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Abstract

This paper examines the new SGP rules that should govern fiscal policies of the EMU member countries by means of dynamic models of the debt/GDP ratio. The focus is on factors of heterogeneity and interdependence in the three key variables that may affect the debt/GDP evolution in a multi-country setup like a monetary union: the real growth rate, the inflation rate and the nominal interest rate on the sovereign debt stock. These factors are almost ignored in the SGP intellectual and institutional framework, but they may jeopardize the main goal of fostering convergence and keeping debt/GDP ratios equalized and stable over time. Even the return of growth, inflation and interest rates to their pre-crisis tendential values, a not so likely and imminent event, will probably be insufficient to create a favourable environment for smooth debt/GDP convergence across EMU countries.

Keywords: Stability and Growth Pact, Public debt management
JEL Codes: E6

1. Introduction

In the midst 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) that sets the fiscal rules of member states. The Commission (IP/10/1199) has 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"[1]. Such a vast 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 that are largely responsible for unleashing the speculators' bets against the survival of the EMU itself.

Five elements in the SGP have been amended:

- the *preventive part*, with the new concept of "prudent fiscal policy-making" that should ensure convergence towards the cyclically-adjusted budgetary objectives
- the *corrective part*, with enhanced emphasis on debt developments: member states each year should submit a Stability and Convergence Plan (SCP), a key component of which is the commitment to debt control and convergence towards a defined target; member states in excess of the 60% debt/GDP ratio in the last three years should reduce it at a pace defined as 1/20th of the excess per year
- the *enforcement of budgetary surveillance*, with a new set of financial sanctions for non-complying member states, and a "reverse voting mechanism" such that the sanction proposed by the Commission will be applied unless the Council turns it down by qualified majority
- the *requirements for the budgetary framework*, that is, revised harmonized accounting principles and rules
- the *prevention and correction of macroeconomic imbalances*, with the brand new "Excessive Imbalance Procedure" based on regular scrutiny of the overall macroeconomic scoreboard of each member state, and an early-warning mechanism in case of serious imbalances (typically "twin

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[1] The package also includes

- the European Financial Stability Facility, to be replaced by the permanent European Stabilization Mechanism, aimed at providing mutual financial assistance to member states under temporary financial distress
- new monitoring authorities of financial markets and institutes, such as the European Systemic Risk Board
- new instruments for better economic policy coordination, namely the so-called "European Semester", a window of time that the member states, with the Commission's assistance, can use each year in order to assess and coordinate their macro-policies.

deficits" of fiscal and foreign accounts) that may jeopardize EMU stability; like the regulation of fiscal accounts, also this new one includes sanctions for member states that fail to take actions in the face of ascertained serious macroeconomic imbalances.

The SGP revision seems inspired by two considerations. The first is that the dramatic worsening of public finance conditions in the EMU as a whole since 2009 indicates that the earlier version of the SGP was not an effective means to induce fiscal discipline according to the Maastricht Treaty provisions. The second is that fiscal stabilization of the Euro Zone will be a long and painful endeavour that will engage all major member states for a number of years to come, and during which their creditworthiness in the financial markets will have to be pinpointed 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".

While the second consideration is hardly disputable, and the shift of focus from short-term deficits to long-term debt developments is a welcome correction, the first premise is more questionable. It is true that the SGP was breached repeatedly, that it did not generate in all countries the kind of "orthodox" fiscal policy that was envisaged by the so-called "Brussels Consensus" (see e.g. Buti and Sapir (1998), Buti and Franco (2005)), and that, moreover, Greece was able to circumvent the Maastricht Treaty for admission to the EMU as well as the SGP budgetary rules. Yet all this is not sufficient evidence of a *general failure* on the grounds of fiscal discipline in the EMU as a whole. As pointed out by De Grauwe (2010) among others, all aggregate EMU fiscal indicators, and those of the qualified majority of member countries, had been steadily improving from 2000 to 2008. The sharp deterioration of these indicators afterwards is obviously not due to a sudden epidemic of unfettered fiscal profligacy. And even after the 2009-10 worldwide campaign of government rescues of financial institutes and of fiscal stimuli for economic recovery, EMU fiscal indicators have worsened less, and appear better, than those of the United States.

According to several observers, the crisis has dramatized two major faults in the SGP design. 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. By 'systemic dimension' I mean that (i) *countries differ* on several economic dimensions, (ii) national fiscal policies *exert external spillovers and create interdependencies* across countries' economic conditions, (iii) *systemic fiscal shocks* may occur, as was in fact the case in 2009-10. This three-fold systemic dimension of national fiscal policies has further exacerbated 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 perceived as "fair" in all relevant circumstances, (ii) there should be a clear and verifiable connection between

a specific (bad) consequence and an individual (bad) action. Clearly, these requirements almost vanish in the presence of heterogeneity, interdependence and systemic shocks. Hence, strengthening the "rules + sanctions" approach does not seem the most sensible reform to implement.

The aim of this paper, however, is not a "normative" discussion of the pros and cons of the revised SGP or of alternative proposals. Rather, the aim is a "positive" analysis of one of its key elements – the commitment to debt control contained in the year SCP – in light of the neglected systemic dimension of the problem at hand. The paper is organized into 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 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. At the same time, the model is also used to point out where and how considerations of heterogeneity, interdependence and exposure to systemic fiscal shocks may change results and policy implications.

These modifications and extensions are examined in the second part (section 3). Among the many dimensions along which EMU countries differ, the focus falls on two: GDP growth rates, and initial debt positions. The role of different growth rates is discussed first, showing how differences affect the key characteristics of the SCPs across countries. Also, a short discussion follows as to whether we may expect as a matter of fact, or whether we should recommend on normative grounds, convergence of growth rates in the EMU. I then examine the other source of heterogeneity, initial debt positions, in a two-country dynamic model of the debt/GDP ratio. To highlight this issue, and to keep the analysis manageable, growth rates are now assumed uniform. Each sovereign bond is held in a single integrated market by a representative investor who maximizes expected utility under constant absolute risk aversion. Different initial debt positions, and their evolutions, affect the subsequent national SCPs as they endogenously determine the interest-rate spread between the two countries. In this case, heterogeneity is also a source of interdependence, because the evolution of the debt/GDP ratio of one country affects the interest rate, and hence the debt/GDP ratio, of the other. Implications concerning convergence to the debt target, fiscal effort, and stability of the debt target may substantially differ from those obtained under the traditional single-country approach. Section 4 summarizes and concludes.

2. The basic single-country model of public debt dynamics

The basic model tracks the evolution of public debt of a single country in isolation by means of two equations

(1) $D_t = D_{t-1} - B_t$

(2) $B_t = F_t - i_t D_{t-1}$

where D_{t-1} is the outstanding public debt, B_t is the current budget balance, F_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

$$d_t = \frac{1+i_t}{1+n_t} d_{t-1} - f_t \tag{3}$$

where lower-case letters for fiscal variables denote GDP ratios, and n_t is the current nominal growth rate of GDP.[2]

In the basic model, i_t and n_t are taken as exogenous variables. The latter may be decomposed into the real and the price components. In order to have a simple and neat framework for growth accounting, let us assume that real GDP in year t, Y_t, is given by a Cobb-Douglas function with stochastic technical disturbances Z_t averaging to 1. Hence:

$$Y_t = Z_t L_t^{a} K_t^{(1-a)}$$

Defining $1+g_t \equiv Y_{t+1}/Y_t$ as the real growth, we can also write

$$1 + g_t = z_t(1 + \lambda_t)^{a}(1 + k_t)^{(1-a)}$$

where λ_t and k_t are the rates of increase in labour supply and in the capital stock (i.e. the net investment rate) from t-1 to t, respectively, and $z_t \equiv Z_t/Z_{t-1}$. To distinguish between the trend component and the disturbance component in the growth rate, suppose for convenience that the economy is characterized by the constant trend rates $\lambda_t = \lambda$ and $k_t = k$. Then

$$1 + g = (1 + \lambda)^{a}(1 + k)^{(1-a)}$$

is the trend growth of GDP. If $\pi_t > 0$ is the inflation rate from t–1 to t, then nominal growth is

$$1 + n_t = z_t(1 + g)(1 + \pi_t) \tag{4}$$

Hence, we can see that nominal growth consists of three components: the trend real growth rate g, cyclical shock z_t, and the inflation rate π_t.

