n_{At}) d_{At-1} - b'_{At} \tag{14}$$

[6] See Galor (1996) for models of "club convergence". The view of the EMU rules as "entrance fees" engineered to "minimize the number of the participants in the monetary club, and to keep it small" was first advanced by De Grauwe (1995).

[7] See e.g. Manganelli and Wolswijk (2009); Sgherri and Zoli (2009); Attinasi et al. (2009); Caceres et al. (2010), Favero and Missale (2011).

[8] Some evidence is also provided by Attinasi et al. (2009), and Favero and Missale (2011).

Consequently,

- the debt path of country *A* is no longer linear, and the quadratic map implies that the endogenous interest-rate differential acts as an *accelerator* of debt growth
- the evolution of country *A*'s debt also depends on the co-evolution of country *B's* debt and interest rate
- note that if *B* is a faster-growing country whose debt ratio falls faster than *A*'s, the consequence is an upward push on *A*'s interest-rate spread and the debt ratio; on the other hand, the fact that *B* also pays a low interest rate plays favourably since it keeps the *level* of i_A lower.

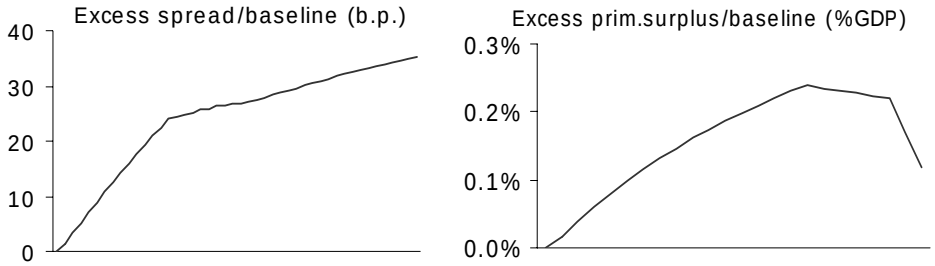
According to the quantification of the parameters α and β for the EMU12 countries over the crisis period 2009-11 provided by Tamborini (2013)[9], they result all positive; not surprisingly they are larger for most indebted countries, and their order of magnitude is of centesimal points. Nonetheless, they may make some difference since one percent point of excess debt/GDP over Germany is translated in one basis point of spread. Favero and Missale (2011) run an econometric estimation of an explicit multi-country model of euro-sovereign spreads where the spread of each country is correlated with (i) the "distance" of the country's fiscal stance with Germany's as in equation 13, (ii) the "global spread", i.e. the weighted average of the spreads of all the other countries according to the reciprocal "distance" of fiscal stances. They find that the global spread is highly significant and explicative; its order of magnitude is of decimal points.

When these interdependence factors become sizeable, as they are today, the implementation of country-by-country SCPs, possibly corrected ex-post, is misleading and can give rise to ex-post disappointments that may be difficult to rectify. As can easily be seen from equation 14, the fiscal effort of countries of type *A* associated with a given reduction path $\Delta d^*_{At} < 0$ should be larger than in the basic SCP. To gauge the quantitative dimension of the problem, I have run a simple simulation of a two-country SCP, a high-debt country *A vis-à-vis* a low-debt risk-free country *B*[10]. I have computed *A*'s SCP inclusive of the interdependence effect of equation 0 due to the concomitant SCP of *B*, and *A*'s SCP with no such effect (i.e. keeping *B*'s debt constant). Figure 5 reports *A*'s excess spreads and the additional primary surpluses along the plan due to interdependence. Note that both are *increasing* over time. Though yearly figures are small, the cumulated additional fiscal effort is a substantial 3.8% of GDP (also, the SCP under interdependence is four years longer).

[9] The parameters are not estimated econometrically, but are inferred from the observed spreads, given the statistical determinants of α and β indicated above.

[10] To isolate the effect of financial interdependence, I have assumed that the two countries will remain on the same nominal growth trend $n = 4\%$. The financial initial conditions are instead representative of a high-debt country like Italy ($d_{A0} = 120\%$, $\alpha = 0.022$, $\beta = 0.013$; see Tamborini, 2011) and a low-debt, risk-free country like Germany ($d_{B0} = 80\%$, $i_B = 2\%$). The simulation is truncated when the SCP hits $d < 60\%$. If $b' \leq 0$ when $d > 60\%$, b' is frozen at 0; from that point onwards, the "snowball" effect drives d downwards up to 60%.

