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BACK TO FISCAL CONSOLIDATION IN EUROPE AND ITS DUAL TRADEOFF: NOW OR LATER, THROUGH SPENDING CUTS OR TAX HIKES*

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Back to fiscal consolidation in Europe and its dual tradeoff: now or later, through spending cuts or tax hikes*

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Abstract

The European consolidation process has raised a few questions. The most frequent one has been how large are the costs of consolidation and has the Eurozone fiscal stance improved or achieved debt sustainability? Second, do these costs and sustainability depend on the composition (tax vs. spending) of the consolidation process? Third, do risk premia matter? Fourth, which of the two following strategies, backloading vs. frontloading, is superior to the other? The aim of the paper is to shed light on these questions using a multi-country reduced-form model. It considers explicitly that the Eurozone member states are facing a dual trade-off, first between labor market outcomes of consolidation and public debt dynamics and, second, between reducing public expenditures and increasing taxes. The main conclusion is that a tax-based backloaded consolidation is superior to all other strategies, be they spending-based or frontloaded, or both. Introducing risk premia endogenously does not alter the conclusion.

Keywords: fiscal consolidation, fiscal multiplier, composition effect, public debt, frontloading, backloading.

JEL Codes: E61, E62, E47.

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1. Introduction

After a short period of expansionary fiscal policy in 2008-2009, most Euro area countries reversed the fiscal stance and entered into a period of fiscal consolidation. Austerity was notably required to comply with the 3%-of-GDP rule, enshrined in the Stability and Growth Pact and reinforced after the adoption of the Treaty on stability, coordination and governance. Besides, the outbreak of the Greek crisis in late 2009 created fears of a possible sovereign default and contagion among Eurozone member states, leading to a panic-driven austerity as described by De Grauwe and Ji (2013).

It has been obvious that substantial domestic austerity measures coupled with a synchronised wave of fiscal consolidation in the Eurozone since 2011 have had a strong negative impact on growth that paved the way for a double-dip recession. The fact that fiscal consolidation has been implemented though the output gap had not yet recovered from the recession has made the former more costly and even self-defeating, like in Greece. A new consensus had indeed emerged about the size of fiscal multipliers since the Great Recession and they are now supposed to be time-varying and higher in time of crisis. The consolidation process has thus raised a few questions. The most frequent one has been how large are the costs of consolidation and has the Eurozone fiscal stance improved or achieved debt sustainability? Second, do these costs and sustainability depend on the composition (tax vs. spending) of the consolidation process? Third, do risk premia matter? Fourth, taking into account risk premia, which strategy among the following two, backloading vs. frontloading, can achieve the sharpest reduction in European public debts at the lowest real cost? The aim of the present paper is precisely to deal with these issues. It considers explicitly that the Eurozone member states have been facing a dual trade-off, first between labour market outcomes of consolidation and public debt dynamics and, second, between reducing public expenditures and increasing taxes.

According to the first trade-off, the frontloading strategy has relied on the argument that the gains from consolidation in terms of lower debt and interest rates have outweighed the costs in terms of lower activity and higher unemployment. Nevertheless, the size of the impact of fiscal consolidation on long-term interest rates remains disputable. This point is investigated in this paper.

According to the second trade-off, the fiscal multiplier effect is often shown stronger after a spending cut than after a tax hike. Nevertheless, in the consolidation context, political economy arguments can help to explain why spending cuts are more frequent than tax hikes. Moreover, public expenditures like investment are less visible to the public in the short run than some others and can be cut without short-run social costs[1]. The impact of the composition effect will be investigated in this paper, on a country basis. Once all Eurozone countries are included, and their composition effect characterized, it is possible to

[1] See e.g. Balassone and Franco (2000).

compare the output outcomes of consolidation plans with different compositions of the fiscal effort. Thus the cost of spending-driven consolidation is assessed.

To investigate this dual trade-off, we extend the simple reduced-form model of 11 Eurozone countries (Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Portugal and Spain) developed in Blot et al. (2014a). The model is sufficiently detailed to explicitly link all macro elements of debt sustainability and output dynamics, the composition effects and the external trade linkages. The model also includes time-varying fiscal multipliers in a dynamic macroeconomic model and assesses their consequence in terms of public debt sustainability and real costs of consolidation. It is important to acknowledge that debates continue about the value of multipliers, the evaluation of recent output gaps, and hysteresis effects. For these reasons, the choice of a reduced-form model makes it possible, after some changes in the parameters, to conduct a large array of a sensitivity tests. Finally, the model also addresses the question of the optimal fiscal stance, defined as the fiscal consolidation producing the smallest real costs and achieving meanwhile public finance sustainability. The international dimension of the model also makes it possible to account for the interdependencies between Eurozone member states.

2. A brief and selective literature review

We mobilise two types of literature: the frontloading vs. backloading and the composition effect. The former depends extensively on the multiplier effect. In a chapter of the World Economic Outlook (2010), the IMF had concluded early that the costs of fiscal consolidation would be important, though not substantial. A fiscal multiplier around 0.5 was found at this time. In 2012 however, in the new issue of the Outlook, the tone was radically different. Assertions were made that fiscal multipliers had been formerly underestimated and were in a range of [0.9;1.7]. Blanchard and Leigh (2013), in a sequel of their box in WEO 2012, acknowledged that during downturns, fiscal multipliers were certainly above unity. While the former value of the fiscal multiplier urged a frontloading strategy, the latest one rather urged a backloading one. As a matter of fact, the growing body of evidence on the time-varying properties of the fiscal multiplier along the business cycle highlighted the importance in the timing of fiscal consolidation: a frontloading strategy when the output gap was widely and negatively open would become a "self-defeating strategy" (Holland and Portes, 2012). Not only would there be large real incurred costs but the debt to GDP ratio would not fall and debt sustainability would recede.

We have reviewed elsewhere the body of evidence on time-varying fiscal multipliers (Blot et al., 2014b). The list of factors which make the fiscal multiplier non-linear includes the zero-lower bound (e.g. Eggertsson, 2010), financial stress for households and firms (e.g. Corsetti et al., 2012), unemployment and the business cycle (e.g. Auerbach and Gorodnichenko, 2012), and public debt thresholds (Corsetti et al., 2013). A general

conclusion of this literature is that the fiscal multiplier is higher in times of crisis than in good times (see the recent meta-analysis by Gechert and Rannenberg, 2014).

As regards the composition effect, the seminal contribution of Alesina and Perotti (1995) concluded that spending-based consolidation had smaller adverse effects than tax-based consolidation. Stated differently, the spending multiplier appeared smaller than the tax multiplier. While Erceg and Lindé (2012) achieve a similar result in a two-country Dynamic Stochastic General Equilibrium (DSGE) model with independent monetary policy, they obtain the contrary once they introduce either a monetary union or a zero-lower-bound on monetary policy. Their argument is that spending cuts require sharp falls in interest and exchange rates to crowd-in private demand. In a monetary union and under the ZLB, both channels disappear and a spending-based consolidation is costlier than a tax-based one. This is consistent with the empirical findings of, e.g. Batini et al. (2012) who conclude that spending multipliers are significantly larger than tax multipliers during downturns. According to Gechert and Rannenberg (2014, baseline estimation, figure 2), the tax multiplier is only weakly different between downturns and upturns, whereas the spending multiplier can be multiplied by 3; during downturns, the spending multiplier can therefore be on average 5 times higher than the tax multiplier. in't Veld (2013), with consideration of spillover effects of fiscal consolidation in the Eurozone, and Coenen et al. (2012), without consideration for the time-varying property of fiscal multipliers, also showed that spending multipliers were higher than tax multipliers.