Equation (3) states that d_t grows over time owing to two factors: (i) an interest rate greater than the nominal growth rate, $i_t > n_t$, and/or (ii) primary deficits, $f_t < 0$. This is a pure accounting phenomenon, which cannot be used to establish whether f_t and d_t are, at any point in time, "good" or "bad", "too high" or "too low", etc. Such value judgments can only be derived from welfare premises, possibly different in different countries, which underlie the government's budget choices and the resulting intertemporal profile of debt accumulation (deficits) and decumulation (surpluses). Thus, at best, equation (3) 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, f_t.

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[2] An alternative formulation decomposes the nominal growth rate into the real growth rate and the inflation rate (see below, equation (4)). Then, the coefficient of equation (3) results reformulated in real term. In principle, the two formulations are equivalent.

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

(5) $$\Delta d_t = \frac{i_t - n_t}{1 + n_t} d_{t-1} - f_t$$

If n_t is a small fractional number (say less than 0.1), as is usually the case, equation (5) can safely be approximated by

(6) $$\Delta d_t = (i_t - n_t) d_{t-1} - f_t$$

A first example of SCP is one of debt/GDP stabilization, $\Delta d_t = 0$. The resulting target for the primary balance is

(7) $$f(d_{t-1}) = (i_t - n_t) d_{t-1}$$

Hence debt/GDP stabilization requires a primary surplus if $i_t > n_t$; a primary deficit is allowed only if $i_t < n_t$. The magnitude of the primary balance/GDP is a measure of the so-called "fiscal effort" of the plan. It is proportional to the interest rate and the outstanding debt, whereas nominal growth reduces the fiscal effort.

Another application which will be relevant to several EMU countries in the coming years is a SCP towards the debt/GDP ratio $d^* = 60\%$. With the help of equation (3), we can examine the main elements in this plan.

In the first place, it should be ascertained what is the prospective evolution of the ratio. Let (d_0, f_0) denote the initial levels of the debt and the associated primary balance ratios, and $d_0 > d^*$. Now let i, n be the expected trend values of the interest rate and the nominal growth rate (accordingly, i_t and n_t can be thought of as random deviations from their trend values). There are thus three possible scenarios: (i) the debt/GDP ratio will not change, (ii) it will increase, (iii) it will decrease over time.

In case (i), debt/GDP is at its steady state (s-s) $\bar{d}$, which occurs if

(8) $$(i - n)\bar{d} - f_0 = 0$$

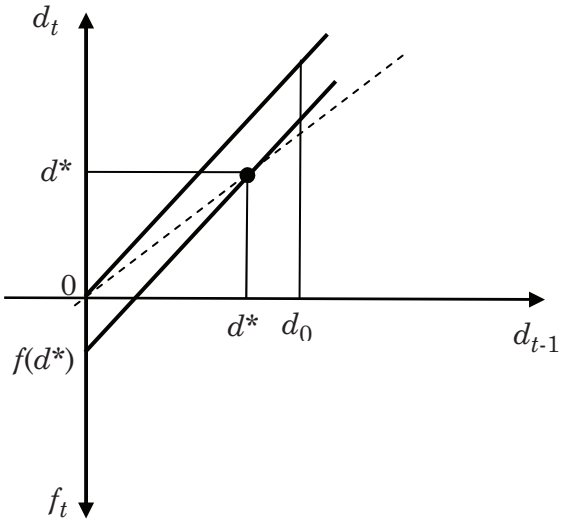
Cases (ii) or (iii) occur, respectively, according to whether the slope of the debt dynamic path at the initial level d_0,

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

is greater or smaller than 1, that is to say, $i > n$ or $i < n$. If debt/GDP 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 outstanding debt level is on an increasing path, or lingers in an unstable s-s. However, given the normative nature of the 60% debt/GDP 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 or not they are in a stable s-s. Figure 1 exemplifies the case with $i > n$; the line corresponding to $f_0 = 0$ entails that the initial d_0 is on a divergent path from the target value d^*.

Figure 1. Debt dynamics with $i > n$



The typical SCP consists of a target $\Delta d^*_t < 0$ year by year.[3] Given the observed values of i_t, n_t, this implies a target for f_t:

(10) $f(\Delta d^*_t) = (i_t - n_t)d_{t-1} - \Delta d^*_t$

Unless n_t largely exceeds i_t, this plan typically requires primary surpluses. The fiscal effort increases with the interest rate, the initial debt/GDP level and the year target.

For the 60% debt/GDP ratio to have normative force, it should also be a s-s. To this effect, equation (8) can be used to compute the associated primary balance:

(11) $f(d^*) = (i - n)d^*$

With reference to Figure 1, the complete SCP consists of downward shifts of the debt path up to the one corresponding to $f(d^*)$. Note that if $i > n$, the s-s debt target implies a permanent primary surplus.

A second desirable requirement that should be associated with the debt target is stability. 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 $f(d^*)$, only if $i < n$. Otherwise (see Figure 1), the government will have to intervene on its primary balance according to rule (10). In other words, instability of the debt target value entails the government's ability to implement a sort of quick "fine tuning" of its primary balance, a requirement that is notoriously rather problematic. Recall that, in this framework, *i, n,* and hence the stability condition, are not under the direct control and responsibility of each individual government.

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

3. Heterogeneous and interdependent countries

EMU technocrats and officials, sometimes politicians at their own convenience, or what we may by and large define the "Brussels Consensus", are wont to treat each single member country as an independent, isolated entity, fully responsible for its own conduct and results. This is of course contrary to common sense, and to basic economic theory as well. As far as the debt dynamic laws presented above are concerned, there are important sources of both heterogeneity and interdependence across member countries.

3.1. Heterogeneity. The role of growth rates

Let us look at equation (3), and let m indicate any member country. Heterogeneity may concern two variables – the interest rate i_{mt} and the nominal growth rate n_{mt} – in addition, of course, to the initial debt/GDP ratio $d_{mt\text{-}1}$. With regard to nominal growth, equation (4) suggests three country-specific variables: the trend growth rate g_m, growth shocks z_{mt}, and the inflation rate π_{mt}.

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 seen, the recipe for easier debt control wants $n_m > i_m$, that is, a nominal trend growth rate larger than the interest rate. Clearly, as suggested by the basic model, heterogeneous debt motion laws entail different speeds of adjustment, different fiscal efforts, and, what is more important, clusters of stable *vis-à-vis* unstable s-s debt levels. As a consequence, even if one day all members were able to hit the 60% debt/GDP ratio, thereafter they would react to asymmetric as well as to symmetric shocks in different, maybe divergent ways. Some would find it easier to keep their debt on target, others ought to engage in active fine tuning of their primary balance.