Figure 5. Simulation of a two-country SCP with endogenous interest-rate spread



4.2. Real interdependence

The first typical issue is business cycle correlations. Research on this characteristic of EMU member economies has been intense since the very beginning of the unification process (e.g. Buti and Sapir, 1998, ch. 11). Much effort has been devoted to disentangling the problem of symmetric vs. asymmetric shocks – a key issue for local stabilization in a monetary union – whereas cyclical cross-correlations have attracted less attention, possibly because they result as high as expected to be in an area of highly integrated countries (Buti and Sapir, 1998, ch. 11.1).

In the context of SCPs, first comes the much vexed question whether budgetary policies themselves may affect the domestic growth rates and hence trigger mutual spillovers. In the first place, it would be necessary to distinguish between short-term, aggregate-demand effects, and long-term, growth-trend effects of budgetary policies. One argument is that restraining budget aggregates may slowdown aggregate demand, and hence GDP, in the short run, but *ceteris paribus* the long-run growth trend may remain unaffected. This is typical within the New Keynesian framework, where changes in budget aggregates produce "Keynesian effects" on aggregate demand and output gaps, that is "fiscal multipliers" that have negative sign on the taxation side and positive on the expenditure side (Woodford, 2011). A recurrent finding is that the composition of budget changes is important, and that negative effects of fiscal restrictions are smaller if they are obtained from expenditure cuts. The literature on the so-called "Non-Keynesian effects" of fiscal policies goes further and argues that well-engineered budget cuts actually have a positive impact on GDP (Giavazzi and Pagano, 1996; Alesina and Perotti, 1997; Alesina and Ardagna, 2009).

As is well-known from basic textbooks, and is confirmed by more sophisticated analyses, the macro-effects of fiscal policy cannot be gauged independently of the cyclical position of the economy, and of the concomitant monetary policy (Gaffeo et al., 2007; Woodford, 2011; Parker, 2011; Favero et al., 2011). In open economies, fiscal multipliers are also conditional on exchange-rate adjustments and on the business cycle of trading partners. Again, heterogeneity is important, so that "there is no unconditional fiscal policy multiplier" (Favero et al., 2011).

This said, the "Keynesian effects" appear as the more frequent empirical finding in recent research, though the magnitude of fiscal multipliers varies considerably from a few decimal points to more than unity (see Ramey, 2011, for a survey). Burriel et al. (2011) find that the average fiscal multiplier for the EMU as a whole ranges between 0.5 and 0.8. An extensive and systematic study across different countries, structural models, fiscal shocks and estimation techniques conducted at the IMF has reached the conclusion that "the size of many multipliers is large, particularly for spending and

targeted transfers" (Coenen et al., 2010). Most of these recent studies have been used to assess the effectiveness of fiscal stimuli in the wake of the Great Recession of 2008-09. Yet the reference models, and the estimation techniques used, imply that, *ceteris paribus*, multipliers are invariant to the sign of the fiscal shock. Hence, if these empirical results are robust, we should expect that inverting the sign of the fiscal shock from stimulus to restriction will have a negative impact on the GDP cyclical path. The recent finding by authoritative sources that "stronger planned fiscal consolidation has been associated with lower growth than expected" (Blanchard and Leigh, 2013, p. 1) testifies the point as well as the fact that fiscal multipliers (in absolute value) have turned out to be larger that they were thought to be

Now consider again the linearized equation 5 of the change in the debt ratio. Let the interest rate be on its trend value *i*, and, as a first approximation, let $-\phi = \Delta n_t / \Delta b'_t$ be the fiscal multiplier; this gives the deviation of nominal growth from trend Δn_t, given a change in the primary balance ratio $\Delta b'_t$ (where $\Delta b'_t > 0$ indicates a fiscal restriction)[11]. Hence $n_t = n - \phi \Delta b'_t$. This fact entails that the change in the debt ratio becomes

$$\begin{aligned} \Delta d_t &= (i - n + \phi \Delta b'_t) d_{t-1} - (b'_{t-1} + \Delta b'_t) \\ &= [(i - n) d_{t-1} - b'_{t-1}] - (1 - \phi d_{t-1}) \Delta b'_t \end{aligned} \tag{15}$$

The term in square brackets yields the debt path with unchanged fiscal effort. The interesting finding is that an *increase* in fiscal effort ($\Delta b'_t > 0$) generates a negative impulse to the debt ratio only if $\phi d_{t-1} < 1$. Hence, a combination of high outstanding debt and high fiscal multiplier can eventually produce an *increase* in the debt ratio, the Labour of Sisyphus in which Greece seems entrapped. However, Table 5 suggests that the phenomenon is more diffused.

