

National debt brakes and convergence in the European Monetary Union

by Carsten Colombier*

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* Dr. Carsten Colombier

FiFo - Institute for Public Economics
University of Cologne
Wörthstrasse 28
50668 Cologne/ Germany

and

Economic Analysis and Policy Advice
Federal Finance Administration
Bundesgasse 3
3006 Bern/ Switzerland
phone +41 31 322 6332
fax +41 31 323 0833
email carsten.colombier@efv.admin.ch

Abstract

This present paper shows that the introduction of national debt brakes in the member countries of the EMU can have a double dividend. Not only proves a debt brake beneficial in terms of sustainable public finances but can also contribute to a convergent development in the EMU under certain conditions. Due to the ongoing crisis, several reforms have been implemented at the EU-level, which are tilted to strengthening the budget discipline of EMU countries. These reforms underlie the view that government profligacy is the main culprit of the crisis. However, several economists emphasise that the EMU is an incomplete currency union. As a result, in the pre-crisis years massive external imbalances in the EMU have been built up. This paper shows that a debt-brake rule leads to lower current-account deficits in a boom phase. This is because automatic stabilisers are allowed to work properly. Additionally, it is less probable that the working of automatic stabilisers is counteracted by pro-cyclical fiscal policy. Overall, a debt-brake rule does not maintain a sufficient insurance against divergent developments in the EMU. For this other measures such as a delegation of fiscal powers to the union level are necessary.

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Key words: European Monetary Union, debt brake, current-account imbalances

1 Introduction¹

The present paper examines if national debt brakes can prove effective in reducing current account imbalances in the European Monetary Union (EMU). In the wake of the Euro crisis, EU leaders have implemented several reform measures to strengthen budgetary discipline in the EU by tightening the rules of the Stability and Growth Pact (SGP) as part of the Euro-Plus-Pact and introducing a new fiscal compact, the Treaty on Stability, Coordination and Governance in the Economic and Monetary Union (TSCG) (see EU-Memo/11/ 647, TSCG, 2012).² While the revised version of the SGP already encourages the implementation of national fiscal rules such as the German debt brake, Article 3(2) of the TSCG obliges at least all EMU member countries to implement a balanced-budget rule in national law at the latest one year after the fiscal compact comes into force. These reforms are driven by the perception that government profligacy is the main culprit of the current crisis. However, since the launch of the Euro persistent current account imbalances have built up in the EMU (Colombier, 2011). From the theory of optimum currency areas one can infer that due to different national systems such as labour market institutions and legal systems political or economic shocks such as the German Hartz-IV reforms have hit member countries of the EMU asymmetrically (De Grauwe, 2009b). In particular, a powerful adjustment mechanism such as a sufficient flexible and mobile labour market, to mitigate the effects of asymmetric shocks is absent in the EMU (Dullien and Schwarzer, 2009).³ Consequently, the EMU is viewed as an incomplete currency union (De Grauwe, 2009a). Furthermore, since wage policies are pursued nationally by independent social partners the only tool left to accommodate divergent economic development is fiscal policy. Therefore, some economists argue that stronger

¹ Note that the view of the author does not necessarily reflect the official position of the Federal Finance Administration and the Federal Finance Department.

² The fiscal compact has been recently signed by the heads of EU governments, but must still be ratified by national parliaments. The rules apply, in particular, to EMU member states.

³ Some Keynesian authors argue that fully downward flexibility of wages is not desirable because it bears the risk of prolonging and deepening a recession by exerting deflationary pressure (e.g. Greenwald and Stiglitz, 1993).

coordination or centralisation of fiscal policies is needed to reduce macroeconomic divergences among EMU countries (Bofinger, 2003; Baldwin and Wyplosz, 2006, de Grauwe, 2009b, de Grauwe, 2011). From this position, one can infer that the coordination failure of national economic policies in the EMU and not over-indebted EMU-countries lies at the heart of the EMU crisis. This seems to be supported by the fact that average government debt of the EMU only rose sharply from 70% of GDP in 2008 to 88% of GDP in 2011 in the aftermath of the financial crisis. This rise is mainly due to bank bailouts and economic stimuli packages. In contrast, a slightly declining government debt-to-GDP ratio of euro-area countries from 68% to 66% could be seen from 2002 to 2007.

One reason that exogenous shocks have not been absorbed sufficiently so far has been the rather pro-cyclical stance of national fiscal policies under the previous SGP (Dullien and Schwarzer, 2009). This confirms a critique of SGP which hints to the fact that on the one hand the 3%-deficit-limit can be too restrictive in a recession. On the other hand, the SGP offers no incentives for restrictive fiscal policies during an upturn (e.g. Colombier, 2006) Therefore, Dullien and Schwarzer (2009) propose the implementation of automatic fiscal stabilizers at the European level. Research findings show that in contrast to the SGP, debt brakes would allow for a better working of automatic stabilizers, in particular, in an economic upswing (Colombier, 2006; Hishow, 2011). Thus, debt brakes might render better coordination of policies and more political unification unnecessary. Therefore, this present paper raises the question whether the implementation of national debt brakes is an effective mean to fight off divergent economic developments in the EMU. For this, an empirical analysis is carried out that focuses on the impact of national fiscal policies on current-account balances in the EMU. Based on these estimations it is simulated how the implementation of the debt brake would have affected the development of the current account balances of a current-account deficit country, i.e. Spain, and and –surplus country, i.e. Germany, since the launch of the Euro.

Results of this analysis suggest that under certain conditions the debt brake could contribute to reduce external deficits.

This paper is organised as follows. In the following section, it is shown that the euro area (ea) has diverged since the introduction of the euro. In section 3 the theoretical model, which is applied to assess the impact of national debt brakes on current account balances is outlined. Section 4 delineates the German debt brake. Section 5 provides empirical results about the impact of government action on current-account balances for the case of German.⁴ Section 6 presents simulations how an introduction of a German-style debt brake would affect current-account balances in Germany and Spain. Finally, some conclusions are drawn in the closing part of this paper.

2 External imbalances in the euro area

More or less with the completion of the monetary union in 2002, a diversion of current account balances within the Euro area can be observed (see Figure 1).

Insert Figure 1 about here

Whereas, for instance, Germany has piled up huge current-account surpluses in the run up of the financial crisis up to 8% of GDP in 2007, southern European countries, for example, Spain, have accumulated considerable current account deficits up to 10% of GDP in 2007. As the overall external balances of the euro area (ea) fluctuates around zero, these imbalances reflect intra-euro-area imbalances. Although in the wake of the great financial crisis in 2008 the current-account deficit of Spain has dropped sharply by about 5% of GDP from 2008 to 2009 the current-account imbalances (Spain -3.5% of GDP and Germany +5% of GDP in 2011) are still considerable. Prior to the crisis the external position of the main deficit countries Greece, Ireland, Portugal and Spain consists to a large extent of private sector deficits (see Bolliger et al., 2010, 8-9). In the crisis private savings rose sharply and due to

⁴ In a revised version of this present paper empirical estimations for a current-account-deficit country will added.

stabilisation measures for the economy and the banking sector public deficits have soared. Thus, the composition of current account deficits has changed due to the crisis. To a great extent private sector, deficits have turned into public sector deficits in these countries. For example the debt-to-GDP ratio of Spain have soared from 40% in 2008 to 70% in 2011, but which is still lower than the debt ratio of Germany, which stood at 82% in 2011.