3. Presentation of the model

We extend the model developed in Blot et al. (2014a) to account for a composition effect of the fiscal stance. The model is a simple macroeconomic framework combining structural and reduced-form non-linear equations. It is able to embrace alternative insights of the literature, including time-varying fiscal multipliers and hysteresis effects. It remains tractable for a large set of Eurozone countries and calibrations are consistent with actual data. Thanks to tractability, we can model supply and demand complex mechanisms which are possibly heterogeneous across countries. The model is also able to make a large set of sensitivity analyses which give rise to different scenarios.

In contrast with DSGE models, this reduced-form model does not derive from optimal behaviours. It remains that, despite optimization, DSGE models are not devoid of strong assumptions, be it e.g. on the properties of households (which part of them is liquidity constrained? which part is not? The answer to these questions is important because it has implications on the effectiveness of fiscal policy)[2] or on expectations, which are often forward-looking though a mix of backward-looking and forward-looking expectations

[2] See for example Wieland et al. (2012) for a comparison of fiscal policy effects on output gap for a large set of DSGE models.

might be preferred, or alternative approaches to expectations like those discussed by Woodford (2013). Moreover, these models generally do not allow to model nonlinearities such as variable fiscal multipliers over the business cycle, because they are linearized around a single point[3], or to model hysteresis effects which mean that the steady-state (potential) output changes over time.

The key features of the model are that it allows for an explicit representation of the main countries of the Eurozone: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal and Spain. An aggregated Eurozone is also computed in order to deal with global analysis and monetary policy. On the demand side, an open economy aggregate demand function is modelled which depends on fiscal and monetary policies, external demand (a channel for intra EU interdependencies) as well as exogenous shocks on the output gap. Hysteresis effects are introduced but they only affect the level of output in the long run whereas the growth rate of the potential output reverts to baseline path. External demand is represented using a bilateral trade matrix taking into account interdependencies between Eurozone countries. Prices are given by a Phillips curve relating current inflation to expected inflation, economic activity, imported inflation and exogenous shocks. Expectations are supposed to be backward-looking[4]. A non-linear Taylor rule is used to set the stance of monetary policy. Fiscal balance is the sum of interest payments, cyclically-adjusted balance and cyclical components. This simple definition helps to properly assess the fiscal stance, *i.e.* the part of fiscal policy which is under the direct control (or discretion) of current governments. We disentangle between fiscal impulses based on expenditures and taxes. The focus is also put on the time-varying dimension of the fiscal multiplier. The model allows to compute public debt projections for Eurozone countries, taking into account the impact of the market interest rate (government-bond yield), and to assess debt sustainability. A risk-premium on long-term public interest rates is also introduced. It depends on public debt and the structural primary balance.

3.1. A simple model for open economies

To sum up, the model may boil down to 4 main equations describing demand[5], potential output, inflation and long-term interest as a weighted sum of future short-term interest rates. The output gap (y) (defined as the difference between current output $(\breve{y})$ and potential output (y^*)) is given by the following equation:

$$(1) \qquad y = EFI^G + EFI^T + \delta_l.(R - \bar{R}) + \beta_l.ad$$

[3] Recent exceptions are papers by in't Veld (2013) drawing on a structural multi-country model and Bi et al. (2013) drawing on a small, open economy, DSGE model.

[4] More precisely, expected inflation depends on the gap between past inflation and the inflation target.

[5] More details on the equations of the model are described in Blot et al. (2014a), as major changes stem from the introduction of a composition effect of the fiscal multiplier.

It is the driven by the usual variables, like real interest rates, external demand and fiscal policy, which is captured here by by EFI^G and EFI^T, the effective fiscal impulses, cumulating past and current *ex ante* fiscal impulses on public expenditures and taxes.[6] R is the long term real interest rate and $\bar{R}$ is the long run equilibrium value of interest rate. The term $\delta_l.(R-\bar{R})$ captures the effect of monetary policy on aggregate demand *via* its impact on financial markets and expectations of future inflation. The term ($\beta_l.ad$) stands for the impact of external demand by trade partners. The dynamics of the current level of output is represented by an error correction equation. Yet, with a large negative output gap, the error correction model implies growth rates which can be very large and unrealistic. Therefore, a 2.5%[7] *ad-hoc* restriction is introduced in the dynamics of current output.

The dynamics of the potential output is described by the following equation:

(2) $y_t^* = y_{t-1}^* + H.y_t + \varepsilon_t^s$

where H is an hysteresis parameter and ε_t^s is an exogenous shock on aggregate supply. GDP prices are set according to a New Keynesian hybrid Phillips curve. Inflation depends on past inflation, expected inflation, output gap, and imported inflation and we rely on estimates by Fuhrer and Moore (1995), Rudd and Whelan (2006), and Paloviita (2008) for calibration:

(3) $\pi_t = \eta_1.\pi_{t-1} + (1-\eta_1).\pi_{t+1}^e + \eta_2.y_t + \eta_3.\sum_j w_{m,j,c}(\Delta\pi_t^c) + \varepsilon_t^\pi$

Actually, a distinction is made between short-term (or one-period ahead forecast) entering the Phillips curve equation (3) and long-term forecasts, which is used for the long term real interest rate. For one-period ahead forecasts (π_t^e), we rely on backward-looking expectations, and we assume that inflation is expected to converge to the ECB target at a given speed. For financial markets, long-run expected inflation is modelled as the discounted sum of forward-looking inflation rates, in a similar fashion as nominal long-term rates, in order to keep expectations consistent at this (more than one-year ahead) horizon.

Monetary policy is described through a non-linear Taylor rule where, under non-ZLB circumstances, the short term interest rate moves with the gap between Eurozone inflation π_t^{EA} and the ECB target π^* on the one hand, and with the Eurozone output gap y_t^{EA} on the other hand. The ZLB is fixed at 0 %. According to the expectations theory, the long term interest rate for German public bonds is set equal to the expected sum of future short term interest rates for which expectations are supposed to be rational (following Shiller, 1979).

[6] It is an *ex ante* multiplier in the sense that it does not take into account monetary policy effects and spillover effects from external trade on GDP.

[7] It does not imply that growth rate is strictly bounded at 2.5% during a recovery since short-term dynamics resulting from monetary and fiscal policy or external demand can also drive growth.

(4) $i_t^{Taylor} = r^* + \pi_t^{EA} + \Psi_1.(\pi_t^{EA} - \pi^*) + \Psi_2.y_t^{EA}$

The long-term public may include a risk premium $\varepsilon_t^{I_{pub}}$. It is supposed to be equal to zero in the baseline scenario where we consider that long term interest rates all converge as observed in the pre-crisis period. A sensitivity analysis accounts for an endogenous linear risk premium, increasing with public debt. The assumption that the risk premium is sensitive to public debt rather than deficits is consistent with results reported by Beirne and Fratzscher (2013) after 2008. The risk premium is zero when public debt is below 60% and when the country reaches a structural primary balance which stabilizes debt.

(5) $\varepsilon_t^{I_{pub}} = \kappa B_t \;\; if\; B_{t-1} > 60\%\; and\; if\; SPS_t < \overline{SPS_t}$

where $\overline{SPS_t}$ is the primary structural balance stabilizing public debt. It must be noticed that for countries that entered the EFSF, the long term interest rate is supposed to be exogenous. The real long term interest rate, entering equation (1) is equal to the nominal long term rate minus long run expected inflation.

Finally, imports of each country increase with the output gap (eq.(6)). Then, as imports in each country are exports for other countries, we define external demand to country *c* as the weighted sum of imports of the other EMU countries (eq.(7)). As the model considers only Eurozone countries, the external demand only accounts for intra-Eurozone trade.