[11] Normally, fiscal multipliers refer to real GDP. In this context we can rely on the usual monetary-union assumption that the inflation rate is not directly affected by local conditions, so that $\Delta n_t \approx \Delta g_t$

Table 5. Percent contribution to the increase of the debt/GDP ratio in EMU12 countries, 2007-12

	Primary balance	Interest and growth	Stock-flow adjust.[a]
Austria	19.7	37.4	42.9
Belgium	11.3	37.6	51.1
Finland	-19.3	29.8	89.4
France	-21.8	2.4	119.4
Germany	68.1	23.1	8.7
Greece	40.7	51.6	7.7
Ireland	62.8	21.6	15.6
Italy	-27.2	106.8	19.8
Luxembourg	-2.4	-9.7	112.1
Netherlands	29.9	24.6	44.9
Portugal	39.1	46.0	15.1
Spain	75.1	19.8	4.9

a Accumulation of financial assets, changes in the value of debt denominated in foreign currency, and remaining statistical adjustments (large figures are mainly due to extraordinary capital account operation with the banking system)
Source: Elaboration on EU Commission (2011b), Table I.1.3

Firstly, as noted above, from 2007 to 2012 all EMU12 countries have been facing worse conditions in terms of interest/growth gap, which has generated a positive impulse to the debt/GDP ratio (except Luxembourg). In 7 countries (Austria, Belgium, Finland, France, Greece, Italy, Portugal) the increase in the debt ratio due to the interest/growth gap has been larger than that due the primary balance[12], with 3 of them (France, Italy, Finland) having in fact engineered a negative impulse to the debt ratio via primary balance.

Equation 15 also entails a substantial change in the determination of the primary balance path along the SCP. Let $\gamma_t \equiv (1 - \phi d_{t\text{-}1})^{-1}$. Then,

$$b'_t = \gamma_t[(i - n)d_{t\text{-}1} - \Delta d^*_t] + (1 - \gamma_t)b'_{t-1} \qquad (16)$$

Compare with the basic equation 6. First, for given values of (i, n, $d_{t\text{-}1}$, Δd^*_t), the sign and magnitude of b'_t now depends on γ_t. If $\phi d_{t\text{-}1}$ is large but less than 1, γ_t is greater than 1, and b'_t should be *larger* in order to countervail the loss of nominal growth. Second, the term $(1 - \gamma_t)b'_{t-1}$ instead entails a "reversal effect" since a large surplus b'_{t-1} induces a *smaller* surplus b'_t. With $\phi d_{t\text{-}1} > 1$, and $\gamma_t < 0$, the government ought at least to abstain from fiscal restrictions, if not to engage in a fiscal stimulus. Note finally, that γ_t *is not a constant parameter* but it changes with the outstanding debt $d_{t\text{-}1}$.

Moving to a multi-country setup, if fiscal "Keynesian effects" are confined to the demand side, the well-known Mundell-Fleming results apply. In a system of integrated economies with fixed exchange rates, a fiscal restriction in one country generates negative spillovers onto others via international trade. If trade multipliers do not exceed unity, the final result is a magnified fall in GDP in each country and the area as a whole

[12] Positive figures do not necessarily indicate the presence of primary deficits, but also of insufficient primary surpluses.

(e.g. Alcidi and Gros, 2011, Annex A). This result can be mitigated if concomitantly the interest rate falls in each and all countries, a likely outcome in a monetary union with a single central bank[13]. The implication is that fiscal multipliers may be quite different (quite larger) with respect to those measured in each country in isolation (Favero et al., 2011). Creel et al. (2011) present a (rare) quantitative assessment of pairwise fiscal restrictions in Belgium, France and Italy, showing how bilateral interdependencies magnify the negative impact of each country's fiscal restriction on its own GDP.