As far as the EMU is concerned, as one can see from Table 1, in the pre-crisis period 2000-08 the determinants of debt dynamics of the member countries (analysis is limited to the first-in group of 11 countries) showed non-trivial heterogeneity. The last column is the difference between the debt/GDP ratio in 2008 and 2000. The area as a whole reduced the ratio by 2.3 points of GDP as well as the differences across countries; yet only nearly half of the countries succeeded in reducing their ratio (including the top debtors, Italy and Belgium), while the others increased it. The member countries on average enjoyed favourable conditions for debt reduction and stability, with year nominal growth (5.1%) exceeding the interest rate by 0.7 points. In a situation with low dispersion of interest rates (fifth column), heterogeneity of debt performances indeed mostly depended on nominal growth rates. Indeed, heterogeneity of nominal growth was sizeable (standard deviation 1.9%; not in the table). Five countries faced

unfavourable conditions, with Germany suffering a substantial 1.8% gap between nominal growth and interest rate.

Table 1. Determinants of debt dynamics, EMU11, average year values 2000-08

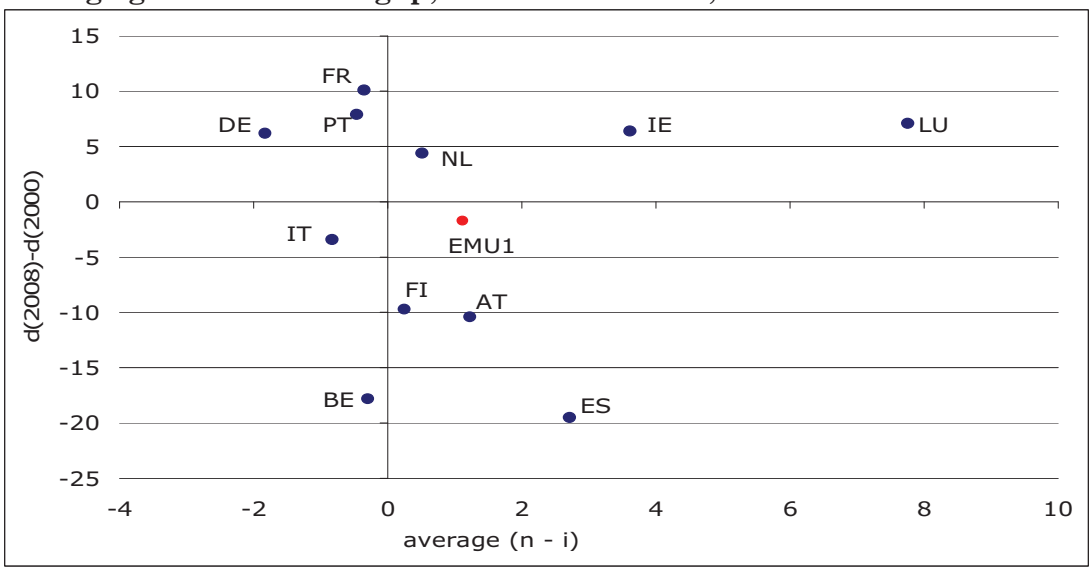
	Δ(2000)	Inflation rate	Real growth rate	L.t. interest rate[a]	$n_{mt} - i_{mt}$	Δ(2008)-Δ(2000)
Belgium	107.6	2.1	2.0	4.4	-0.3	-17.8
Germany	59.7	1.0	1.5	4.3	-1.8	6.2
Ireland	37.7	3.0	5.0	4.4	3.6	6.4
Spain	59.2	3.8	3.3	4.4	2.7	-19.5
France	57.3	2.1	1.9	4.3	-0.4	10.1
Italy	109.2	2.5	1.2	4.6	-0.8	-3.4
Luxembourg	6.4	3.5	4.3	4.1	7.8	7.1
Netherlands	53.8	2.7	2.2	4.4	0.5	4.4
Austria	58.8	3.4	2.3	4.4	1.2	-10.4
Portugal	55.9	2.7	1.3	4.5	-0.5	7.9
Finland	43.8	1.5	3.1	4.4	0.2	-9.7
EMU11[b] (mean)	59.1	2.6	2.5	4.4	0.7	-1.7
EMU11[b](st. dev.)	28.9	0.86	1.2	0.1	2.7	10.92

[a]Yield on 10-year government bonds
[b]Non-weighted average of national data

Source: Eurostat, AMECO database.

These indications are summarized by the data in Figure 2, which represents the spreadsheet between the average growth/interest gap (horizontal axis) and the change in the debt/GDP ratio. The negative relationship between the variables is apparent.

Figure 2. Relationship between the change in the debt/GDP ratio and the average growth/interest gap, EMU11 countries, 2000-2008

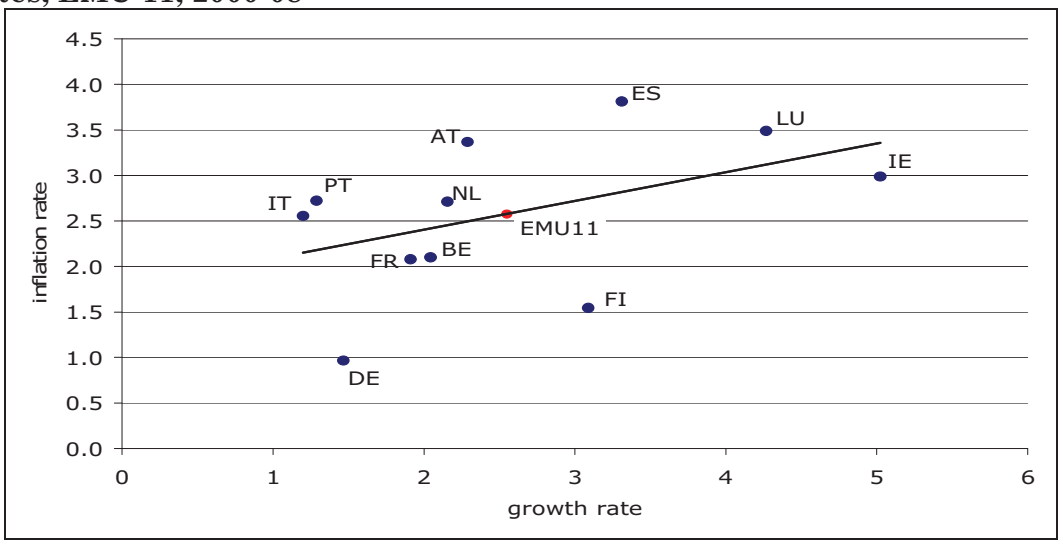


Source: AMECO database

The decomposition of nominal growth between real growth and inflation in the table indicates that the former provided the bulk (63%) of standard deviation. 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 beyond 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. 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.

Inflation reduces the fiscal effort associated with debt reduction; hence the devolution of monetary sovereignty to a supernational central bank precludes abuses of "seignorage". Nonetheless, 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 broad 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 6 countries had above-average inflation; of these, 3 were also fast GDP runners. Of the 5 countries with below-average inflation, 4 were also slow GDP runners.

Figure 3. Cross-country correlation of inflation rates and real growth rates, EMU 11, 2000-08



Source: AMECO database

The overall pattern is mixed, and a strong correlation is not detectable. However, 7/11 of the cases fit the hypothesis of positive correlation between

growth and "non monetary" inflation, with a magnification of nominal growth differentials.[4]

Let us now consider the real trend growth rate g_m. *Ceteris paribus*, countries on a low growth path will find convergence towards the debt target more difficult, and they will more likely find it an unstable achievement. Giavazzi (2010) has criticized the EMU exit strategy from the debt crisis since it relies too much on stricter rules and too little on fostering growth. The first issue of the *Annual Growth Survey* (EC (2011)) to accompany the first "European Semester" (see fn. 1) is entirely devoted to pro-growth policies.