One should note that current-account deficits could be accepted if they are not persistent. For instance, a country that starts from a lower level of economic development is expected to run external overdrafts because the country offers a lot of profitable investment opportunities and comparatively low labour costs. This leads to capital inflows and current account deficits. In the longer term, productivity and wages go up so that investment inflows and the current account deficit diminish. The income of deficit and surplus countries should converge. Nevertheless, in the EMU convergence of per-capita income between surplus and deficit countries has been very modest (see Bolliger et al., 2010, 7). Moreover, disparities in terms of macroeconomic indicators such as GDP growth, unemployment rate and inflation rate have remained high or even widened (see Mathieu and Sterdyniak, 2007, 282; Figure 2).

Insert Figure 2 about here

For example, the inflation rates between Germany and Spain differed substantially by on average 1.6 percentage points from 2002 to 2007, though the European Central Bank (ECB) managed to keep the union-wide inflation rate near its inflation target of at maximum 2%. In addition, monetary policy was rather too restrictive for Germany. In contrast, it was much too expansionary for Spain. Thus, though unintentionally, common monetary policy affected current-account deficit and –surplus countries in the ea asymmetrically. In the following section, it is shown that an external equilibrium of an ea-member country can only be reached if national inflation rates correspond to the inflation target of the ECB.

3 Model of a currency union

This section outlines a three-equation model of an open economy with imperfect competition in the goods and labour market to analyse the impact of fiscal policies on external balances in a currency union (see Carlin and Soskice, 2006, chapters 10 and 11). Before I proceed, it should be noted that all variables if not otherwise are represented in real terms. Apart from the interest rate, variable small Latin letters indicate natural logarithm of the respective variables.⁵ Real demand (y_j), the real interest rate (r_j), the price level (p_j) and thus the real exchange rate (θ_j) of euro area (ea) country j are determined by the model set out in the following. The first equation of this model is the aggregate demand of a euro area (ea) country j (y_j^d):

$$y_j^d = d_j + g_j - \tau_j t_j - \rho_j r_j + \omega_j \theta_j + \eta_j y_{j, ea} \quad (1)$$

with: d_j := autonomous private demand, g_j := autonomous public expenditure, t_j := tax rate; r_j := real interest rate, θ_j := real exchange rate, $y_{j, ea}$:= foreign demand of other ea-countries than j ; τ_j , ρ_j := semi-elasticities, ω_j , η_j := elasticities.

Since empirical studies suggest that public expenditure items such as education or transport infrastructure can foster productivity growth, it is assumed that labour productivity of a ea-country j (λ_j) is positively affected by productive public expenditure (e.g. Nijkamp and Poot, 2004):

$$\lambda_j = b_j + \alpha_j k_j + \gamma_j g_{\text{prod},j}$$

with: b_j := technology-variable, k_j := capital-to-labour ratio, $g_{\text{prod},j}$:= productive public expenditure; α_j , γ_j := output elasticities.

The inclusion of the latter leads to the second equation of the model, the aggregate supply of a ea-country j (y_j^s):

$$y_j^s = a_j + \alpha_j k_j + \gamma_j g_{\text{prod},j} - t_j - \delta_j \theta_j \quad (2)$$

⁵ As the components of aggregate supply and aggregates demand are given in logarithms the aggregates represent approximations.

with: a_j := constant term, which contains supply-side factors such as mark-up of firms, power of trade unions, product-market and labour-market regulations, technical progress; $\alpha_j, \gamma_j, \delta_j$:= output elasticities with respect to $k_j, g_{\text{prod},j}$ and θ_j .

To keep the analysis simple, the difference between the balance of trade and the current-account balance is ignored. The balance of trade corresponds to the difference between real exports (X_j) and real imports (M_j) of ea-country j to and from other ea-countries. In order to keep the analysis simple I use an equivalent to the balance of trade, the logarithm of the ratio between exports and imports, which is dubbed adjusted balance of trade. Furthermore, the Marshall-Lerner condition holds. Thus, the third equation of the model, the adjusted balance of trade (abt_j) is as follows:

$$\text{abt}_j = \ln (X_j/M_j) = x_j - m_j = \omega_j \theta_j + \eta_j y_{j, \text{ea}} - v_j y_j \quad (3)$$

with: x_j := natural logarithm of exports; m_j := natural logarithm of imports; v_j : elasticity of imports with respect to national GDP;

$$\text{abt}_j \geq 0 \Leftrightarrow \text{bt}_j \geq 0 \quad \text{and} \quad \text{abt}_j \leq 0 \Leftrightarrow \text{bt}_j \leq 0.$$

In the monetary part of the model, it is presupposed that the single goal of the central bank of the currency union, i.e. ECB, is to pursue price stability in the ea. To simplify the analysis I assume that the ECB adheres to a Taylor rule. Moreover, market actors make adaptive expectations on union-wide and country-specific inflation rates.⁶ This results in the following equation:

$$r = r^s + (\pi - \pi^T) \quad (4)$$

with: r := short-term interest rate, deflated by the consumer price index of the euro area ;

r^s := stabilising real interest rate at which domestic markets and external

⁶ Usually rational expectations are assumed. But given the fact that even professional forecasters cannot agree on a common economic model, which is prerequisite for the proper working of rational expectations, and the economy is an evolutionary system, adaptive expectation would appear to be more realistic. This is supported by insights from behavioural economics. These results show that the more complex it gets to make a decision the more likely it is that individuals resort to simple decision-rules like rules of thumps. Thus, more often than not individuals tend to extrapolate from the past to foresee future developments (see Kahnemann, 2003, 1460).

balances of ea countries are in equilibrium;

π^T := target inflation rate of the ECB, which is 2% at maximum;

π :=union-wide inflation rate.

The real interest rate of a ea-country j corresponds to:

$$r_j = r^s + (\pi - \pi^T) + (\pi - \pi_j) \quad (5)$$

with: π_j := inflation rate of ea-country j.

Equation (5) shows that two conditions must be met to reach an overall equilibrium in the ea, i.e. a domestic (medium-term-) market equilibrium and an external equilibrium in each ea-country. First, the union-wide inflation rate (π) should correspond to the inflation target of the ECB ($\pi^* = \pi^T$).⁷ This means that the product and labour markets of all ea-member countries are in a medium-term equilibrium, i.e. supply and demand in each member country equates. Second, the union-wide inflation rate (π) should be tantamount to all individual inflation rates (π_j) ($\pi^* = \pi_j^*$). However, as conditions of labour and product markets can differ substantially between ea-member countries nothing guarantees that the second condition is met. This demonstrates that even if the ECB manages to keep the union-wide inflation rate at the target level this does not ensure economic convergence between ea-member countries. On the contrary, common monetary policy can cause asymmetric shocks in ea member countries because monetary policy is too restrictive for ea countries with lower inflation rates than the inflation target and vice versa.