What is more relevant to the issue under discussion here – a EMU-wide fiscal restriction – is not so much country-by-country correlation as between each single country and the remaining countries as a whole (the so-called "mean field effect"). Table 6 reports some simple statistics that highlight the correlation between a few growth indicators of each country with the EMU average of the remaining countries. The first is GDP growth, the second is potential growth, the third is the growth gap (the difference between the previous two). While the first and the third indicators typically capture cyclical correlations, the second indicates correlations in the long run growth trends. All correlations are clearly very high, and, remarkably, the data suggests that interdependencies also affect potential growth across countries.

Table 6. Correlation coefficients of selected variables between each country's variable and the average variable of the remaining countries, EMU 12, 2000-10 (yearly data)

	GDP growth	Potential growth	Growth gap
Austria	0.93	0.98	0.96
Belgium	0.96	0.85	0.96
Finland	0.98	0.98	0.97
France	0.97	0.56	0.91
Germany	0.90	0.84	0.94
Greece	0.95	0.89	0.96
Ireland	0.92	0.99	0.89
Italy	0.97	0.95	0.96
Luxembourg	0.95	0.96	0.91
Netherlands	0.94	0.86	0.96
Portugal	0.93	0.96	0.91
Spain	0.95	0.94	0.96

Source. Eurostat, AMECO database

In the light of these data, let $m = 1, \ldots, N$, be the member countries. Denote with $\underline{m}$ all non-m countries, and with $\underline{N}$ their number. Suppose that all countries adopt uncoordinated fiscal restrictions $\Delta b'_m > 0$, each of which associated with a fiscal multiplier $-\phi_m$. Hence, $-\Delta b'_m \phi_m$ is the domestic component of each country's impact on GDP. To this it should be added the "mean field effect", which is activated by the coefficients in the Table 6, say c_m, and amounts to

$$\mu_m = -c_m \frac{1}{\underline{N}} \sum_{\underline{m}} \Delta b'_{\underline{m}} \phi_{\underline{m}}$$

[13] See e.g. Tamborini (2004).

The overall impact on the union's GDP will be

$$\frac{1}{N}\left(\sum_m (-\Delta b'_m \phi_m + \mu_m\right) \tag{10}$$

In order to grasp the thrust of this result, let us put heterogeneity aside and assume that $\Delta b'$, ϕ, c are equal in all countries. Then, it is easily seen that the overall impact on GDP for each country and the union as a whole is $-\Delta b'\phi(1 + c)$. With $c = 0.9$ (see Table 6), the impact is almost doubled with respect to each country taken in isolation. Hence, there seems to be the possibility that an uncoordinated fiscal restriction brings about a massive continental recession worsening the debt management conditions for all countries.

As with financial interdependence a simulative exercise may help gauge the quantitative dimension of the problem. Let us consider again the high-debt country *A* (d_{A0} = 120%) *vis-à-vis* the low-debt country *B* (d_{B0} = 80%), both engaged in the respective SCP. The focus is on cyclical real interdependence triggered by fiscal restrictions; in this respect, *A* is characterized by the (mild) domestic fiscal multiplier ϕ = 0.5 (e.g. Burriel et al. 2011), and the mean field parameter c_A = 0.9. Accordingly, *B* has to be understood as a large entity representative of all the other members; its fiscal multiplier is assumed to be equal to *A*'s, whereas its GDP correlation with *A* is smaller than the reciprocal, c_B = 0.2.[14] I have run three simulations for both countries: (i) the baseline case (ϕ = 0, $c_A = c_B$ = 0), (ii) the case with the domestic fiscal multiplier alone (ϕ = 0.5, $c_A = c_B$ = 0), (iii) the case with both domestic fiscal multiplier and mean field effect (ϕ = 0.5, c_A = 0.9, c_B = 0.2).