As said above, the basic model takes the trend growth rate as given or as a variable on which the government has little control. The "Brussels Consensus" offers a more articulated view. It maintains that this variable is substantially unaffected by the "macroeconomic" fiscal policies, whereas it is affected by "microeconomic" fiscal instruments. The former kind of policies are those operated by means of budget aggregates, which mostly affect aggregate demand. The latter policies, also called "structural policies", involve specific taxing or spending tools that may affect factor markets and aggregate supply. The *Lisbon Agenda* was this view writ large.

Supporters of this view find it attractive because it gets rid of one vexed issue: the effects of restrictive fiscal policies on growth. The fact that a slow-growth country should have a tighter fiscal policy all along the convergence path of debt may appear a “labour of Sisyphus”. However, the argument is that restraining budget aggregates may slow down aggregate demand, and hence GDP, in the short run, but *ceteris paribus* the long-run growth trend may remain unaffected. This is more likely to be the case if budget cuts are obtained from the expenditure side. The literature on the so-called "Non-Keynesian effects" of fiscal policies goes further and argues that well-engineered budget cuts actually enhance the long-run growth trend (Giavazzi and Pagano (1996), Alesina and Perotti (1997)).

Standard fiscal theory, however, is not conclusive. A larger structural primary surplus can be obtained either by permanently increasing fiscal pressure or by permanently cutting public expenditure, or by a mix of the two. Moreover, each of the alternatives may in turn be implemented with different instruments (taxing labour, capital, or incomes; cutting current or investment expenditure). The effect on growth will be different in the various cases[5]: (i) taxing production factors will tend to reduce their supply

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[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, the three high-growth-high-inflation EMU countries most of the time remained in surplus (Ireland) or well above the 3% deficit threshold.

[5] I ignore here the popular argument that reducing the government deficit lowers the real interest rate and hence raises the accumulation rate. In the present

λ and k, and hence will have a negative impact on growth; (ii) taxing incomes may induce households to choose a lower saving rate in their life-cycle plan, which also may reduce k and growth[6]; (iii) cutting public expenditure may be neutral on growth provided that it is substitutable by private expenditure in aggregate demand or, alternatively, if aggregate demand shocks do not alter λ and k[7].

In the 1990s, the so-called "New Growth Theories" began to draw attention to the influence of public expenditure on growth through the positive effects that public expenditure may exert on the marginal productivity of capital and/or labour (Barro, 1990; Barro and Sala-i-Martin, 1992). Such positive effects range from securing better operating conditions for physical capital (communication ways information networks, etc.) to raising the quality of human capital (education, retraining, etc.). These models generally yield a bell-shaped "Laffer-curve" effect of *balanced* spending-taxation on the growth rate, with an optimal level of tax-financed spending corresponding to maximum growth. Therefore, the conclusion is that cutting public expenditure and taxes will increase or reduce the growth rate depending on whether (i) the cut hits unproductive or productive expenditure, and (ii) it occurs on the falling arm of the curve (i.e. when expenditure is excessive) or on the rising one (i.e. when expenditure is still insufficient).

However, as shown previously, some EMU countries will face the problem of maintaining a structural primary *surplus,* which will be larger the lower is their growth rate. As a consequence, cuts in expenditure will not be compensated by tax cuts. The result is a permanent distortionary effect on resource allocation, and the effect on growth may be negative no matter how expenditure cuts are selected, so that the vicious circle between larger primary surpluses and lower growth does take place. Hence, the possibility that the fiscal rules will act as a straitjacket on low-growth countries cannot be dismissed light-heartedly.

We have seen that the country-by-country appeal to debt convergence and stability hides the additional requirement of uniform growth rates, at

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context, the power of a single local government's borrowing requirement to alter the EMU real interest rate can be excluded.

[6]We know that income taxation is neutral on the life-cycle plan only in the infinite horizon (or intergenerational altruism) case, provided that the zero-debt condition holds in the limit. Actually, the fiscal rules do not impose this condition even as a long-run commitment. Yet EMU countries are *now* forced to correct their fiscal imbalances; hence households should not expect that primary surpluses (higher taxation) levied now will be compensated by primary deficits (lower taxation) in the future, though the non-zero debt requirement makes the time profile of primary surpluses lower than it would otherwise be.

[7]This is peecisely the point where the Keynesian view is pessimistic. If negative demand shocks give rise to involuntary unemployment, then λ will fall; if they induce a worse prospective marginal efficiency of capital, then k will also fall.

least as a favourable precondition. Is this a necessary requirement 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? Unfortunately, the "Brussels Consensus" is not actively engaged in the search for answers to these questions.

Convergence to uniform growth rates is a rather peculiar requirement. None of the available interpretations of growth attaches particular importance or a normative role to uniform growth rates. 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 New Growth Theories recalled above 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 steady-state 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 steady-state 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, or the neglect of problems of heterogeneous growth rates, behind the new SGP fiscal rules 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.[8] The conventional wisdom among growth scholars holds that σ-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).

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[8]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).

Table 2 reports basic data on the dispersion of real growth rates across US states and EMU member countries. The latter persistently display higher dispersion, but also show a tendency to reduce it. Overall, the EMU picture does not seem pathological with respect to a long-established monetary union such as the United States. Nonetheless, the data examined in this section suggest that, even on the fairly optimistic assumption of a fast return to the EMU growth pattern of the pre-crisis decade, ambitious plans of debt consolidation *and cross-country convergence* may face not so favourable conditions, unless interest rates remain at the current lower level.

Table 2. Growth statistics. US states and EMU11 member countries, 1990-2008

	US states	EMU11 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

Be that as it may, the subsequent point is that heterogeneity in growth rates is not the only issue. Additional complications arise from the combination of heterogeneity with interdependence among member countries, a dimension of the problem of debt stabilization even less considered and investigated by the "Brussels Consensus". In what follows I examine the heterogeneity-interdependence interaction in relation to the other key variable pointed out above, namely the interest rate. The point of interest is that heterogeneous debt paths entail persistent differences in debt stocks, and in their speed of reduction, among countries. This fact may reverberate onto interest-rate differentials via the sovereign risk premia mechanism.

3.2 Interdependence. The role of interest-rate spreads

When the EMU was launched, there was widespread confidence in the role of financial integration and freedom from exchange-rate risks as means to equalize interest rates across member countries. The first decade of the EMU by and large delivered this outcome (see Table 1), whereas the more recent financial turmoil has shown that country risks may still boost substantial interest-rate differentials. In this paragraph I draw on the basic portfolio diversification model to gain insights into the issue of the endogenous evolution of interest rate spreads.