(6) $m_t = \Omega.y_t$

(7) $ad_t = \sum_j w_{m,j,c} m_t$

Calibration of the model is described in the appendix.

3.2. Public finances and fiscal policy

The fiscal block of the model includes public debt dynamics and hinges extensively on the structural primary balance. The latter evolves according to the differentiated impulses on public spending (FI^G) and taxes (FI^T) but also according to changes in taxes which are due to variations in the gap between potential production and the baseline. As a matter of fact, a permanent downward shift in potential output relative to the baseline entails a permanent fall in taxes, then a permanent fall in the structural primary balance. The cyclical balance depends on the overall sensitivity of revenues and expenditures to the business cycle. The average interest rate on debt evolves according to the long term nominal interest rate on newly issued public bonds.

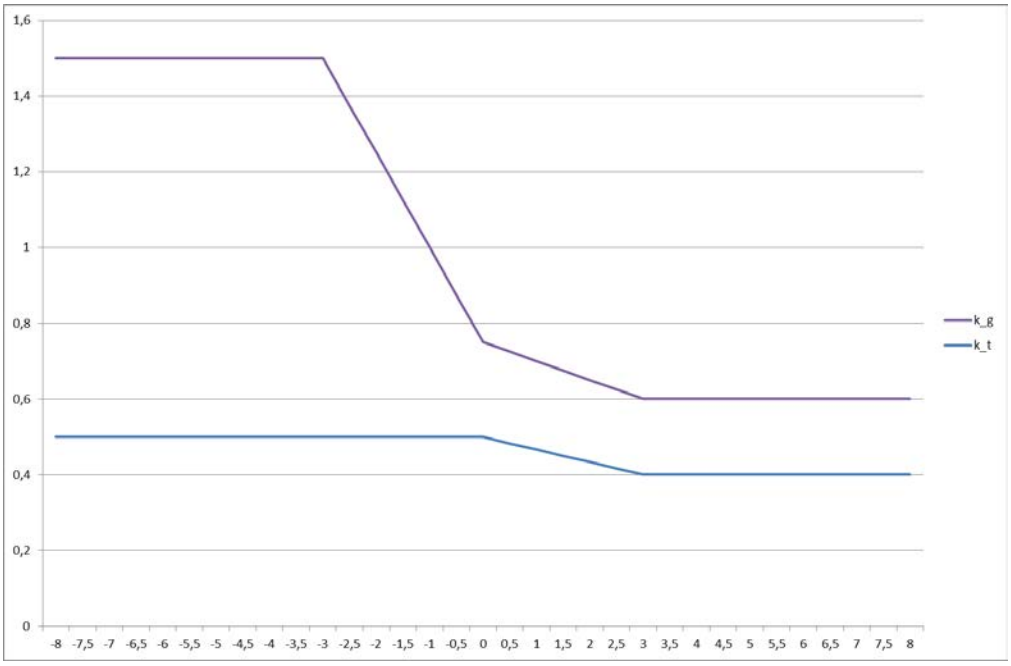
The impact of fiscal policy depends on the state of the economy as emphasized by the growing literature surveyed by Parker (2011). Hence, we build a time-varying fiscal

multipliers μ_t which depends on the output gap and on the composition of the adjustment. Tax-based and spending-based multipliers can be described by the illustrative figure 2. We consider the same shape for the two fiscal multipliers. Yet μ^T_{max} (respectively μ^T_{min} and μ^T_0) may differ from μ^G_{max} (respectively μ^G_{min} and μ^G_0). The calibrated values for the fiscal multipliers are based on the meta-regression analysis provided by Gechert and Rannenberg (2014) where they show that the spending-based multiplier is very sensitive to the state of the economy whereas the tax-based multiplier is flatter.

The values of fiscal (tax and spending) multipliers are maximal in very bad times, whereas they are minimal in very good times. Such a representation of the fiscal multiplier does not directly account for all the possibilities highlighted in the empirical literature. Yet, as monetary policy is endogenous and constrained by the zero lower bound, the effect of fiscal policy becomes stronger when the output gap is negative and monetary policy constrained by the ZLB since there is no increase in the interest rate that can mitigate the impact of fiscal policy. Since the banking sector is not represented in the model, the state of the financial system has no incidence on the fiscal multiplier[8]. Nevertheless, we may suppose that a situation of distressed banking system would be accompanied by a negative output gap, a feature which is explicitly introduced in the model via the time-varying nature of the fiscal multiplier. Besides, fiscal multipliers are higher when the unemployment rate is high as liquidity constraints become more stringent for firms and households. In such a case, the Ricardian hypothesis does not hold. Finally, there is one situation that seems to be more controversial if public debt is high or increases quickly: Corsetti et al. (2013) argue that the fiscal multiplier would be low. The analyses will yet also include a situation where a risk premium in the interest rate increases with public debt. Though it may not strictly correspond to the effect illustrated by Corsetti et al. (2013), it will mitigate our conclusion on the cost of consolidation when public debt is high.

[8] We thank Pablo Hernandez de Cos for raising this issue.

Figure 2. Example of the value of the multiplier for public spending and taxes according to the output gap



Note: $\mu^G_{max} = 1.5$, $\mu^G_{min} = 0.6, \mu^G_o = 0.75$, $\mu^T_{max} = 0.5$, $\mu^T_{min} = 0.4$, $\mu^T_o = 0.5$. $y_{inf} = -3\%$, and $y_{sup} = 3\%$. Values are supposed to be identical across countries.

Source: OFCE.

Beyond fiscal impulses which represent discretionary decisions (in % of GDP) on government spending and taxes, we compute effective fiscal impulses (EFI, based on public spending and taxes), as the *ex ante* cumulative real effect of current and past fiscal impulses at time t. Thus, with $\psi_k . \mu^j_{t-k}$ (for $j = G, T$) the fiscal multiplier at time t of a fiscal impulse that occurred k years ago, one has:

$$(8)\ \Delta EFI^j_t = \psi_0 . \mu^j_t . FI^j_t + \psi_1 . \mu^j_{t-1} . FI^j_{t-1} + \psi_2 . \mu^j_{t-2} . FI^j_{t-2} + \psi_3 . \mu^j_{t-3} . FI^j_{t-3} + \psi_4 . \mu^j_{t-4} . FI^j_{t-4} + \psi_5 . \mu^j_{t-5} . FI^j_{t-5} + \psi_6 . \mu^j_{t-6} . FI^j_{t-6} + \psi_7 . \mu^j_{t-7} . FI^j_{t-7}$$

$$(9)\ \Sigma FI^j_t = \Sigma FI^j_{t-1} + \mu^j_t . FI^j_t$$

Equation (8) ensures that the impact of a fiscal impulse depends on the fiscal multiplier that prevailed when the fiscal impulse occurred. Seven lags are retained to account for the possibility of long lasting effects of fiscal impulses. The total impact of a sequence of fiscal impulses is then computed using the accumulation of fiscal impulses times the multiplier (eq.(9)).

4. Public Debt and output gap dynamics under alternative compositions of fiscal adjustment

We aim to provide simulations on the paths of public debt and output gap of Eurozone member states according to the path of consolidation and the composition of the adjustment under different scenarios.

The baseline scenario incorporates time-varying fiscal multipliers and hysteresis effects, but does not introduce the risk premium effect on long-term interest rates. First, we take into account the *observed* amount of fiscal consolidation from 2011, which is the starting year for all simulations, and derive the public debt dynamics until 2034. We investigate whether, under *observed* fiscal stances, Eurozone countries may achieve the 60% debt-to-GDP target.