If one assumes that, a medium-term equilibrium is reached and takes equation (5) into account one can rewrite the demand-side equation (1) as follows:

$$y_j^* = d_j + g_j - \tau_j t_j - \rho_j (r^s + \pi^T - \pi_j^*) + \omega_j \theta_j^* + \eta_j y_{j,ea} + u_j \quad (1a)$$

with: $\pi^T - \pi_j^* \approx \theta_j^* - \theta_{j,-1}$; $r_j^* = r^s + \pi^T - \pi_j^*$

asterisks denote the values of the medium-term equilibrium

⁷ Asterisks denote medium-term equilibrium, i.e. a domestic market equilibrium of ea country j.

In the medium term, the union-wide inflation rate corresponds to the inflation target of the ECB. Given (irrevocable) nominal fixed-exchange rates the difference between the union-wide inflation rate (π^T) and the individual inflation rate of ea-country (π_j) corresponds roughly to the first difference of the logarithmized real exchange rate (growth rate of real exchange rate).

*** Insert Figure 3 about here ***

Now assume that a ea country j is in a medium-term equilibrium, which corresponds to point A in Figure 3. In this equilibrium, the individual inflation rate outgrows the union-wide inflation rate and the ea-country j has a trade deficit and current-account deficit respectively. If one can align the individual inflation rate of ea country j with the inflation target of the ECB an external equilibrium can be reached. In this case, the real interest rate of the ea country j would equal the union-wide stabilising real interest rate (r^S) (see equation (1a)). The overall equilibrium is depicted by point B in Figure 3. A shift of the domestic equilibrium A to point B can be achieved either by shifting the demand-curve (y_j^d) to the left or by shifting the supply-curve to the right (y_j^s). Fiscal policy can influence the positions of the demand and supply curve by a variation of autonomous public expenditure or the tax rate.

*** Insert Figure 4 about here ***

In addition, automatic stabilisers also exert impact on the external position of ea country j . In order to explain the latter, assume that due to an exogenous demand shock the aggregate demand curve (y_j^d) shifts to the right (see Figure 4, blue solid line). The economy is booming as output is above the output potential in the medium term equilibrium A. Due to adaptive expectations inflation is higher than expected. Workers demand higher wages so that the inflationary pressure goes up, which leads to a decreasing real exchange rate (an appreciation), the trade deficit widens.⁸ As soon as inflation expectation can be stabilised a

⁸ Note that if this disequilibrium lasts several periods the boom can have repercussions on the supply-side. For example, the boom in Spain fuelled construction investments, which in all likelihood contributed to the rise in the net-capital –to–labour ratio of around 8% from 2002 to 2007.

new medium-term equilibrium at point A1 is reached. Due to automatic stabilisers the increase in import demand is slowed down so that the widening of the trade deficit is decelerated. Without automatic stabilisers aggregate demand would move further to the right, which would imply an even higher trade deficit (see Figure 4, blue dashed line). However, in a downturn, the situation is reversed and automatic stabilisers dampen the decrease in import demand. As a result, the shift of aggregate demand to the left is less pronounced than without automatic stabilisers and the shrinking of the trade deficit is slowed down (see Figure 4, red solid line and red dashed line). This means that automatic stabilisers reduce external imbalances of a ea country with a trade deficit in an upswing, whereas the opposite is true in a downturn. These effects of automatic stabilisers are reversed in a ea country with a trade surplus. Consequently, a proper working of automatic stabilisers in Spain may have put a drag on growing current-account deficits during the housing boom. Thus, it becomes obvious why the implementation of a debt brake, which allows for a proper working of automatic stabilisers, might help reducing economic divergences in the ea.

4 The debt brake and external imbalances from a theoretical perspective

Before I proceed with the inclusion of the debt brake in the model described in the previous section, a brief outline of the German debt brake is provided. Debt brakes are framed against the background of the (new) neo-classical synthesis (see Colombier, 2006, 529). The debt brake aims at stabilising nominal debt over the business cycle, but budget movements due to cyclical fluctuations should be taken into account. According to neo-classical theory, fiscal policy can smooth the business cycle but is not able to enhance the long-run production possibilities of an economy. On the contrary, a too high debt-level may cause uncertainty among consumers and investors, which in turn causes interest rates to rise and as a result, crowd out private investment. Therefore, the structural government budget should be balanced over the business cycle under a debt brake. However, since the advent of new growth theory

several studies show that certain kind of government spending such as educational or infrastructure expenditure can be growth-promoting (e.g. Colombier, 2009). To consider this possibility, the German debt brake allows for a structural deficit of 0.35% of GDP at the federal level.⁹ In contrast, the states (the *Länder*) are not allowed to run a structural deficit.¹⁰ The overall limit of a structural budget deficit is in the spirit of the SGP, which foresees a close-to-balance budget over the business cycle. According to the SGP, the structural budget deficit must not exceed 0.5% of GDP. The German debt brake is enshrined in the German constitution (see Art. 109(1) and 115 Grundgesetz).

Moreover, according to conventional wisdom discretionary fiscal policy have severe shortcomings. First, due to the democratic decision process usually fiscal measure are implemented too late and may not be efficiently composed due to strong lobby groups. Second, incentives given to policy-makers or civil servants to, for instance, enlarge their influence and power leads to a deficit bias of the government sector. Nonetheless, to smooth the business cycle automatic stabilisers such as the unemployment insurance should be able to work. Since the beginning of 2011, the German debt brake has come into force at the federal level (see also fn. 10). At the federal level, apart from a structural component the debt brake contains a cyclical component, which allows the automatic stabilisers to work. To give policy-makers limited flexibility the federal government can exempt from the rule under exceptional economic conditions such as a financial crisis or natural catastrophes. Along the lines of the SGP, financial transactions such as revenues for privatisation of public assets or loans to the unemployment insurance are excluded from the calculation of the deficit ceiling. A crucial part of the German debt brake is the control account. As the debt brake relies heavily on

⁹ In particular, the German Federal Ministry of Finance was very sceptical about a golden rule for public investment, which limits the structural deficit to the level of public investment (see Baumann et al., 2008, 40-41). The Ministry emphasises that the former German golden rule was rather ineffective and that a suitable definition of public investments is elusive.