Let us consider a two-country monetary union, with two sovereign debt stocks, D_A, D_B, issued by the national governments *A* and *B*, and the union's

representative wealth-owner who, for any period t, can hold the two stocks under his/her wealth constraint $D_{At} + D_{Bt} = W_t$. To normalize the value of wealth, we can re-express this constraint in terms of the wealth/income ratio, where the income of the representative wealth-owner is the average nominal GDP of the two countries. These are assumed to be equal, $YN_{At} = YN_{Bt} = YN_t$, so that YN_t is also the income of the representative wealth-owner. Dividing the whole wealth constraint by YN, and using our previous notational convention, $w_t \equiv W_t/YN_t$, $d_{mt} \equiv D_{mt}/YN_t$, $m = A, B$, we obtain

(12) $$d_{At} + d_{Bt} = w_t$$

The expected return rates to the two bonds, conditional on information available at t, are normally and independently distributed with mean, respectively, i_{At+1}, i_{Bt+1}, variance σ^2_A, σ^2_B, and covariance σ_{AB}. The demand for bonds by the representative wealth-owner is the result of his/her maximization of an exponential utility function of wealth, with constant absolute risk aversion $\rho \in [0,1]$, under the constraint (12). As is well known, under these conditions the Lagrange maximand function is

(13) $$i_{At+1}\, d_{At} + i_{Bt+1}\, d_{Bt} - (\rho/2)(\sigma^2_A d^2_{At} + \sigma^2_B d^2_{Bt} + 2\sigma_{AB}\, d_{At}\, d_{Bt}) + \\ + \lambda(d_{At} + d_{Bt} - w_t)$$

The demand functions for the two stocks are:

(14) $$d_{At} = \frac{1}{\alpha+\beta}(i_{At+1} - i_{Bt+1}) + \frac{\beta}{\alpha+\beta} w_t$$

(15) $$d_{Bt} = -\frac{1}{\alpha+\beta}(i_{At+1} - i_{Bt+1}) + \frac{\alpha}{\alpha+\beta} w_t$$

with $\alpha = \rho(\sigma^2_A - \sigma_{AB})$, $\beta = \rho(\sigma^2_B - \sigma_{AB})$.

Consequently, the interest rate spread observed in period t must be consistent with these demand functions of the outstanding debt stocks held from t–1, that is

(16) $$i_{At} - i_{Bt} = \alpha d_{At\text{-}1} - \beta d_{Bt\text{-}1}$$

Hence a positive spread of sovereign debt A may develop, owing to

- $\sigma^2_A > \sigma^2_B$, i.e. higher volatility of returns
- $d_{At\text{-}1} > d_{Bt\text{-}1}$, i.e. higher outstanding debt/GDP ratio, or "relative supply effect".

Since the two countries have the same nominal GDP, and face the same inflation rate determined by the union's central bank, we also let them grow at the same nominal rate n_t. Granted what was said in the previous section, this is a simplifying assumption that insulates the single role of the endogenous interest rate spread in the debt dynamics. As is well known, the basic portfolio model for N risky assets determines N-1 independent interest rates. For simplicity, and with transparent analogy with the EMU, I assume that one country's debt, namely B, provides the N-th interest rate, or "the anchor" of the interest rate array. Again with transparent analogy to the EMU, one may think of B as the "virtuous" country with low i_B and β; the representative investor considers B's debt an almost risk-free asset, and i_B is kept close to the interest rate directly controlled by the central bank.

We can now substitute equation (16) into the debt equation (3) for country *A*, obtaining the following system of dynamic equations:

(17)
$$\text{A)}\ d_{At} = \frac{\alpha}{1+n_t} d_{At-1}^2 + \frac{1+i_{Bt}-\beta d_{Bt-1}}{1+n_t} d_{At-1} - f_{At}$$

$$\text{B)}\ d_{Bt} = \frac{1+i_{Bt}}{1+n_t} d_{Bt-1} - f_{Bt}$$

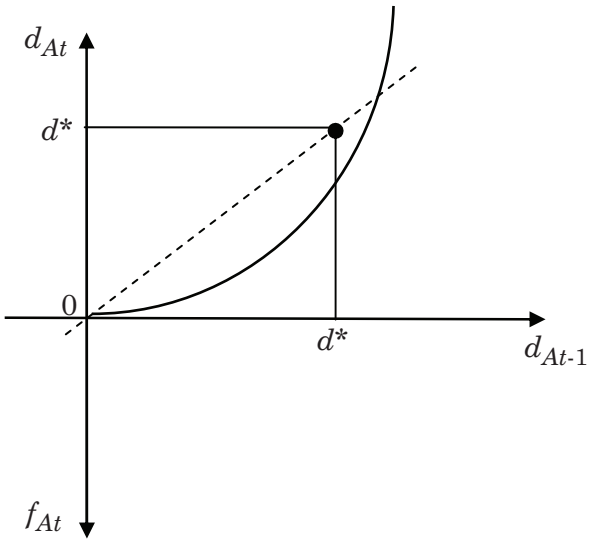
This system has the following noteworthy features, in particular for *A*.

1) Because of the dependence of the interest rate on the evolution of the debt/GDP ratio, the debt equation is no longer linear. Specifically, it is a quadratic function.

2) Debt/GDP dynamics now depends not only on the domestic policy instrument f_{At} , but also on the other country's debt/GDP and interest rate. Note that this interdependence works in two opposite directions. A high foreign interest rate i_{Bt} has a negative spillover in that it accelerates also the domestic debt/GDP dynamics (the whole array of interest rates is higher), whereas a high foreign debt stock $d_{Bt\text{-}1}$ has a positive spillover in that it decelerates the domestic debt/GDP dynamics (the interest-rate spread is lower).

3) The debt/GDP dynamic equation of the basic model (3) also applies to individual countries in the two-country context only if the two countries are financially identical. In fact it is easily verified that equation (17) boils down to (3) if $d_{At\text{-}1} = d_{Bt\text{-}1}$, $\sigma^2_A = \sigma^2_B = \sigma^2$, $\sigma_{AB} = 1$, $\alpha = \beta$, $i_{Bt} = i_{At} = i_t$.

Figure 4. Debt dynamics with endogenous interest-rate spread



In order to explore the properties of equation (17)-A, we can assume that, normally, α and β are positive, and $d_{At-1} \geq 0$. Taking i_B, n, d_B as constants, the equation tracks the positive arm of a concave quadratic map. There is an entire family of curves corresponding to the primary balance/GDP chosen by the government, which is measured as the intercept

of the curve along the vertical axis. Figure 4 exemplifies the case when a constant $f_A = 0$ is given. Note that the curve is drawn keeping d_B constant; this condition will be removed below.

Before proceeding, the legitimate question arises as whether these "relative supply" effects of debt stocks will be relevant in practice. The determinants of interest-rate spreads on public bonds have long been subject to extensive empirical investigations that fall outside the scope of this paper. Overall, it can be said that, even in the limited field of the EMU experience, the results are controversial, to say the least. A glance at the data in Table 3 suggests the following stylized facts:

- there is clear evidence of a break between the early years of financial tranquillity (2000:01-2008:12) and those of the sovereign debt crisis (2009:01-2010:12)
- during the latter, in each and all countries (except Luxembourg) the mean value of the spread and its volatility (standard deviation) increased abruptly
- likewise, in the Union as a whole, the mean value of the spread and its cross-country dispersion (EMU standard deviation) also increased sharply.

The reasons for these phenomena are not yet clear; in particular, it is not clear whether they are significantly explained by the increase in debt stocks with respect to the previous era , or also by other factors, not least a change in our parameters α and β.