Then, we analyze different paths of consolidation with three alternative instruments: purely expenditure-based adjustment, purely tax-based adjustment and a mixed-adjustment. Finally, in a third step, we introduce an endogenous risk premium.

4.1. Public debt in 2034 under the current adjustment

In the baseline scenario, we simulate the path of public debt-to-GDP ratios until 2034, which is the horizon of the 1/20th debt rule incorporated in the revised SGP and in the Fiscal Compact. The simulated path of public debt depends on the fiscal impulses which have been forecasted in the Eurozone from 2011 to 2016[9]. We then assume zero fiscal impulses beyond 2016. Under this scenario, the fiscal multiplier is supposed to be time-varying as described in figure 2. Hysteresis effects are also introduced in the model so that a negative (respectively positive) demand shock will have negative (respectively positive) long-term effects on GDP. We suppose that sovereign spreads will vanish after 2015. Results are reported in Table 1 and hypotheses regarding the set of initial conditions are described in box 1.

Columns (1)-(4) report public debt and structural balance respectively in 2020 and 2034 (20-year horizon). 2020 is the year for which the output gap has returned to zero for almost all countries. The cumulative fiscal impulse for 2011-2016, is reported in column (5) and sums up the short-term fiscal stance for all Eurozone countries. Growth performances (GDP growth rates) are reported in columns (6) and (7). For GDP growth, we report the average growth rate over the period for which we have information on realized fiscal stance (2011-2014). Beyond 2020, GDP growth converges to the long-term growth rate.

[9] For 2015 and 2016, we consider planned fiscal impulses.

Table 1. Public finance and output performances under the baseline scenario

	Public debt (% of GDP)		Structural balance (% of GDP)		Cumulative fiscal impulse	GDP growth rate (%)		Sovereign yield (%)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	2020	2034	2020	2034	2011-2016*	2011-2014	2015-2034	2012-2018
Germany	51	6	1,9	3,0	-1.8	1,5	1,1	1,9
France	93	99	-3,1	-3,9	-2.5	0,8	1,6	2,3
Italy	112	57	1,1	2,9	-2.1	-0,8	0,5	3,4
Spain	92	71	-1,4	-1,0	-5.7	-0,4	1,7	3,3
Netherlands	71	66	-1,6	-1,8	-2.3	0,0	1,5	2,1
Belgium	86	52	-0,3	0,5	-1.1	0,8	1,7	2,4
Portugal	115	83	-1,0	-0,2	-7.4	-1,4	1,4	3,2
Ireland	82	8	2,4	4,6	-6.3	1,5	2,2	2,8
Greece	148	58	1,7	4,9	-11.1	-4,8	1,7	3,4
Finland	65	74	-2,3	-3,3	-1.8	0,1	1,9	2,1
Austria	69	56	-1,1	-1,0	0.3	1,3	1,5	2,2
Eurozone	82	54	-0,3	0,2	-2.8	0,4	1,3	2,6

Source: iAGS model

*: Fiscal impulses are null beyond 2016.

Given initial conditions and realized and expected fiscal impulses, table 1 shows that public debt would significantly decrease between 2020 and 2034 for all countries but France and Finland. Moreover, Germany, Italy, Belgium, Ireland, Greece and Austria would meet the 60% target by 2034.

In 2020, despite substantial fiscal efforts, France, Spain, the Netherlands, Portugal, Finland and Austria would not be able to bring their cyclically-adjusted deficit under the Fiscal Compact limit of 0.5% of GDP. Among these countries, France, Spain, the Netherlands, Portugal and Finland would not comply with the fiscal rule on public debt and would stand above the 60 % threshold in 2034 despite their fiscal efforts to bring back debt to this ratio.

Finally, the baseline scenario questions the issue of public debt sustainability in the Eurozone. Sustainability is assessed regarding the ability of countries to meet the objective of bringing back the debt ratio to 60 % of GDP by 2034, consistently with the recent fiscal framework which fixes a 20-year horizon for assessing debt evolution. Sustainability refers to the ability of the general government to pay back its domestic debt. Its ability depends on the future available scope for spending cuts and tax hikes, but also on future economic growth. Though some countries in our baseline simulations do not reach this 60% threshold, it is noticeable that they achieve substantial reductions in public debt-to-GDP

ratios. This downward trend in public debt implies enhanced debt sustainability *stricto sensu*. However the social costs as well as the cost in terms of fiscal balance could make this adjustment unrealistic (see Buiter and Rahbari, 2014). For Greece, Italy and Ireland, it would require structural primary surpluses close or above 3% of GDP for many years. This obviously questions the ability of these countries to maintain such a high primary surplus, a situation which has rarely been observed in the history of fiscal consolidations.

For countries, where public debt would fall significantly below 60 %, it raises the opportunity to pursue a fiscal stimulus as existing fiscal rules state that public debt must remain below 60 %, hence leaving some possible leeway to expand in the future. One may consider that the baseline scenario is economically, politically and socially costly: it goes beyond the requirements of fiscal sustainability, beyond the requirements of EU fiscal rules and beyond the social resilience of European citizens. For Germany, the primary surplus would reach 3.0% by 2034 under the current scenario. As the optimal level of public debt is unknown *a priori*, there is no reason to consider that this situation will correspond to a long-term equilibrium. The German government may decide to expand fiscal policy in the years after 2016.[10]

It must be acknowledged that the projections can be sensitive to alternative hypotheses. Blot and al. (2014a) notably show that the value of fiscal multipliers and the hysteresis effect play a significant role to gauge the dynamics of public debt. Initial output gap and long-term growth are also critical hypotheses.[11] Fiscal impulses have been high for most of Eurozone countries and sometimes exceeding 5% in Spain, Portugal, Ireland and Greece. They may be even larger if years 2015 and 2016 are excluded as the fiscal stance would turn positive for some countries according to AMECO forecasts (see table 3). For most countries average growth rates have been low during the 2011-2014 period. It must be recalled that over these years, the model has been calibrated to mimic the *observed* growth, public debt, public balance and interest rates. Thereafter, due to less contractionary or even expansionary fiscal impulses in 2015 and 2016, GDP would recover faster: Eurozone growth rate would reach 1.3% and 2.9% respectively. It would also result from a more expansionary monetary policy and to the error correction effect introduced in the model.

Box 1: Main hypotheses for the baseline simulations

All simulations begin in 2011. To do so, we need to set starting point values in 2010 for some key variables. Output gaps for 2010 come from OECD database. We have taken the

[10] Blanchard et al. (2014) report the different channels through which a fiscal stimulus in Germany may be fruitful in the periphery. In't Veld (2013) reports a positive impact of a fiscal stimulus in Eurozone surplus countries (e.g. Germany) but does not report a comparison with a fiscal stimulus in deficit countries. Blot et al. (2014a) show that such a fiscal stimulus in Germany, which would not jeopardize public debt sustainability, would be less effective than if it happened in Spain: the almost close output gap in Germany does neither favor a strong impact of fiscal policy in Germany nor in the Eurozone via spillover effects.

[11] Simulations also depend on starting debt levels. In the present context, however, initial debt levels are *actual* ones, and cannot therefore be modified.

Economic Outlook 88 database (December 2010) which was the latest information available to policymakers when they decided upon domestic fiscal stances for 2011 and beyond. Output gaps are frequently revised and an alternative calibration might be to use more recent OECD estimates. Long-term projections for growth rates are OFCE hypotheses (see Table 2) where long-term growth is decomposed between the growth of the labor force and labor productivity. These hypotheses are necessarily open to debate but they may only be seen as exogenous projections since the model does not properly account for a long term analysis of the growth rate equilibrium. Concerning fiscal policy and budget variables, the main hypotheses are as follows:

— Public debts and fiscal balances in 2010 come from Eurostat;

— Fiscal impulses and the composition of the adjustment are taken from AMECO database (see Table 3). For 2015-2016, fiscal impulses are planned ones. Fiscal impulses take into account the one-off measures and correspond to the underlying primary cyclically-adjusted fiscal balance.