¹⁰ Note that the German states should have their own debt brakes implemented by 2020. Apart from the binding constraint of a balanced structural budget the states have some leeway to formulate their debt-brake rules. In particular, the states can choose if their rule permits the budget to fluctuate with the business cycle. For a detailed overview see Deutsche Bundesbank (2011).

forecasts of government revenues deviations from the deficit ceiling e.g. due to forecast errors enter the control account. Only deviations, which are not due to the business cycle, are taken into account. Notable exceptions are revisions of GDP-forecasts, which generally do not enter the control account. This is done in order to make the debt brake more binding and to take account of unforeseeable financial needs. In particular, government practices, which damage the rule, such as systematic error-prone budgeting should be avoided. At certain thresholds, the government is obliged to take action in order to reduce the deficit.¹¹

The government budget identity of a ea country j in terms of GDP is as follows:

$$g_{y,j} + r_j b_j \equiv tr_{y,j} + \Delta b_j \quad (6)$$

with: $g_{y,j}$:= ratio of public expenditure to GDP

$tr_{y,j}$:= ratio of public revenues to GDP

b_j := ratio of outstanding stock of government debt to GDP

Δb_j := new bonds issued in the current period in terms of GDP

As ea countries cannot fund their expenditure by printing new high-powered money public expenditure, either can be financed by tax revenues or issuing bonds. Under the debt brake, a limit is placed on the issuing of new bonds. This deficit ceiling can be written as follows:¹²

$$\Delta b_{c,j} \leq \sigma_j - \varepsilon_j (y_j - y_j^*) / y_j^* \leq 0.03 * y_j \quad (7)$$

with: y_j^* := potential GDP of ea country j

$(y_j - y_j^*) / y_j^*$:= output gap of ea country j

ε_j := budget sensitivity with respect to a 1%-change of the output gap

σ_j := structural deficit limit, for Germany: 0.35% of GDP

Under the debt-brake rule the deficit ceiling ($\Delta b_{c,j}$) is calculated as the sum of a cyclical component (second term on the rhs of equation (7)) and a structural component (first term on

¹¹ If the deficit of the control account reaches 1.5% of GDP the government must reduce the deficit. Above 1.0% of GDP the government must reduce the deficit if the output gap is not negative, i.e. the economy is not in a downturn.

¹² In the case of the German debt brake an output gap, which is calculated by the European Commission (COM), is applied. For this calculation the COM uses a production-function method (Denis et al., 2006).

the rhs of equation (7)) of the government budget. To calculate the cyclical component of the government budget the so-called budget sensitivity (ε_j) with respect to changes of the output gap is applied. The budget sensitivity comprises the short-term income elasticities of those revenue and expenditure items, which fluctuate with the business cycle. In the German debt-brake framework, these are income and consumption taxes as well as social contributions and expenditure for labour-market measures. Equation (7) shows that the government is allowed to exceed the structural deficit limit if the economy is in a recessions (negative output gap) and vice versa (positive output gap). In addition, the headline deficit should meet the deficit criterion of the SGP, which limits the headline deficit to three percent of GDP. Over the cycle, the cyclical-adjusted budget must not exceed the structural deficit limit (σ_j) of the debt brake:

$$g_{y,j}^* + r_j b_j - tr_{y,j}^* \leq \sigma_j \quad (8)$$

with: $g_{y,j}^*$:= cyclical-adjusted public expenditure excluding financial transactions such as loans to the unemployment insurance.

$tr_{y,j}^*$:= cyclical-adjusted public revenues excluding financial transactions such as revenues from privatisation of public assets.

As already outlined in the previous section under certain conditions the debt brake can be conducive to a coherent development in the ea by giving automatic stabilisers room to work. Additionally, a debt brake could serve as a preventive measure against rising external imbalances in a currency union. Suppose that the economy of a ea country runs a current-account deficit and the economy is in a boom phase. Furthermore, the cyclically adjusted government budget is balanced. In general, governments have an incentive to increase public expenditure to enhance their chances to be re-elected. This is particular true in a booming economy. Consequently, the government of the booming ea country may increase public outlays, which would shift the aggregate demand-curve in Figure 3 to the right. Therefore, both domestic demand and the current-account deficit grow. If a government adheres to a debt-brake rule public expenditure cannot be increased without raising taxes. However, the

latter can be costly for a government because it can spoil the chances to stay in office and may produce output losses. Therefore, incentives to increase public expenditure in good times would be much reduced under a debt brake. In the following section estimations on the impact of fiscal policy on net exports are run.

5 Empirical approach and results

Empirical approach

This part deals with the estimation of the short- and long-term impact of government activity on current-account balances. To avoid certain problems surrounding a panel-data approach, in particular 'parameter heterogeneity' (e.g. Temple, 2000), which can lead to inconsistent results and to take account of the idiosyncratic nature of economic developments in ea countries I apply a time-series approach. Estimations are run for a typical current-account surplus country, i.e. Germany, and a typical current-account deficit country, e.g. Spain or Portugal.¹³

The data set for Germany ranges from 1970 to 2008. In order to be able to interpret the regression coefficients as elasticities I use the ratio of exports to imports as the dependent variable (abt). The latter is an equivalent to net exports (see section 3). The right-hand side of the estimated equation can be derived from the theoretical model. If one substitutes the output variable y in equation (2) with the rhs of equation (1) and inserts this term in equation (3), the following equation results:¹⁴

$$abt(t) = \alpha_0 + \alpha_1 g(t) + \alpha_2 g_{prod}(t) + \alpha_3 t_y(t) + \alpha_4 r(t) + \alpha_5 y_{ea3}(t) + \alpha_6 \theta(t) + \alpha_7 k(t) + u(t) \quad (9a)$$

with: $t :=$ year, $\alpha_0 :=$ intercept, $\alpha_{i>0} :=$ regression coefficient, $u :=$ error term.

Public expenditure variables (g , g_{prod}) and tax revenues (t_y) are expressed as a percent of GDP. The tax-to-GDP ratio (t_y) serves as a proxy for the average tax rate. Productive public expenditure encompasses expenditure on transport and communication and on education.

¹³ Note that due to time constraints I have been not able to carry out estimations for a current-account-deficit country. This will be added in a revised version of this present paper.

¹⁴ Note that in the empirical part all variables relate to Germany. Therefore, I neglect the country indexation.

Empirical studies provide solid evidence for a growth-enhancing impact of these public-expenditure items (e.g. Nijkamp and Poot, 2004). Furthermore, the real effective exchange rate (θ) of Germany, which is based on unit labour costs, and the long-term interest rate (r), which is deflated by private consumption expenditure, are included as explanatory variables. To include foreign demand for German products we include the sum of the GDP of France, Italy and Spain (y_{ea3}). Thus, this variable encompasses the second to fourth largest economies of the ea. Furthermore, according to the theoretical model the private capital-to-labour ratio should be included in the estimation. I run estimations with a typical proxy of the private capital stock, private capital formation. But this leads to inconclusive results. Therefore, I run the estimations without a private-capital proxy.¹⁵

Moreover, from the three-equation model one can derive that the real exchange rate (θ) depends on the same set of variables as net exports (abt) (see section 3). Thus, the real exchange rate is an endogenous variable. But the real exchange rate does not depend on net exports so that it should not be correlated with the error term of equation (9a). In order to obtain the residual part of the real exchange rate, which is not endogenously determined, I run a regression with the real exchange rate as dependent variable on the remaining regressors of equation (9a). The residual part of the real exchange rate is applied to the estimations. Thus, the real exchange rate is 'purified' from the influence of the other regressors.