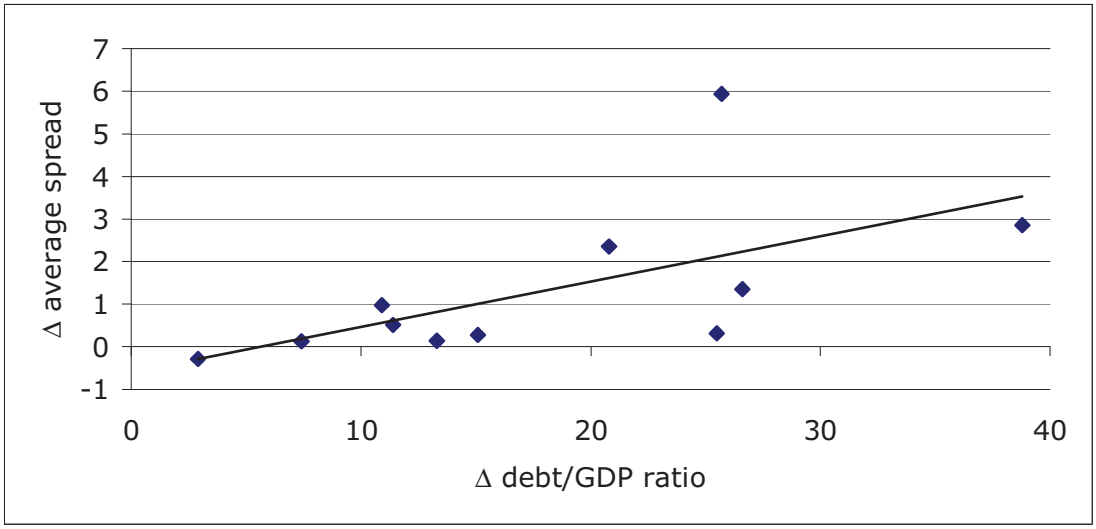
Table 3. Statistics of interest-rate spreads with Germany in the EMU, 2000-2010 (monthly yields on 10-year government bonds)

	2000:01-2008:12				2009:01-2010:12			
	mean	s.d.	Δd	$\Delta(d-d_{GER})$	mean	s.d.	Δd	$\Delta(d-d_{GER})$
Austria	0.16	0.14	-10.4	-16.6	0.48	0.22	25.5	14.7
Belgium	0.20	0.15	-17.8	-24.0	0.72	0.22	11.4	0.6
Spain	0.16	0.14	-19.5	-25.7	1.51	0.58	26.6	15.8
Finland	0.13	0.12	-9.7	-15.9	0.27	0.19	13.3	2.5
France	0.10	0.07	10.1	3.9	0.38	0.09	15.1	4.3
Greece	0.41	0.28	-2.6	-8.8	6.35	2.80	25.7	14.9
Ireland	0.15	0.21	6.4	0.2	3.00	1.16	38.8	28.0
Italy	0.31	0.19	-3.4	-9.6	1.29	0.30	10.9	0.1
Luxemb.	0.16	0.27	7.1	0.9	-0.13	1.07	2.9	-7.9
Netherl.	0.10	0.09	4.4	-1.8	0.23	0.16	7.4	-3.4
Portugal	0.23	0.16	7.9	1.7	2.58	1.22	20.8	10.0
Cyprus	–	–	–		1.86	0.35	-4.0	-14.8
Malta	–	–	–		1.44	0.16	4.6	-6.2
Slovenia	–	–	–		1.03	0.39	20.3	9.5
Slovakia	–	–	–		1.06	0.39	11.5	0.7
EMU	0.19	0.04	-1.7		1.47	1.61	16.7	

Source: ECB, Interest rate statistics, online database; AMECO database.

One well-known argument is that in the pre-crisis years the "EMU premium" induced investors to suspend sovereign-risk assessment, whereas they over-reacted subsequently.[9] The data indicate that, as a matter of fact, in the pre-crisis period debt stocks relative to GDP fell in almost all countries (column denoted by Δd) and almost all countries reduced their distance with respect to Germany (column denoted by $\Delta(d - d_{GER})$). These tendencies were substantially reversed during the crisis period. As a result, each country's change in the average spread in the two periods seems consistent with the respective change in the debt stock (Δd) (excluding the abnormal case of Greece): see Figure 5.

Figure 5. Cross-country relationship between the change in the debt/GDP ratio and in the average monthly interest-rate spread with Germany in the pre-crisis and crisis periods, EMU12 countries.



Source: see Table 3

A balanced judgement may be that each country's own or relative debt stock is not the single determinant of its spread, and that this stock effect may be time varying according to news, "frames", and "conventions". Though the historical experience of the EMU until 2008 is open to different interpretations, psychology, if not fundamental analysis, suggests that the current sovereign debt turmoil may represent an important change in investors' "frames" and "conventions", with a long-lasting shift of focus on

[9] Wyplosz (2006), drawing on Bayoumi et al. (1995) for US states, shows that in the pre-crisis period up to 2005 quadratic equations of debt/GDP ratios were good predictors, albeit quantitatively modest ones, of interest-rate spreads. These equations, however, do not include foreign substitutes. Schiavo (2008) offers an extended analysis of the theoretical and empirical issues involved, and further original estimates using various techniques, also including foreign substitutes as well as flow variables (i.e. budget deficits and new issuances of bonds). Stocks alone are seldom significant, but in the cases where they are significant, the signs of coefficients corresponding to our α and β are consistent with those in equation (16).

country risk assessment. Hence the theoretical analysis that follows may be valuable in highlighting the role of stock effects in the evolution of sovereign debts in the EMU.

We can now examine how the present reformulation of the debt motion law modifies the policy indications drawn from the basic model. Various aspects can be investigated. We may begin with the provision of the new SGP that all countries exceeding the 60% debt/GDP ratio should commit to a convergence plan (SCP) to be accomplished in a given number of years. This implies that both countries aim at the same debt target given by the SGP rule, $d^*_A = d^*_B = d^* = 60\%$. As discussed previously, the SCP is a meaningful requirement if the initial ratio exceeds 60%, d_{A0}, $d_{B0} > d^*$, and it is on a divergent path. To check this condition we should examine the slope of the debt/GDP path at the initial level, and for the trend values of i_B and n, that is,

$$\text{(18)} \qquad \text{A)}\ \partial d_{At}/\partial d_{At\text{-}1} \mid d_{A0} = \frac{1+i_B-\beta d_{B0}}{1+n} + \frac{2\alpha}{1+n} d_{A0}$$

$$\text{B)}\ \partial d_{Bt}/\partial d_{Bt\text{-}1} \mid d_{B0} = \frac{1+i_B}{1+n}$$

Recall that divergence occurs if these expressions exceed unity. Clearly, the result is the same as in the basic model for country B ($i_B > n$), whereas country A now faces two additional conditions. One depends on its own initial debt/GDP value d_{A0} and its effect on its interest-rate spread: this initial condition favours divergence. The other consists of the opposite-sign effect of the other country's initial debt/GDP value d_{B0}. Consequently, we may say that a country's debt/GDP ratio will more likely be set on a divergent path from the 60% target (see Figure 4) if the initial conditions include a high-debt/high risk history and a lower-debt/lower-risk counterparty. It is predictable that the so-called "PIIGS" will find themselves in this position *vis-à-vis* Germany.

As seen in the previous section, a typical SCP will consist of a year-by-year change in the debt/GDP ratio $\Delta d^*_t < 0$, given the observed values of i_{Bt} and n_t. The policy instrument is the primary balance/GDP $f(\Delta d^*_t)$ obtained from equations (17):

$$\text{(19)} \qquad \text{A)}\ f(\Delta d^*_{At}) = \frac{\alpha}{1+n_t} d^2_{At-1} + \frac{i_{Bt}-n_t-\beta d_{Bt-1}}{1+n_t} d_{At-1} - \Delta d^*_{At}$$

$$\text{B)}\ f(\Delta d^*_{Bt}) = \frac{i_{Bt}-n_t}{1+n_t} d_{Bt-1} - \Delta d^*_{Bt}$$

These adjustment equations provide the basis for an assessment of the fiscal effort of the convergence plan. As is clear, the two countries are in a different position. A few determinants of the fiscal effort are common to both countries, namely i_{Bt} relative to n_t, outstanding debt/GDP $d_{t\text{-}1}$, and the convergence speed $|\Delta d^*|$. Again, country A also faces the additional factors affecting its interest-rate spread pointed out before: the square of its own

outstanding debt, and its dependence on the foreign country's debt at each point in time.