— Sovereign spreads for 2015-2016 are supposed to vanish progressively in the baseline scenario. It is assumed that the announced ECB program of unlimited debt-buying on the secondary market (Outright Monetary Transactions, up to a 3-year maturity) has been effective and achieves its goal of bringing down interest rates for Italy and Spain. Regarding countries relying on the ESM (formerly EFSF) for debt financing, we assume that Ireland gets full access to financial markets in 2014, Portugal in 2015 and Greece in 2016. We discuss a scenario with endogenous risk premium hereafter.

Table 2. Main hypotheses for 2010

in %

	Public debt	Fiscal balance	output gap	potential growth
Source	**Eurostat**	**Eurostat**	**OECD**	**OFCE**
Germany	82.5	-4.2	-3.7	1.0
France	82.8	-6.8	-3.3	1.4
Italy	115.3	-4.5	-4.4	0.2
Spain	61.7	-9.4	-6.5	1.4
Netherlands	63.4	-5.1	-2.4	1.3
Belgium	96.6	-3.8	-3.8	1.5
Portugal	94.0	-11.2	-2.3	1.0
Ireland	91.2	-9.1	-11.7	1.8
Greece	148.3	-10.9	-7.3	1.5
Finland	48.8	-2.5	-6.0	1.6
Austria	72.5	-4.5	-2.5	1.4

Source: OECD, Eurostat and OFCE

Table 3. Fiscal impulses – 2011-2016

in % of GDP

	2011 – 2014		2015-2016	
	Expenditures	Taxes	Expenditures	Taxes
Germany	-1.5	-0.7	0.1	0.3
France	-3.9	1.1	0.4	-0.1
Italy	-2.2	-0.5	0.5	0.2
Spain	-1.9	-4.1	-0.1	0.4
Netherlands	-1.7	-1.3	0.5	0.2
Belgium	-2.9	1.4	0.6	-0.3
Portugal	-3.9	-4.4	0.3	0.6
Ireland	-1.3	-4.8	1.7	-1.9
Greece	-7.0	-5.5	1.3	0.1
Finland	-3.9	4.0	-0.4	0.6
Austria	-1.6	0.0	-0.2	0.0

Sources: OECD, Eurostat and AMECO.

4.2. Does composition matter?

We assess whether countries can achieve the public debt target in 2034 by resorting to alternative instruments of consolidation. For the sake of simplicity and with regard to the literature on fiscal multipliers, we consider an instrument for which the fiscal multiplier is high, called here expenditure-based adjustment and the other for which the fiscal multiplier is low, called tax-based adjustment as emphasized in figure 2.

For each instrument, we calculate a sequence of fiscal impulses over 2011-2034 and we assess whether or not the country achieves the target and what is the output dynamics under the adjustment. For simplicity, we set fiscal impulses at - / + 0.5 from 2011 on. Austerity (a negative impulse) is reversed once the public debt-to-GDP ratio falls below 60% in 2034. For example, Spanish public debt stands at 71% of GDP in 2034 in the baseline scenario. We start with replacing the 2011 *observed* fiscal impulse by -0.5 and then, by iteration, we introduce additional negative fiscal impulses of -0.5 until the debt-to-GDP ratio reaches 60% in 2034. Once the target has been reached, we introduce positive impulses insofar as they do not breach the target.

The ability to comply with the debt objective is analyzed separately with three instruments (expenditure-based, tax-based and mix-adjustment). In the mix-adjustment case, we consider that countries for which consolidation is needed resort to the instrument with the lowest fiscal multiplier (taxes) whereas countries where an expansionary fiscal policy is possible resort to the instrument with the highest multiplier (expenditures). In all cases, it is assumed that interest rates converge among Eurozone countries.

First, with maximum yearly consolidation of -0.5% of GDP based only on expenditures from 2011 on (table 4a), only three countries (Spain, Portugal and Greece) would not reach the debt target in 2034. For those countries the cumulative fiscal impulse would amount to 11.5% of GDP. For France, the Netherlands and Austria, a significant additional amount of consolidation is needed when compared to table 1. In the case of Italy, reaching 60% with -0.5 point of consolidation per year would involve 3.1 points of consolidation which is close to the -2.1 that were realized between 2011 and 2016.[12] For Germany, fiscal stance would turn to a positive figure reflecting the fiscal space of the country. With a neutral fiscal stance, Belgium would also be able to reach the 60% debt-to-GDP ratio. Finally, it must be stressed that average growth would be significantly higher between 2011 and 2014, in comparison with the baseline scenario, thanks to lower requirements for consolidation. For the Eurozone as a whole, average growth would have been 0.6 point higher. The most striking difference would concern Greece, with an averaged recession of -0.9 instead of -4.8. Yet it must be reminded that under this adjustment path, Greece would still be unable to reach the debt target. Under this scenario, the cumulative fiscal impulse would be substantially higher than under the baseline (incorporating observed and planned fiscal stances between 2011 and 2016), but since it would be spread over a longer horizon, the gains in terms of short-term growth would be relatively substantial, whereas the long-term costs would be minimal.

Turning to the case of purely tax-based adjustment (table 4b), only Portugal would not comply with the debt target. Public debt would reach 92%, which is significantly lower than in the expenditure-based adjustment, where it stood at 150%. This scenario is certainly and not surprisingly better for all Eurozone countries since, needed adjustment is lower and consolidation is less costly. Average growth in the Eurozone would now have reached 1.2 between 2011 and 2014, with average growth between 2015 and 2034 similar with the baseline scenario.

This conclusion certainly hinges on the assumption that the tax multiplier is always lower than the spending multiplier. Resorting to the instrument associated with the lowest multiplier in times of consolidation is optimal, all else equal. This is of course untrue when an expansion is possible. Thus, we consider a fourth scenario of mixed-adjustment (table 4c). Here, countries with fiscal room for maneuver resort to expenditure-based expansion whereas countries implementing consolidation resort to tax-based adjustment. The differences with the pure tax-based adjustment are rather small. Public debt for Portugal is only reduced by 1 percentage point. Average growth for the Eurozone is 0.1 point higher

[12] Here we also take into account planned consolidation or expansion for 2015 and 2016.

between 2011 and 2014 and similar on average afterwards. It must be stressed that the main country for which there is fiscal room for maneuver is Germany. Though it is the biggest Eurozone country, the spillover effects from a German expenditures-based expansion are found to be small (see footnote 10).

Let us briefly return to the superiority of tax-based adjustment over spending-based adjustment in the model. It shall not be considered tautological. Indeed, the model introduces spillover effects via trade which do not modify the discrepancy between both types of adjustment: the adjustment with the assumed lowest real costs (tax-based adjustment) also produces the lowest spillover effects on partners, hence the lowest (negative) feedback effects from partners. However, the model includes a monetary policy setting which reduces the discrepancy: the adjustment with the assumed lowest real costs produces the smallest reduction in the nominal interest rate, hence the lowest compensation for demand. The argument that spending-based consolidation should be the preferred strategy during consolidation episodes drew extensively on the reversed crowding-out effect: a fall in expenditure would be followed by a fall in interest rate and a consecutive increase in private investment[13]. This argument is strongly dependent on the existence of the ZLB (unless the liquidity trap is driven by shock on households' confidence, as in Mertens and Ravn, 2010): once the ZLB has been reached, spending-based consolidations cannot produce a compensating increase in private demand. Moreover, the higher the fiscal multiplier, the faster a ZLB episode is reached. Consequently, the time frame for a reversed crowding-out effect to happen is shorter under a spending-based consolidation than a tax-based one.