In order to ensure that the regressions are not spurious it has to be tested whether the chosen variables are stationary. But classical unit-root tests such as the Augmented-Dickey-Fuller test reject a unit root too often in the presence of outlying observations and structural breaks (Franses and Haldrup, 1994). Robust estimation methods are acknowledged as a tool for mitigating the drawbacks of classical unit-root tests (Abadir and Lucas, 2000). In addition,

¹⁵ The exclusion of the capital-to-labour ratio can be justified by the fact that private capital accumulation is influenced by technical progress and public capital formation. This can be shown in the framework of an endogenous growth model (e.g. Barro and Sala-i-Martin, 1992). Therefore, one might suppose that the long-term impact of the private capital stock on net exports can be captured by the intercept, the stochastic term and productive public investment (see equation (9a)).

since economic data cannot usually be deemed high-quality data and only a single outlying observation can severely bias and reduce the efficiency of least-squares estimator, some economists propose using robust estimation methods (Temple, 2000; Zaman et al., 2001, Colombier, 2009). Therefore, I apply robust unit-root tests, which are based on the modified M-estimator (MM-estimator) (Abadir and Lucas, 2000; Thompson, 2004). According to the results of the robust unit-root tests, net exports correspond to an difference-stationary (I(1)) process (see Appendix, Table A1). This is independent of the chosen time, i.e. the time from 1970 to 2011 or the period after German unification from 1991 to 2011. Since the results of the unit tests provide only inconclusive evidence regarding the regressor variables, the bounds-testing procedure by Pesaran et al. (2001), which allows for I(0)- and I(1)-regressors, is applied to test for cointegration. Furthermore, the robust MM-estimator proposed by Yohai et al. (1991) is applied to the regressions in levels.

In order to test whether government activity exerts an influence on current-account balance I use an Autoregressive Distributed Lag (ARDL) model. Once a cointegrating relationship has been established, the order of lags of the ARDL model is selected by applying an appropriate lag-selection criterion such as the Schwartz Bayesian Information Criterion (BIC). The selected model is estimated by the robust MM-estimation method. In addition, I follow Pesaran and Shin (1999) who propose using a maximum of two lags with annual data. This leads to the following ARDL model:

$$\begin{aligned} \text{abt}(t) = & \beta_0 + \beta_1 \text{abt}(t-1) + \beta_{2,1} g_{\text{prod}}(t) + \beta_{2,2} g_{\text{prod}}(t-1) + \beta_{3,1} t_y(t) + \beta_{3,2} t_y(t-1) + \beta_4 g_{\text{prim}}(t) \\ & + \beta_{5,1} y_{\text{ea3}}(t) + \beta_{5,2} y_{\text{ea3}}(t-1) + \beta_6 r(t) + \beta_7 \theta_{\text{pure}}(t) + v(t) \end{aligned} \quad (9b)$$

with: β_0 := intercept; $\beta_{i>0}$:= regression coefficient;

g_{prim} := non-productive primary public expenditure (i.e. it excludes g_{prod});

θ_{pure} := "purified" real exchange rate.

Note that to avoid collinearity between fiscal variables, estimations are either run with tax revenues (t_y) or public expenditure (g_{prim}). As productive public expenditure is a share of total

public expenditure productive public expenditure are subtracted from total public expenditure. Moreover, interest payments of the government are also subtracted so that non-productive primary public expenditure enters the estimated equation. Finally, the error-correction model, which is applied to the Bounds-testing procedure, is used to estimate the short-term impact of the explanatory variables on net exports.

Results

Overall, the estimations show that foreign demand proves beneficial to net exports in the long term (see Table 1). The coefficient is rather stable and the elasticity amounts to well-above 0.5.

Insert Table 1 about here

The empirical analysis provides evidence that the long-run interest rate is conducive to net exports and that the real exchange rate promotes net exports. Concerning fiscal variables, the estimations provide solid evidence for a positive stable relationship between productive public expenditure and net exports. No statistically significant relationship is obtained for primary public expenditure, which is in line with theory. The evidence relating to the tax ratio points to an adverse impact on net exports as is expected. The long-term elasticity of the tax ratio emerges as statistically significant at a 5% level and shows the expected sign in a single estimation. Additionally, in two out of five estimations the coefficient of the tax ratio is weakly statistically significant.

*** Insert Table 2 about here***

To consider a possible endogeneity bias instrumented regressions are performed. However, in a small sample instrumented regressions can be biased. Therefore, one has to be cautious by interpreting the results of these regressions. Nonetheless, with the exception of the tax

ratio, the instrumented regressions would appear to confirm the results of the first regressions (see Table 2). In contrast, the coefficient of the tax ratio shows neither the expected sign nor statistical significance. This can be due to the small-sample bias mentioned above.

Insert Table 3 about here

The estimations of the short-term elasticities of fiscal variables provide evidence for a short-term impact of the tax ratio on net exports (see Table 3). Nonetheless, since growth dynamics have been driven by exports over the last decade in Germany, this result may also be due to reversed causality. Only in a single regression the short-term elasticity of non-productive primary public expenditure is weakly statistically significant and shows a negative sign. Yet, the latter is in line with the prediction of the underlying theoretical model (see Figure 3).

Overall, the empirical analysis of the German case suggests that, in particular, productive public expenditure can prove beneficial to net exports. The results show that tax policy increases net exports in the short term, but reduces net exports in the long term. Though the empirical evidence concerning the short-term impact of non-productive primary public expenditure is weak, the results imply the possibility that these public expenditure items put a drag on net exports as is predicted by the theoretical model (see Figure 3). To sum up, the empirical evidence provided for Germany would appear to confirm the predictions of the underlying theoretical model delineated in section 3.

6 Ex-post calculations of debt-brake-coherent budget balances

In the following, government deficits ceilings that are based on a German-type debt brake are calculated for the pre-crisis period from 2002 to 2007. For the simulation of the debt-brake-coherent deficit ceiling, I assume that forecasts of GDP and government budget had not suffered from forecast errors since the launch of the common currency in the EMU. In Tables

4a and 4b, the actual government deficit (Δb) of Germany and Spain is compared with the deficit ceiling under the debt brake (Δb_c).

Insert Tables 4a and 4b about here

Tables 4a and 4b report also the cyclical component of the public deficit under the debt brake ($-\varepsilon$ *output gap) and the reduction of the deficit ($\Delta b_c - \Delta b$), which would have been necessary to abide by the debt-brake rule. What is striking is that Germany breached the rule in each year. In contrast, the Spanish budget was in line with a debt brake in the period from 2005 to 2007. In addition, the need for adjustment is much lower in Spain than in Germany. For Germany, the need to adjust the budget balance accumulates to 12.6% of GDP, whereas the amount for Spain corresponds to only 1.6% of GDP. This shows clearly that current economic difficulties of Spain are not caused by government profligacy but by the indebtedness of the private sector spurred by the housing boom in Spain. Nonetheless, one wonders if under the debt brake the divergent economic developments could be reduced.

*** Insert Table 5 about here ***

In order to provide an answer I focus on the pre-crisis period from 2002 to 2007 and take the empirical results for Germany into account.¹⁶ It is assumed that the debt brake would have been introduced in 2002. Two different simulations are run, which are related to the impacts of fiscal policy shown in Figure 3. Firstly, it is analysed how the need to adjust the structural budget balance under the provisions of the debt brake affects external balances. I assume that the government varies either tax rates or productive public expenditure to abide by the debt brake. Furthermore, the simulation takes into account that a variation of the tax rate exerts a short and long-term effect on the economy. Non-productive public expenditure are not taken into account as a mean to adjust the structural budget balance because the empirical analysis provides no evidence for a long-term impact of this expenditure item on external balances. Secondly, the impact of automatic stabilisers on net export is considered. The simulation

¹⁶ As mentioned before, an empirical analysis of a current-account deficit country will be added in a revised version of this present paper.

includes tax revenues and non-productive public expenditure, which are affected by business-cycle fluctuations such as outlays for labour market measures, as automatic stabilisers. It is assumed that the structural budget balance of the government is in line with the debt brake. The impact of automatic stabilisers is simulated by using the short-term elasticities of the average tax rate and non-productive public expenditure (see Table 5). The simulations are based on the median of the statistically significant estimates of the elasticities of fiscal variables (see Tables 1 and 3). Furthermore, the marginal values of the confidence intervals of the estimated elasticities, i.e. the lowest and highest elasticities that fit the estimations, are applied to the simulations.