Consider the following numerical example, with $\beta = 0.01$, $\alpha = 0.05$, and where $i_B = 3\%$, $n = 5\%$ are assumed to remain constant. In the first place we can examine the case where country *A* starts with debt/GDP at 100% and zero primary balance, whereas *B* already fulfills the mandatory 60%. The initial interest rate on *A*'s debt results 7.4%, i.e. a spread of 4.4%. Note that the values for i_B and n set a favourable environment for debt reduction; nonetheless, according to equation (18), *A*'s debt/GDP is on a divergent path. Consequently, *A* adopts, say, a ten-year SCP. The SCP path of country *A* is reproduced in Table 4, Case 1.

Table 4. The SCP paths of debt and primary balance GDP ratios

Case 1		Case 2			Case 3		
Country *A*		Country *A*		Country *B*	Country *A*		Country *B*
spread	primary bal./GDP	spread	primary bal./GDP	primary bal./GDP	spread	primary bal./GDP	primary bal./GDP
4.4%	6.3%	4.0%	5.9%	2.1%	4.0%	5.9%	6.1%
4.2%	6.0%	3.8%	5.7%	2.2%	3.9%	5.7%	6.2%
4.0%	5.8%	3.7%	5.5%	2.2%	3.8%	5.5%	6.4%
3.8%	5.5%	3.5%	5.3%	2.3%	3.6%	5.4%	6.6%
3.6%	5.3%	3.4%	5.1%	2.4%	3.5%	5.2%	6.7%
3.4%	5.1%	3.2%	4.9%	2.5%	3.4%	5.1%	-1.1%
3.2%	4.9%	3.0%	4.8%	2.6%	3.2%	4.9%	-1.1%
3.0%	4.7%	2.9%	4.6%	2.6%	3.0%	4.7%	-1.1%
2.8%	4.5%	2.7%	4.5%	2.7%	2.8%	4.5%	-1.1%
2.6%	4.4%	2.6%	4.3%	2.8%	2.6%	4.4%	-1.1%
2.4%	0.2%	2.4%	0.2%	-1.1%	2.4%	0.2%	-1.1%
2.4%	0.2%	2.4%	0.2%	-1.1%	2.4%	0.2%	-1.1%

In the first year of the plan, the primary surplus/GDP target is $f(\Delta d^*_{A1}) = 6.3\%$. Then both the debt and the primary surplus ratios decrease; as soon as the debt/GSP target is reached, the primary balance can be levelled at $f(d^*_A) = 0.2\%$ of GDP. That is to say, in order to keep its debt on target, *A* should sustain a small primary surplus. The spread is reduced, but it remains substantially high at 2.4%. An important message of portfolio theory is contained in this result, namely that history matters, in the sense that a country with a history of higher risk reflected in $\alpha > \beta$ should be compelled to pay for a sovereign risk premium even when the Promised Land of the SGP is reached.

A second important issue, one which is almost ignored in official documents, is whether different countries moving towards the target simultaneously have a better or worse chance of accomplishing the task. The problem is relevant because we have seen that portfolio choices may generate spillovers across the debt dynamic paths of different countries. Hence we now examine the case where both countries start with 100%

debt/GDP, zero primary balance, and adopt a ten-year SCP: see Table 4, Case 2. The first observation is that the fact that *B* has the same initial debt/GDP ratio as *A* entails a smaller spread all along the SCP path. As a consequence, *A* also faces less fiscal effort as measured by its primary balance/GDP. On the other hand, despite the equal initial conditions, *B* enjoys much less fiscal effort; once on target, it can even afford a small primary deficit. These differences between *A* and *B* are entirely due to the risk factors α and β.

This numerical example seems to suggest that simultaneous convergence is not jeopardized. However, this may well be due to the particular choice of figures. A rigorous analysis of the problem would require investigation of the dynamic properties of the two-equation system (19), but since one equation is non- linear there may be no analytical solution. On the other hand, the present setup is simplified in that there is only a one-way spillover from country *B* to *A*, so that the key problem is how fast *B*'s debt falls with respect to *A*'s. In principle, if *B*'s debt falls faster than *A*'s, the interest rate spread for *A* may increase instead of decreasing. If this happens, *A*'s primary surplus should also increase, instead of decreasing, along the convergence plan in a sort of labour of Sisyphus. Let us consider Case 3 in Table 4, where *B* adopts a faster five-year SCP. As soon as it reaches the 60% debt/GDP target, *A*'s fiscal effort worsens with respect to Case 2. This is also known as the "laggard problem", which may hit the risk assessment of countries that lag behind the adjustment pace of others.

A third issue to be examined is whether the assigned SGP target is also stable. This is another neglected problem, perhaps because it may appear too abstract with respect to the practical problems of managing large debt stocks. However, the SGP prescriptions, in particular those relating to the 'S', are ranked high in the institutional design of the EMU, and are pinpointed by authoritative theoretical justifications. But an unstable target is not a particularly appealing normative concept. Probably, discovering that once the 60% debt target has been reached it is unstable, is, for any member country, not just a mathematical *curiosum*.

The problem can be split into two parts. First, each government should choose the primary balance such that the 60% debt/GDP ratio is a s-s. This is the solution of equations (19) for $d_{At\text{-}1} = d_{Bt\text{-}1} = d^*$, $\Delta d^*_{At} = \Delta d^*_{Bt} = 0$, that is,

(20) A) $$f(d_A^*) = \frac{\alpha - \beta}{1+n} d^{*2} + \frac{i_B - n}{1+n} d^*$$

B) $$f(d_B^*) = \frac{i_B - n}{1+n} d^*$$

In the previous numerical example we have seen that these values are, respectively, 0.2% and −1.1%. Note that a coordination issue is involved here, because government *A* should safely assume that government *B* is in fact aiming at d^*. Now we can see algebraically what was said in the numerical example: the difference in the two countries' s-s primary

balance/GDP is entirely due to the first addendum in the equation for A, which reflects the determinants of the domestic interest-rate spread. Given n, the low-interest-rate union fellow B brings in a relaxing effect on the primary surplus. But also note that $\alpha - \beta = \rho(\sigma^2_A - \sigma^2_B)$; hence the low-interest-rate fellow is also likely to have $\sigma^2_B < \sigma^2_A$ exerting an upward pressure on the domestic interest rate spread and a restrictive effect on the primary balance.