[13] The argument is present in, e.g. Giudice et al. (2003) and Corsetti et al. (2013).

Table 4a. + / - 0.5 adjustment - expenditure-based adjustment

	Public debt (% of GDP)		Structural balance (% of GDP)		Cumulative fiscal impulse	GDP growth rate (%)	
	2020	2034	2020	2034	2011-2034	2011-2014	2015-2034
Germany	70	60	-1,1	-1,1	1,2	2,2	1,0
France	95	60	-1,1	0,8	-6,8	1,4	1,4
Italy	122	60	1,1	3,4	-3,1	-0,7	0,4
Spain	127	**100**	-3,6	2,0	-11,5	0,1	1,4
Netherlands	85	60	-0,6	-0,3	-5,0	0,1	1,4
Belgium	87	60	-1,0	-0,2	0,0	1,7	1,6
Portugal	160	**150**	-4,6	0,1	-11,5	-0,1	0,9
Ireland	122	60	-0,8	2,4	-7,0	1,9	1,9
Greece	163	**110**	-2,2	4,4	-11,5	-0,9	1,0
Finland	58	60	-1,8	-2,4	0,9	1,3	1,7
Austria	74	60	-1,4	-1,2	-2,1	1,1	1,5
Eurozone	96	67	-1,1	0,5	-3,8	1,0	1,1

Source: iAGS model

Table 4b. + / - 0.5 adjustment - tax-based adjustment

	Public debt (% of GDP)		Structural balance (% of GDP)		Cumulative fiscal impulse	GDP growth rate (%)	
	2020	2034	2020	2034	2011-2034	2011-2014	2015-2034
Germany	72	61	-1,1	-1,1	1,0	2,1	1,0
France	84	60	-0,9	-0,5	-4,2	1,8	1,4
Italy	114	60	0,7	2,8	-1,7	-0,2	0,4
Spain	111	60	-2,4	2,8	-9,2	0,6	1,6
Netherlands	72	60	-1,3	-1,2	-2,6	0,6	1,4
Belgium	88	63	-1,1	-0,5	0,2	1,7	1,6
Portugal	142	**92**	-3,2	3,8	-11,5	0,4	1,0
Ireland	105	60	-0,6	0,7	-3,8	2,6	2,0
Greece	139	60	-0,4	4,6	-7,6	-0,2	1,1
Finland	59	61	-1,8	-2,4	0,7	1,1	1,8
Austria	71	60	-1,4	-1,3	-1,5	1,5	1,4
Eurozone	89	61	-1,0	0,3	-2,6	1,2	1,2

Source: iAGS model

Table 4c. + / - 0.5 adjustment - mix-adjustment (expenditure-based expansion and fiscal-based consolidation)

	Public debt (% of GDP)		Structural balance (% of GDP)		Cumulative fiscal impulse	GDP growth rate (%)	
	2020	2034	2020	2034	2011-2034	2011-2015	2016-2034
Germany	70	60	-1,1	-1,1	1,2	2,2	1,0
France	84	60	-0,9	-0,5	-4,2	1,8	1,4
Italy	114	60	0,7	2,8	-1,7	-0,2	0,4
Spain	111	60	-2,4	2,8	-9,2	0,6	1,6
Netherlands	72	60	-1,3	-1,2	-2,6	0,6	1,4
Belgium	87	62	-1,1	-0,4	0,2	1,8	1,6
Portugal	142	92	-3,2	3,8	-11,5	0,4	1,0
Ireland	105	60	-0,6	0,7	-3,8	2,6	2,0
Greece	139	60	-0,4	4,6	-7,6	-0,2	1,1
Finland	58	61	-1,8	-2,5	1,0	1,3	1,7
Austria	71	60	-1,4	-1,3	-1,5	1,5	1,4
Eurozone	89	61	-1,0	0,3	-2,5	1,3	1,2

Source: iAGS model

4.3. Does credibility matter?

The assumption that interest rates will converge across Eurozone member states was included in the former scenarios. Yet, recent experience has shown that countries with high public debt underwent a sharp loss of credibility which materialized in risk premia increases. This situation has induced countries to implement sharper consolidation to restore credibility *vis-à-vis* financial markets, a situation already described by, e.g. Guichard et al. (2007). Thus we consider scenarios with endogenous risk premia on sovereign debts, as shown in eq. (5)[14]. We focus on pure expenditure-based and pure tax-based scenarios. Results are reported in tables 5a and 5b, in difference with results reported in tables 4a and 4b respectively. The endogenous risk premium, given by eq. (5) on the national interest rate appears in the last-but-one column of each table. It might not be directly compared with the sovereign yield given in table (1) as the scenario is not the same. The relevant comparison would be with tables (4a, 4b and 4c) where risk premium is zero by construction. It may also be stressed that a zero risk premium does not mean that there is no spread with the safe asset (here the German sovereign bond) as convergence is supposed to occur slowly in the model as explained for the baseline scenario.

[14] Dewachter and Wouters (2014) introduce endogenous financial risk in a DSGE model via a perturbation-based approach, but they do not model either a multi-country setting or risk premia on sovereign bonds.

It should be straightforward that the ability to reach the debt target when there is an endogenous risk premium is lower because positive risk premium increases the debt burden and weighs down on growth, reducing the advantage of a smoother path of consolidation.

In the case of an expenditure-based policy (table 5a), the introduction of a risk premium requires a sharper consolidation of 1.1 percentage point of GDP for the Eurozone, with a strong discrepancy between France (with an additional cumulative fiscal impulse of almost -5 percentage points) and Belgium (with an additional cumulative fiscal impulse of +0.5). Despite stronger consolidation, the Eurozone average public debt increases by 5 percentage points of GDP, in comparison with the previous scenario, and Greece, Portugal and Spain are still unable to reach the debt target in 2034. Real GDP growth rates are almost similar, on average between 2011 and 2014 and between 2015 and 2034 though these average figures hide some real costs which may cumulate in output gaps. Indeed, in the case of France and Portugal, between 2011 and 2034, the negative output gap would widen by 16 and 22 percent respectively. On average for the Eurozone, the output gap would widen by 5 percent. Risk premia would be higher for France or Finland, compared to a situation without endogenous risk premium but yet sovereign spreads with German interest rate would still be close or above 100 basis points in Greece, Italy, Portugal and Spain between 2012 and 2018.

The real costs of a tax-based adjustment (table 5b) would be substantially lower than after a spending-based one, once a risk premium is introduced. The cumulative fiscal impulse would reach a mere -0.3 percentage points of GDP for the Eurozone, and the cumulative loss of output gap would be 0.5 percent. In this case again, risk premia would be lower compared to the expenditure-based consolidation but may still be substantial for France and Portugal. Finally the debt target would not be achieved in 2034 for Spain, Portugal and Greece.

The response of sovereign spreads to increases in public debt in the simulations are quite in line with the literature which reports relatively low values, e.g. Gruber and Kamin (2012). Results of the simulations concerning the peripheral countries of the Eurozone can be brought close to the empirical conclusions of Schaltegger and Weder (2015), though they study only developing countries. They show that fiscal adjustments do not have a strong impact on the probability of default, and that a composition effect exists: spending-based adjustments are not successful at reducing the probability of default, whereas tax-based ones are. In a scenario of endogenous risk premia, spending-based and tax-based adjustments give almost similar sovereign spreads (they are a bit higher in the latter than in the former, though the difference is probably not significant), but public debt increases less in the latter than in the former case. A composition effect thus arises.