The simulations for the period from 2002 to 2007 show that the introduction of the debt brake in Germany in 2002 would have brought about a reduction of German net exports if the German government had increased taxes to adjust the structural budget balance (see Table 5). The results remain inconclusive if the government had cut non-productive public expenditure in 2002 to abide by the debt brake. However, the structural adjustment, which would have been necessary under a debt brake in Spain, would have probably worsened the external deficit by 1% of GDP. In contrast, the simulations for automatic stabilisers suggest that, in particular, tax revenues could have contributed to shrinking the current-account deficit of Spain to some extent. This is caused by the fact that under a debt-brake rule the Spanish fiscal policy had to be more restrictive due to the booming economy. Since Germany had a negative output gap until 2005 and a current account surplus, automatic stabilisers would have even accelerated the increase of the external surplus (see Table 4a and 5). The results concerning automatic stabilisers are in line with the theoretical considerations (see section 3). Thus, the working of automatic stabilisers appears to prove beneficial in terms of reducing external imbalances under certain conditions. In particular, in a booming economy a debt-brake seems to prevent policy-makers from adopting a pro-cyclical fiscal policy. Moreover, the structural adjustments needed under a debt brake might support a convergent development in a currency

union as is shown for Germany. However, this result seems to be sensitive to special economic conditions as the Spanish case shows.

7 Conclusion

This present paper shows that a debt-brake can contribute to a convergent economic development in a currency union under certain conditions. In particular, a debt-brake considerably reduces the incentives for a pro-cyclical fiscal policy in an upswing. Consequently, automatic stabilisers can work properly and decelerate a growing current-account deficit in a booming economy, such as was the case in Spain before the crisis. In addition, the debt brake limits the freedom of policy-maker to implement pro-cyclical fiscal-policy measures. A slowing down of the economy in Spain might have also slowed down the accumulation of private debt, which may have put Spain in a better position to come to terms with the crisis. This is a clearly defined case, under which the debt brake can prove beneficial to reduce divergent economic developments in a currency union. Based on theory, the same result should apply to an economy in an downturn with a current-account surplus. Overall, the results of this paper suggest that national debt brakes can foster a convergent development in a currency union only under certain conditions. These are defined by the position in the business cycle, the sign of the current-account balance and the instruments chosen by governments to adjust the structural budget balance. To sum up, the impact of national debt brakes on current-account balances is limited. Therefore, to prevent further divergent economic development in the ea it remains a sine qua non to delegate more fiscal responsibility to the EU-level.

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Appendix

Data

Economic and fiscal data stem from the Ameco data base of the European Commission. Fiscal data on public expenditure by function originate from Government Finance Statistics of the International Monetary Fund.

Table A1: Robust unit root tests - Germany

Variable (logarithms and as of GDP and % resp.)		1970 - 2011			1991 – 2011 (after unification)		
		Statistic	Lags	Drift, trend	Statistic	Lags	Drift, trend
Net exports	Levels	-2.14	5	drift	0.16	4	none
	First D.	-3.24***	5		-4.41***	1	
Total primary public expenditure	Levels	-2.38	1	drift	-2.72*	1	drift
	First D.	-5.66***	1		-3.94***	1	
Productive gov. expenditure	Level	-3.36***	1	none	-1.33	1	none
	First D.	-7.25***	1		-8.88***	1	
Non-productive primary public expenditure	Levels	-0.38	1	drift	-0.91	1	trend
	First D.	-7.22***	1		-3.34***	1	
Tax revenues	Levels	-0.66	1	none	-0.09	1	none
	First D.	-5.03***	1		-3.31***	1	
Real exchange rate	Levels	-0.69	1	none	1.31	1	trend
	First D.	-5.03***	1		-2.51***	1	
Real long-term interest rate	Levels	-0.49	3	none	-1.09	3	trend
	First D.	-3.73***	3		-2.77***	3	
Private Investment expenditure	Levels	-3.14**	1	drift	-0.70	1	none
	First D.	-5.74***	1		-3.31***	1	
Real GDP EA3	Levels	2.95	1	trend			
	First D.	-1.60*	1				

Notes: ***:= 1% significance level; **:= 5% significance level; *:= 10% significance level. As to robust unit root tests with robust modified M-estimator see Abadir and Lucas (2000) and Thompson (2004), D.:= differences.

Tables

Table 1: Cointegration test (Bounds test) and long-run model - Germany

Variable	Estimated model										
	lags								lags		
Export-to-import ratio	t-1	0.45*** (0.11)	0.61*** (0.17)	0.23 (0.19)	0.22 (0.20)	0.62*** (0.20)	0.56*** (0.18)	0.71*** (0.23)	t-1	0.45*** (0.12)	0.35*** (0.12)
Real GDP EA3 ^a	t, t-1	0.45*** (0.10)	0.57*** (0.16)	0.52** (0.19)	0.52** (0.19)	0.65** (0.23)	0.53*** (0.16)	0.55** (0.22)	t	0.40*** (0.10)	0.43*** (0.08)
Productive public expenditure ^b	t, t-1	0.28** (0.10)	0.46** (0.18)	0.08 (0.17)	0.21 (0.16)	0.51** (0.22)	0.41** (0.19)	0.47** (0.21)	t	0.28*** (0.10)	0.24** (0.10)
Non-productive primary public exp. ^c	t	-0.04 (0.14)	-0.02 (0.12)				-0.01 (0.13)		t	-0.18 (0.13)	
Tax revenues	t, t-1			-1.17* (0.66)	-1.22* (0.67)	-0.15 (0.65)		0.11 (0.75)	t		-0.66** (0.30)
Purified real exchange rate	t	0.30*** (0.11)			0.51*** (0.17)		0.15 (0.20)	0.11 (0.24)	t	0.38*** (0.10)	0.43*** (0.10)
Real long-term interest rate	t		0.02 (0.02)			0.02*** (0.007)	0.02*** (0.007)	0.02*** (0.007)	t		
Adj. R ² (as %)		64.5	79.4	75.3	75.7	78.5	78.8	54.8		67.1	73.5
Bounds F-test		10.1***	5.56**	6.34**	7.11***	5.98**	5.00**	5.28**		10.1***	7.11***
Box-Ljung test		12.8	12.7	17.0	17.4	13.3	11.1	5.99		13.8	18.3
Normality test		0.80***	0.95	0.89***	0.90***	0.97	0.95	0.84***		0.82***	0.84***
Ramsey reset test		0.40	0.72	0.52	0.55	0.56	0.62	1.11		0.70	0.31
BIC		-76.8	-91.6	-84.9	-85.4	-88.7	-89.0	-66.9		-84.7	-90.7

Notes: ***:= 1% significance level; **:= 5% significance level; *:= 10% significance level; all variables in logarithms; robust MM-estimator applied to regressions (Yohai et al., 1991); t tests: figures in parentheses are standard errors; Bounds F-test with OLS (Pesaran et al., 2001): H0: no cointegration, critical values for small samples from Narayan (2005) Box-Ljung test: H0: no autocorrelation of residuals, Box-Ljung statistic; Shapiro-Wilk normality test: H0: Gaussian distribution, W test statistic; BIC:= Bayesian information criterion.