Second, the stability conditions at the debt levels $d^*_A = d^*_B = d^*$, along the respective paths given by $f(d^*_A)$, $f(d^*_B)$ are

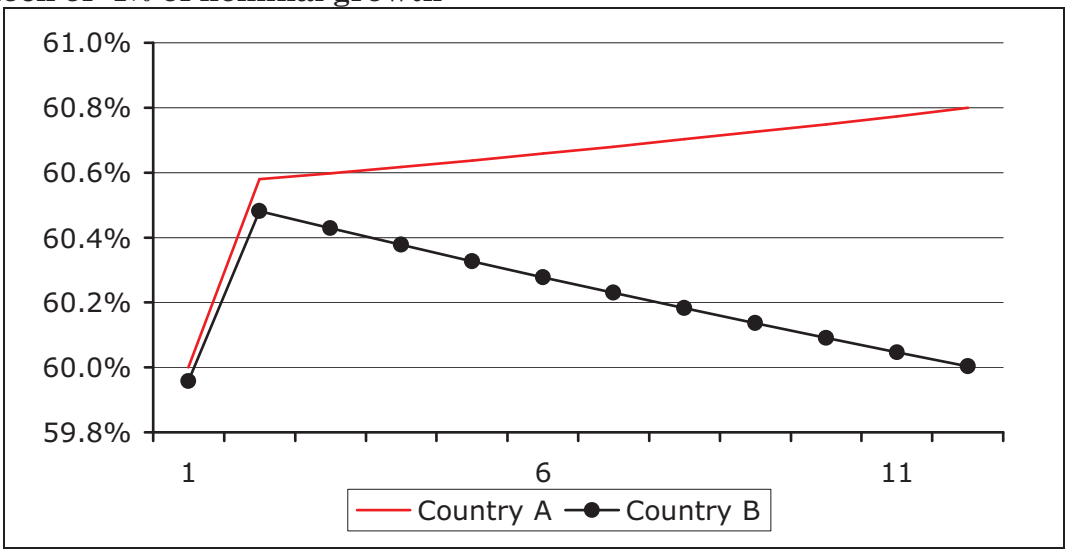
(21) A) $$\partial d_{At}/\partial d_{At\text{-}1}\,|_{d^*} = \frac{1+i_B}{1+n} + \frac{2\alpha-\beta}{1+n}d^* < 1$$

B) $$\partial d_{Bt}/\partial d_{Bt\text{-}1}\,|_{d^*} = \frac{1+i_B}{1+n} < 1$$

The stability condition for B is the same as in the basic model (9) ($i_B < n$), whereas it is more restrictive for A. In fact, it may no longer be sufficient that the nominal growth rate exceeds the interest rate (set by the foreign country). The second term, due to the debt-stock effect on the interest rate spread, should also be taken into account. Given α, β, stability for A depends on the magnitude of d^* itself, namely

(22) $$\frac{n-i_B}{2\alpha-\beta} > d^*$$

Figure 6. The divergent paths of the debt/GDP ratios after a common shock of -1% of nominal growth



Unlike B, A cannot choose its debt target arbitrarily if it is also to be stable; otherwise, the 60% debt target may not be stable for all countries. Once again, "one size does not fit all". For instance, in the previous numerical example, condition (22) does not hold for country A (the left-hand side is 0.22 < 0.6). To make the 60% debt target stable, country A would need stronger nominal growth or lower interest rate. The consequence is another

form of asymmetry between the two countries, portrayed by the previous figure.

At the 60% debt target, adverse shocks to *B*'s debt/GDP ratio are self-correcting though keeping $f(d^*_B)$ unchanged, while those to *A*'s debt are not, so that the government should engage in the "fine tuning" of its primary surplus as already discussed in the case of the basic model. The following table exemplifies the effects of various types of on-off shocks on *A*'s debt level, and the changes in its primary surplus that are necessary to keep debt on target.

Table 5. Effects of exogenous shocks to country *A*'s debt path

	Debt/GDP	Primary surplus/GDP	Change of debt/GDP	Change of spread	Corrective change of primary surplus/GDP
Baseline	60%	0.2%			
−1% n			+0.8%	+0.04%	+0.58%
+1% i_B			+0.8%	+0.04%	+0.57%
+1% d_A			+1.3%	+0.06%	+1.3%

Note that in the first two cases, a procyclical fiscal manouevre is necessary.

It might be argued that instability may also be beneficial, since a small *favourable* shock to the debt/GDP ratio sets in motion a progressive fall of the ratio itself with no fiscal effort. Yet this argument is just the other side of the coin that the government has aimed at (or has been directed to) the wrong target for its own country. It is therefore of some interest to examine what our model indicates as the correct s-s debt. To this end we should generalize equations (21) as follows:

(23) $$\text{A)}\ \partial d_{At}/\partial d_{At\text{-}1} \mid \bar{d}_A = \frac{1+i_B-\beta\bar{d}_B}{1+n}+\frac{2\alpha}{1+n}\bar{d}_A<1$$

$$\text{B)}\ \partial d_{Bt}/\partial d_{Bt\text{-}1} \mid \bar{d}_B = \frac{1+i_B}{1+n}<1$$

and therefore,

(24) $$\bar{d}_A < \frac{n-i_B+\beta\bar{d}_B}{2\alpha}$$

The important innovation of the two-country analysis is that, ideally, a specific s-s solution should exist for each country, and that it should hold for both simultaneously. Again, *A* cannot choose its s-s debt arbitrarily: it should be smaller, the larger is α, and the smaller is $\bar{d}_B$. Hence, interdependence matters: a country confronted with a low-debt union fellow should aim at a low debt too. If, with the previously given figures, *B* sticks to the 60% debt target, then *A* should search for its s-s debt level below 26%. If *B* cuts its target to 50%, *A*'s debt should remain below 25%, and so on. The suggestion of this analysis is that, for countries starting from high debt levels and carrying a historically high sovereign risk factor, convergence to

their truly s-s debt level may take a very long and painful way well beyond the SGP debt target.

4. Conclusions

In this paper I have put forward an analysis of the new SGP rules that should govern fiscal policies of the EMU member countries by means of dynamic models of the debt/GDP ratio. The focus of analysis has been on factors of heterogeneity and interdependence in the three key variables that may affect the debt/GDP evolution in a multi-country setup like a monetary union: the real growth rate, the inflation rate, and the nominal interest rate on the sovereign debt stock. These factors are almost entirely ignored in the SGP intellectual and institutional framework.

The main conclusion is that the new SGP rules will deliver on their main promises of making debt/GDP ratios converge to the 60% target and keeping them stable over time if the tendency towards uniform (and higher) growth rates, inflation rates and interest rates also prevails. The requirement of convergence of growth rates (towards a higher trend) does not seem well founded on normative grounds, nor will it be reasonably attainable in the near future. The requirement of uniform inflation rates seems more consistent with membership of a monetary union, although it has so far been delivered to a lesser extent than expected. Finally, the requirement of (re)convergence across interest rates will eventually depend on convergence of debt stocks, but a limit may be found in historical differences in risk measures embedded in investors' portfolio diversification. Even the return of nominal growth rates to their pre-crisis tendential values, a not so likely and imminent event, will probably be insufficient to create a favourable environment for smooth debt/GDP convergence for all EMU countries, unless benchmark interest rates remain at the present historical minimum.

Heterogeneity and interdependence factors will entail different speeds, fiscal efforts, reciprocal spillovers and chances of success of governments' convergence plans towards the SGP target. Moreover, these factors imply that this target may not be a stable steady state for all countries, with the consequence that even when the Promised Land is reached, some countries may be easily shocked away from it.

The aim of this paper has been essentially positive in nature: an examination of the workings of the SGP rules as they are. Its conclusions may also have normative implications to be further explored. One is that the almost exclusive focus on new rules as a means to regenerate investors' confidence in EMU sovereign debts may turn out to be insufficient if the divergence forces identified in this paper materialize and prevail. Another implication is that the "principle of sovereignty" that pinpoints the SGP from its origin – each sovereign government is fully and exclusively responsible for its own debt – is increasingly a misleading fiction. No rule, not even the simplest one, survives for long if it is based on fictitious

principles rather than on reality. It is time to recognize that heterogeneity and interdependence are inherent in the EMU reality (in modern economic reality, one would say), and that they should be consciously inserted into the intellectual framework within which the EMU conceives the regulation of sovereign governments.

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