Table 5a. +/- 0.5 fiscal impulses - endogenous risk-premium - expenditure-based adjustment

In difference with table 4a

	Public debt (% of GDP)		Structural balance (% of GDP)		Cumulative fiscal impulse	GDP growth rate (%)		Risk premium (pts)	Cumulative OG
	2020	2034	2020	2034	2011-2034	2011-2014	2015-2034	2012-2018	2011-2034
Germany	0	0	-0,1	0,0	0,1	0,0	0,0	0.1	0,9
France	6	0	-1,0	3,2	-4,7	0,0	-0,2	0.9	-16,1
Italy	5	0	0,2	0,4	-0,9	-0,2	0,0	0.4	-4,5
Spain	7	32	-1,3	-1,8	0,0	-0,1	0,0	1.1	-6,4
Netherlands	2	0	-0,3	0,4	-0,3	0,0	0,0	0.6	-1,0
Belgium	0	0	-0,1	-0,1	0,5	0,1	0,0	0.0	2,9
Portugal	12	102	-2,4	-9,7	0,0	-0,2	-0,2	1.4	-22,1
Ireland	2	0	-0,2	0,3	-0,4	0,1	0,0	0.3	1,1
Greece	0	0	-0,1	0,1	0,0	0,0	0,0	0.6	1,6
Finland	0	0	-0,1	0,1	0,0	0,1	0,0	0.0	2,5
Austria	0	0	-0,1	0,0	0,4	0,0	0,0	0.0	1,1
Eurozone	3	5	-0,4	0,4	-1,1	0,0	0,0		-5.0

Source: iAGS model

Table 5b. +/- 0.5 fiscal impulses - endogenous risk-premium - tax-based adjustment

In difference with table 4b

	Public debt (% of GDP)		Structural balance (% of GDP)		Cumulative fiscal impulse	GDP growth rate (%)		Risk premium (pts)	Cumulative OG
	2020	2034	2020	2034	2011-2034	2011-2014	2015-2034	2012-2018	2011-2034
Germany	2	2	-0,1	0,0	0,2	0,0	0,0	0.1	0,9
France	3	0	0,0	0,2	-0,5	0,0	0,0	0.6	-0,5
Italy	0	-1	0,0	0,1	-0,2	-0,1	0,0	0.2	-0,8
Spain	6	7	-1,1	1,7	-2,3	-0,1	0,0	1.1	-5,2
Netherlands	0	0	-0,1	0,0	0,2	0,1	0,0	0.1	1,6
Belgium	-1	-4	0,2	0,3	0,0	0,0	0,0	0.0	0,4
Portugal	10	42	-2,0	-2,4	0,0	-0,2	0,0	1.4	-7,6
Ireland	1	0	-0,1	0,0	0,0	0,1	0,0	0.2	2,4
Greece	0	0	-0,1	0,0	0,0	0,0	0,0	0.4	1,0
Finland	0	0	-0,1	-0,1	0,0	0,1	0,0	0.0	1,8
Austria	1	1	-0,1	0,0	0,3	0,0	0,0	0.0	0,5
Eurozone	2	2	-0,2	0,2	-0,3	0,0	0,0		-0,5

Source: iAGS model

5. Backloading vs. frontloading

In this section, we address the issue of frontloading according to the choice of instruments (expenditures or taxes). In the case of a frontloaded adjustment, countries implement the bulk of the fiscal consolidation early. This is clearly the choice that has been made in the Eurozone since 2011. Despite negative output gaps, Eurozone countries have engaged massive consolidation plan as emphasized in table 3 where it appears that for some countries fiscal consolidation between 2011 and 2014 exceeded 10 percentages points of GDP. On the one hand, under the assumption that fiscal multipliers are high in time of crisis, this strategy may be ill-designed, implying high output losses. It may even be counterproductive for very high value of fiscal multiplier since public debt is hardly reduced because of the feedback effect from bad growth performance. On the other hand, spreading (or postponing) the adjustment may undermine the credibility of government and trigger speculative attacks on sovereign debt markets. Interest rates would go up. We illustrate the trade-off between backloading and frontloading by comparing the scenario of +/- 0.5 percentage point of GDP with a scenario where the adjustment amounts to +/- 1 percentage point of GDP. We keep on distinguishing between spending-based and tax-based adjustments, and also retain the endogenous risk premium. As in previous scenarios, adjustments start in 2011 and are pursued until debt-to-GDP ratios reach 60%.

The frontloading strategy under a spending-based consolidation would substantially alleviate the debt problem in Greece, Portugal and Spain though in the former two countries, the debt target would remain unreachable in 2034, despite strong negative fiscal impulses. This setback is all the more unfortunate that it would be accompanied by a high real cost: Greece and Portugal would face a negative output gap of 3 and 4% per year during 20 years respectively. For the Eurozone, frontloading would be preferable to backloading in terms of public debt and real activity in the long run, at the expense of the short-run where real growth would be reduced by 0.4%.

Frontloading under a tax-based adjustment gives better outcomes. All countries are able to reach the debt target in 2014 and in the Eurozone, the requirement to implement a contractionary fiscal policy is relieved by almost 1 percentage point of GDP between 2011 and 2034. The cumulative output gap is improved by 2% during the same period. Relief is substantial for Portugal and Spain who gain 0.5% per year during 20 years. In the short-run however, there is a minor real cost with frontloading in comparison with backloading.

It remains to be acknowledged that sovereign spreads are substantially reduced by the recourse to a frontloading strategy. In countries where interest rates spreads are high, like Italy, Spain and Portugal, the fall amounts to an average of 0.4 if consolidation is spending-based. Stronger austerity measures means that the peak for public debt and the stabilizing primary surpluses are reached more rapidly reducing the risk premium.

Table 6a. +/- 1 fiscal impulses - endogenous risk-premium - expenditure-based adjustment

In difference with the scenario described in table 5a

	Public debt (% of GDP)		Structural balance (% of GDP)		Cumulative fiscal impulse	GDP growth rate (%)		Risk premium (pts)	Cumulative OG
	2020	2034	2020	2034	2011-2034	2011-2014	2015-2034	2012-2018	2011-2034
Germany	0	-1	0,0	0,0	0,0	0,0	0,0	-0,1	-0,1
France	-10	-1	1,3	-4,1	5,4	-0,8	0,3	-0,8	16,8
Italy	-7	1	-0,3	-0,6	0,9	-0,3	0,1	-0,4	4,0
Spain	-4	-72	4,3	3,8	-1,9	-0,8	0,1	-0,3	-11,0
Netherlands	-10	1	-0,5	-0,9	1,6	-0,5	0,2	-0,6	8,2
Belgium	0	0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Portugal	10	-168	7,2	26,5	-23,0	-1,6	-0,5	-0,3	-93,3
Ireland	-6	0	0,7	-1,2	1,4	-1,0	0,2	-0,3	1,4
Greece	18	-22	2,5	7,8	-11,5	-1,1	-0,4	0,1	-65,2
Finland	0	0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Austria	-1	0	0,0	0,0	0,0	0,0	0,0	0,0	-0,3
Eurozone	-5	-11	0,9	-0,2	0,8	-0,4	0,1		0,9

Source: iAGS model.