If Box-Ljung tests indicates autocorrelation at at minimum 10%-significance level, HAC standard errors by Andrews (1991) are applied.

^a EA3:= France, Italy and Spain; ^b Sum of education and transport expenditure; ^c Total primary public expenditure minus productive public expenditure.

Table 2: Instrumented regressions long-run model - Germany

Variable	Instruments	Spearman rank correlation (as %)	Estimated model	
Export-to-import ratio (t-1)	lag (t-2)	73	0.38*** (0.10)	0.35*** (0.11)
Real GDP EA3 ^a (t-1)	none		0.48*** (0.06)	0.45*** (0.07)
Productive public expenditure ^b (t)	lag (t-1)	79	0.35*** (0.09)	0.30*** (0.09)
Non-productive primary public exp. ^c	lag (t-1), lag (t-2)	58	-0.06 (0.23)	
Tax revenues (t)	lag (t-1)	74		0.29 (0.47)
Purified real exchange rate (t)	lag (t-1), lag (t-2)	61	0.40** (0.15)	0.36** (0.15)
Real long-term interest rate (t)	lag (t-1), lag (t-2)	74	0.03** (0.01)	0.03*** (0.008)
Adj. R ² (as %)			60.3	61.3
Sargan test			-15.3	-13.8
Box-Ljung test			3.50*	3.85*
Normality test			0.86***	0.87***
Ramsey reset test			0.65	0.96
BIC			-67.8	-68.4

Notes: ***:= 1% significance level; **:= 5% significance level; *:= 10% significance level; all variables in logarithms; robust MM-estimator applied to regressions (Yohai et al., 1991); t tests: figures in parentheses are standard errors; Box-Ljung test: H0: no autocorrelation of residuals, Box-Ljung statistic; Shapiro-Wilk normality test: H0: Gaussian distribution, W test statistic; BIC:= Bayesian information criterion; Sargan's test on validity of instrument: Chi-square test statistic, H0: valid instruments.

If Box-Ljung tests indicates autocorrelation at at minimum 10%-significance level, HAC standard errors by Andrews (1991) are applied.

^a EA3:= France, Italy and Spain; ^b Sum of education and transport expenditure; ^c Total primary public expenditure minus productive public expenditure.

Table 3: Short-term impact - Germany

Variable	Short-term part				
First differences	lags				
Export-to-import ratio	t-1	-0.22 (0.18)	-0.001 (0.24)	0.14 (0.22)	0.12 (0.22)
Real GDP EA3	t-1	-0.84 (0.55)	-0.51 (0.71)	-0.71 (0.60)	-0.79 (0.65)
Productive public expenditure	t-1	-0.04 (0.10)	-0.02 (0.16)	-0.005 (0.11)	-0.03 (0.13)
Non-prod. primary public exp .	t-1	-0.34* (0.19)	0.20 (0.24)		
Tax revenues				1.19* (0.61)	1.25** (0.57)
Purified real exchange rate	t-1	0.75*** (0.20)		0.34 (0.24)	
Real long-term interest rate	t-1		-0.004 (0.01)		0.0 (0.01)
Error correction term	t-1	-0.58** (1.54)	-0.61** (0.24)	-0.81** (0.30)	-0.55** (0.24)
Adj. R ² (as %)		66.8	46.0	66.2	57.1
Box-Ljung test		19.5	18.3	22.7*	12.9
Normality test		0.95	0.97	0.98	0.98
Ramsey reset test		0.64	0.47	3.01	0.56
BIC		-82.8	-72.0	-82.4	-78.2

Notes: see Notes Table 1; note that OLS-estimator is applied to Bounds-test approach.

Table 4a: Ex-post deficit ceilings under the debt brake – Germany (as % of GDP)^{a,b}

Year	Δb^a	Δb_c $\sigma = 0.35$	$-\varepsilon * \text{output gap}$ $\varepsilon = 0.51^c$	$\Delta bc - \Delta b$
2002	3.846	0.350	0.000	-3.496
2003	4.151	1.201	0.851	-2.950
2004	3.758	1.242	0.892	-2.515
2005	3.321	1.475	1.125	-1.846
2006	1.638	0.281	-0.069	-1.357
2007	-0.237	-0.709	-1.059	-0.471

^a Red figures indicate breach of debt brake.

^b $\Delta b > 0$:= deficit and vice versa.

^c For budget sensitivity see Girouard and André (2005).

Table 4b: Ex-post deficit ceilings under the debt brake – Spain (as % of GDP)^b

Year	Δb^a	Δb_c $\sigma = 0.4$	$-\varepsilon * \text{output gap}$ $\varepsilon = 0.44^c$	$\Delta bc - \Delta b$
2002	0.214	-1.18	-1.58	-1.396
2003	0.348	-0.69	-1.09	-1.036
2004	0.112	-0.61	-1.01	-0.719
2005	-1.266	-0.84	-1.24	0.430
2006	-2.369	-1.55	-1.95	0.822
2007	-1.923	-1.66	-2.06	0.261

^a Red figures indicate breach of debt brake.

^b $\Delta b > 0$:= deficit and vice versa.

^c For budget sensitivity see Girouard and André (2005).

Table 5: Fiscal Policy under a debt-brake rule – simulations for the period 2002-2007

Variable	Elasticity			Net exports 2007 (as % of GDP)									Value	
	Long-term			Short-term			Structural adjustment			Automatic stabilisers				
	Min	Med	Max	Min	Med	Max	Min	Med	Max	Min	Med	Max		
<i>Germany</i>														
Net exports														7%
Tax ratio	-0.03	-1.21	-2.39	0.12	1.29	2.47	7%	5%	1%	7%	9%	10%		
Prod. publ. exp.	0.03	0.50	0.97				8%	13%	4%					
Primary publ. exp.				-0.01	-0.34	-0.67				7%	7%	8%		
<i>Spain^a</i>														
Net exports														-7%
Tax ratio	-0.03	-1.21	-2.39	0.12	1.29	2.47	-8%	-8%	-7%	-7%	-5%	-4%		
Primary publ. exp.				-0.01	-0.34	-0.67				-7%	-7%	-6%		

Notes: Elasticity: min:= minimum of the confidence interval of lowest significant coefficient of Table 1 at 5% or 10%-level resp.; max:= the opposite of min; med:= median of min and max.

^a Elasticities are taken from the estimations for Germany; Data for productive public expenditure are not available.