Figure 6. Simulation of a two-country SCP with real interdependence

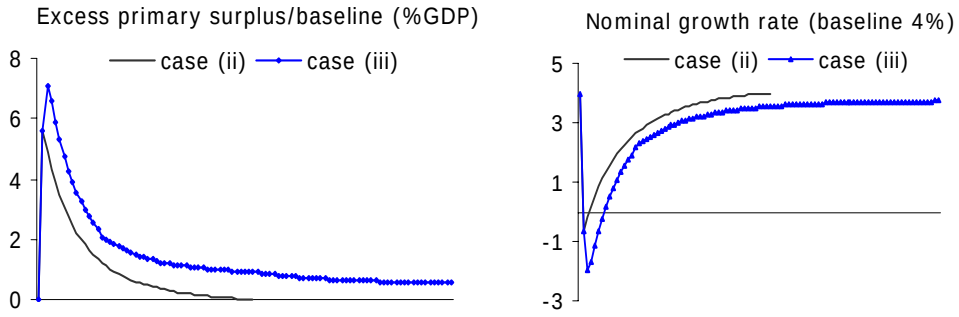


Figure 6 shows, on the left-hand side, the additional fiscal effort of *A*, with respect to the baseline case, that is necessary to correct for effects (ii) and (iii). Clearly, the latter is larger: in fact, *A*'s fiscal effort peaks at 3.7% of GDP (2nd year) in the baseline case, at 9.3% (1st year) in case (ii), and at 10.6% (2nd year) in case (iii); the additional fiscal effort per year is 1.1% of GDP in case (ii) and 1.4% in case (iii). The

[14] I have also assumed that (i) the two countries have the same nominal growth trend, n = 4%. *A*'s interest rate is determined by equation 13 and α = 0.022, β = 0.013.

right-hand side of the figure shows *A*'s track of nominal growth in cases (ii) and (iii), which imply a deviation from trend per year of 1.1% and 1.7%, respectively[15].

This example warns that real interdependence may have a substantial impact on the real costs of SCPs over time, so that individual plans that appear sustainable ex ante may turn out to be unsustainable when under way.

5. Conclusions

This paper has offered an analysis of the new SGP rules that should govern public debt-management policies of the EMU member countries, namely the SCPs, by means of dynamic models of the debt/GDP ratio. The focus has been on factors of heterogeneity and interdependence in the key variables of growth and interest rates that may affect the evolution of the debt/GDP ratio in a multi-country setup like a monetary union. These factors are neglected in the EMU institutional framework. The main conclusion is that compliance with the new SCPs may fail to deliver on the promise of smooth convergence of debt/GDP ratios to the 60% target and of their stability over time.

The present scenario with persistent low growth rates and high sovereign risk spreads is severely unfavourable for SCP compliance in most countries. Heterogeneity and interdependence are likely to act as further formidable obstacles for subsequent evolution. In fact, these factors will entail different speeds, fiscal efforts, reciprocal spillovers and chances of success of governments' convergence plans towards the SCP target. Moreover, they imply that this target may not be stable for some countries, with the consequence that even when the Promised Land has been reached, such countries may be easily shocked away from it.

The requirement of (re)convergence across interest rates will eventually depend on convergence of debt/GDP ratios, but a hurdle may be found in the *relative* speed of convergence: higher debt - lower growth countries will have to increase their fiscal effort. The convergence of real growth rates (towards a higher trend) does not seem well-founded on normative grounds, nor will it be reasonably attainable in the near future. Moreover, the risk cannot be ignored that uncoordinated SCPs may have a negative (cyclical or even permanent) impact on growth in each country magnified by reciprocal spillovers resulting in a sharp continental recession with a massive waste of fiscal effort. A relief may only come from *nominal* growth, that is inflation, certainly an unintended temptation embedded into of the new SGP.

The aim of this paper was essentially positive in nature, an examination of the working of the SCPs as they are. Its conclusions may also have normative implications to be further explored. One is that the "country-by-country" + "one-size-fits-all rules" approach of the "Brussels Consensus" is not suitable to a large area of highly integrated, heterogeneous and interdependent countries. The idea that "complications" such as those presented in this paper may be managed by each country at the implementation level is misleading. Ex-post disappointments may be substantial thus undermining credibility and "ownership" of the whole system. This further magnifies the original weakness of the "rules + sanctions" approach. In fact, the minimal requirements for this approach to work are, in general (and even with single individuals), that (i) rules should be felt as "fair" in all relevant circumstances, (ii) there should be a clear and verifiable

[15] The two averages are computed over the same number of years; yet, as can be seen in the figure, the return to trend in case (iii) is much longer

connection between a specific (bad) consequence and an individual (bad) action. Clearly, these requirements almost vanish in the presence of heterogeneity and interdependence. Hence, strengthening the "rules + sanctions" approach does not seem the most sensible reform to implement. Heterogeneity and interdependence are intrinsic features of a large monetary union, and they should be consistently addressed in the institutional design of the union. It is a basic principle of economic policy that if there are policy externalities, these should "internalized" either via voluntary cooperation incentives or via an upper-level institution.

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