Table 6b. +/- 1 fiscal impulses - endogenous risk-premium - tax-based adjustment

In difference with the scenario described in table 5b

	Public debt (% of GDP)		Structural balance (% of GDP)		Cumulative fiscal impulse	GDP growth rate (%)		Sovereign yield (%)	Cumulative OG
	2020	2034	2020	2034	2011-2034	2011-2014	2015-2034	2012-2018	2011-2034
Germany	0	0	0,0	0,0	0,0	0,0	0,0	-0,1	0,0
France	-10	0	-0,3	-0,7	1,0	-0,1	0,0	-0,6	3,1
Italy	-1	0	-0,1	-0,1	0,1	0,0	0,0	-0,2	0,2
Spain	-21	-7	2,8	-4,0	5,0	-0,2	0,1	-0,9	9,1
Netherlands	-3	0	0,0	-0,2	0,1	0,0	0,0	0.0	0,0
Belgium	0	0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Portugal	-27	-74	6,1	1,4	2,1	-0,2	0,1	-1,0	10,0
Ireland	-5	0	-0,2	-0,3	0,3	-0,2	0,0	-0,2	0,2
Greece	-13	0	1,1	-1,6	1,8	-0,3	0,1	-0,4	2,2
Finland	0	0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Austria	0	0	0,0	0,0	0,0	0,0	0,0	0,0	0,1
Eurozone	-6	-2	0,4	-0,7	0,9	-0,1	0,0		2,1

Source: iAGS model.

There are two arguments which may make a frontloading strategy preferable to a backloading one. [15] The first one relates to uncertainty. Of course, if one knows today that the fiscal multiplier will be much lower tomorrow, backloading consolidation is always a superior strategy. But a question arises: can one be sure that the fiscal multiplier will be significantly lower in a reasonable number of years? As a matter of fact, if the lower multiplier tomorrow is not confirmed, backloading may make public finances worse, because it maintains the cumulative consolidation needs. The second argument relates to the political economy of reforms. It is hard to argue that newly elected governments in the future will or should commit to the commitments of incumbent governments. Hence, consolidation should be implemented as soon as possible.

A counter-argument can be given by the baseline scenario (table 1): it shows that the real costs of a sharp consolidation when the output gap is negative are not negligible and produce a self-defeating strategy where public debts continue to grow in countries which implemented the most negative impulses.

[15] We thank Pablo Hernandez de Cos for clarifying this point.

Conclusion

Turning back to the questions raised in the introduction, it is time for answers.

First, the simulations performed with the iAGS model showed that there have been quite substantial costs with the fiscal stance endorsed by Eurozone member states since 2011. It involves unrealistic improvements in public finances which stop the recovery under way after the Global Financial Crisis. Meanwhile the model confirms that this fiscal strategy will be unable to achieve, or sometimes to improve, public finance sustainability. Second, the simulations show that a composition effect is at work. Despite an active monetary policy, but only until the short-run nominal interest rate hits the zero-lower-bound, spending-based consolidations are less effective than tax-based ones in terms of public finance sustainability; they are also more costly in terms of economic growth. Third, introducing endogenous risk premia does not alter these results, nor does the simulation of a frontloading strategy.

The conclusion is that it is not only important to implement a fiscal adjustment based on the instrument associated with the lowest fiscal multiplier but also to neutralize the risk premium through an accommodative monetary policy. Our results show that fiscal consolidations do not prove themselves very effective at improving credibility. Indeed, though Spain or Greece implemented strong measures to reduce their public balance, risk premia kept rising in 2011 and 2012 and went down only after Mario Draghi declared that the ECB would do "whatever it takes" to save the Euro.

The introduction of different shapes for the multiplier effect on tax and spending, and the inclusion of a banking and financial systems with frictions in the model are left to future research.

Appendix - Calibration

A1. Aggregate demand and supply

We calibrate the error-correction equation stemming from equation (3) by distinguishing short run and long run effects of monetary policy and external demand on GDP. Long run effect of long term yields ($\acute{}_l$) is higher than the short run one ($\acute{}_s$), to take into account delays in the transmission of monetary policy. As for heterogeneity between Eurozone member states in the transmission of interest rate shocks, empirical literature has not provided very conclusive results to date. Peersman (2004) reports diverging results so that any calibration remains hazardous. We choose to avoid a strong heterogeneity, which is consistent with the convergence in the transmission process before the crisis emphasized by Boivin et al. (2008) or Barigozzi et al. (2014). Boivin et al. (2008) notably suggest that the effect of an increase in the interest rate is higher for Spain and Italy than for France and Germany. The effect of interest rate shocks is therefore supposed to be lower for "Northern

countries". We set β_l (the long-run impact of foreign demand on output) equal to the share of exports in the country's GDP, and β_s (short-run impact) equal to half β_l.

Table A1. Calibration of monetary policy and external demand effects on output

	δ_s	δ_l	β_s	β_l
Austria	-0.40	-0.60	0.29	0.58
Belgium	-0.40	-0.60	0.40	0.81
Finland	-0.40	-0.60	0.23	0.46
France	-0.30	-0.50	0.13	0.27
Germany	-0.30	-0.50	0.25	0.50
Greece	-0.40	-0.60	0.13	0.25
Ireland	-0.40	-0.60	0.50	1.00
Italy	-0.30	-0.40	0.14	0.28
Netherlands	-0.40	-0.60	0.40	0.79
Portugal	-0.40	-0.60	0.17	0.34
Spain	-0.30	-0.40	0.15	0.30

Source: iAGS Model, OFCE.

The critical point in calibrating the error-correction equation is to set the speed of convergence of output to its long run equilibrium. The speed depends on values of λ (impact of variables in level) and α (impact of past growth rate), which are set equal across countries. We fix α at 0.1 and λ at -0.3. These values ensure that the speed of convergence of output to its long-run value is comparable under normal times to that of a standard DSGE model. With these values, the output gap is closed about 5 years after a shock.

Concerning equation (2), long run effects on potential GDP come from hysteresis effects. The risk-premium effect depends on the sensitivity of the sovereign yield on public debt as described in eq. (5).

Hysteresis	Risk-premium
H	κ
0.15	0.01

Source: iAGS Model, OFCE

The hysteresis effect parameter is fixed at 0.15 in order to obtain qualitatively similar impacts of transitory and permanent fiscal impulses on potential growth, as those obtained with QUEST III (see Blot et al. (2014a) for a comparison with QUEST III model). For the simulation, fiscal rules are unplugged and shocks occur on the share of government consumption to GDP ratio.

Public finances

The most important parameter to set for public finances is Φ, the overall sensitivity of revenues and expenditures to the business cycle. To do so we use the European Commission estimates. To compute the average interest rate on public debt, we compute an average maturity (MAT) of public debts using national sources on public debt maturity structures in 2011.

Table A.3. Calibration of public finances parameters

	Φ	*MAT*
Austria	0,47	8,1
Belgium	0,54	6,8
Finland	0,50	5,0
France	0,49	6,9
Germany	0,51	6,1
Greece	0,43	11,3
Ireland	0,40	6,9
Italy	0,50	6,6
Netherlands	0,55	7,0
Portugal	0,45	6,1
Spain	0,43	6,8

Sources: European Commission (2005), OFCE.

External trade and finance

We set the sensitivity of imports to output gap equal to the share of imports in country's GDP. The matrix of trade exchanges between countries comes from the Chelem Database for year 2003.

Table A.4. Calibration of the sensitivity of imports to output gap

	Ω
Austria	0.5
Belgium	0.8
Finland	0.4
France	0.3
Germany	0.4
Greece	0.3
Ireland	0.8
Italy	0.3
Netherlands	0.7
Portugal	0.4
Spain	0.3

Source: Chelem (CEPII).

As regards the parameters of the Taylor rule, they are set according to Taylor (1993). The sensitivity of forward-looking expectations in long-run expected inflation is set at 0.82 which makes the long-run nominal interest rate equal to 4% (see Shiller, 1979; Fuhrer and Moore, 1995).

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