Figures

Figure 1

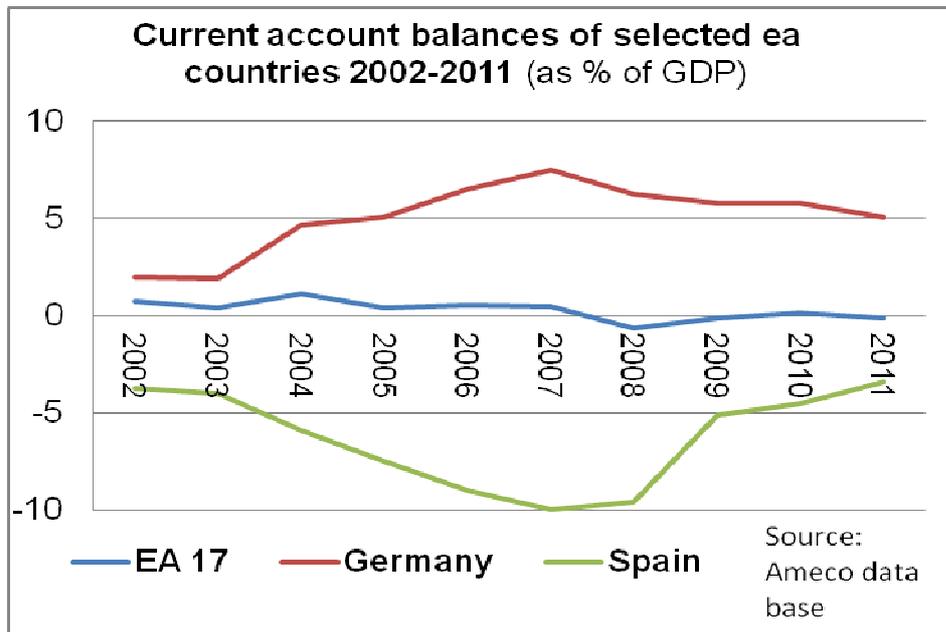


Figure 2

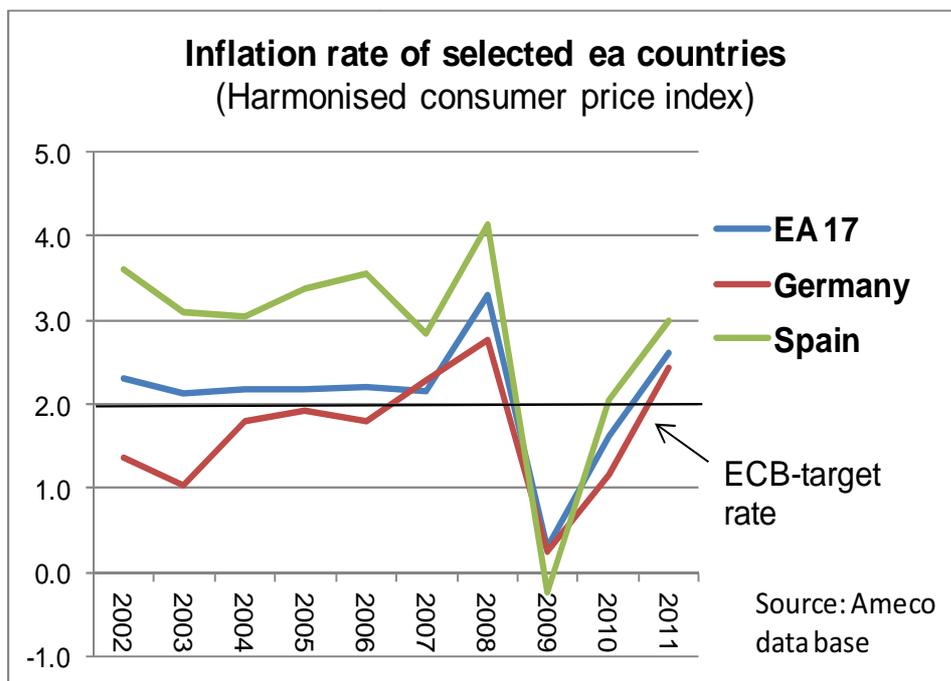


Figure 3

Discretionary fiscal policy and current-account deficit in EMU

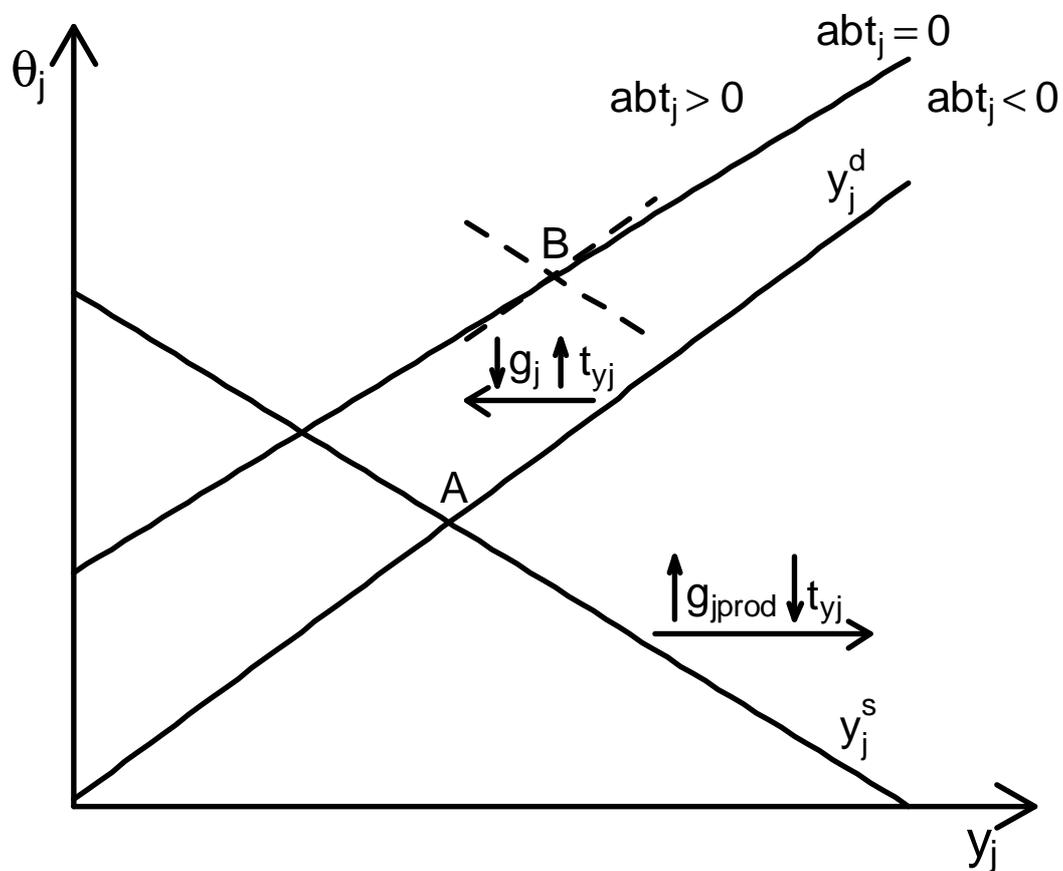


Figure 4

Business cycles, automatic stabilisers & current-account deficit

