National debt brakes as a remedy for diverging economies in the European Monetary Union?

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Summary

Due to the ongoing crisis, several reforms have been implemented at the EU-level, which are tilted towards strengthening the budget discipline of EMU member states. These reforms underlie the view that government profligacy is the main culprit of the crisis. Consequently, a fiscal compact that includes national debt brakes at its core has been introduced in the EU. However, several economists emphasise that the EMU is an incomplete currency union. As a result, massive external imbalances have been built up in the pre-crisis years. Therefore, this present paper analyses whether a debt break, which is viewed as supportive for sustainable public finances, can also contribute to a convergent development in the EMU. The back-of-the-envelope simulations run for a typical current-account surplus and -deficit country (Germany and Spain respectively) provide mixed results. It is shown that under a debt brake current-account deficits can be lowered 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. But the impact of the debt brake on current-account balances depends on various factors, i.e. the position of an economy in the business cycle, the sign of the current-account balances and the instruments chosen to adjust the structural budget balance. Consequently, European policy-makers should be aware of the fact that the structural drawbacks of the EMU cannot be resolved by the attempt to balance structural government budgets. For this other measures than a fiscal compact such as a delegation of fiscal powers to the union level are necessary.

1   Introduction[1]

This chapter examines if national debt brakes can prove effective in reducing current accounts 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). 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, EMU member countries to implement a balanced-budget rule in national law. 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, e.g. labour market institutions, 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).[2] 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 developments is fiscal policy. Therefore, some economists argue that stronger coordination or centralisation of fiscal policies is needed to reduce macroeconomic divergences among EMU member states (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 EMU member states from 68% to 66% could be seen from 2002 to 2007.

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[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] 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).

One reason that so far exogenous shocks have not been absorbed sufficiently 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 anti-cyclical fiscal policies during an upturn (e.g. Colombier, 2006). Therefore, Dullien and Schwarzer (2009) propose the implementation of automatic fiscal stabilisers at the European level.

Research findings show that in contrast to the SGP, debt brakes would allow for a better working of automatic stabilisers, 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 -surplus country, i.e. Germany, since the launch of the Euro. Results of this analysis suggest that the debt brake could contribute to reduce external deficits, but only under certain conditions. Therefore, European policy makers have to go beyond fiscal compacts to fix structural drawback of the EMU, i.e. the coordination failure, by, e.g., delegating more fiscal responsibilities to the EU level.

This paper is organised as follows. In the following section, the German debt brake is delineated, which has served as a role model for the balanced-budget rule of the fiscal compact. Section 3 analyses the impact of fiscal policy under a debt brake on the balances of payment from a theoretical perspective. Section 4 provides empirical results about the impact of government action on external balances for the case of German. Section 5 presents simulations how an introduction of a German-style debt brake would have affected current-account balances in Germany and Spain. Finally, some conclusions are drawn in the closing part of this paper.

2   The debt brake and external imbalances from a theoretical perspective

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 allowed. 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 break allows for a structural deficit of 0.35% of GDP at the federal level.[3] In contrast, the states (the *Länder*) are not allowed to run a structural deficit.[4] 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 suffers from the following 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 lead 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. 4). 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 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

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[3] 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.

[4] 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).

of unforeseeable financial needs. In particular, government practices that 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.[5]

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

$$g_{y,j} + r_j \, b_j \equiv tr_{y,j} + \Delta b_j \tag{1}$$

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

$\Delta b_j :=$ new bonds issued in the current period in terms of GDP

As EMU member states cannot fund their expenditure by printing new high-powered money, public expenditure can only 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:[6]

$$\Delta b_{c,j} \leq \sigma_j - \varepsilon_j \, (y_j - y_j^*)/y_j^* \leq 0.03 * y_j \tag{2}$$

with: $y_j^* :=$ potential GDP of EMU member country j

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

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

$\sigma_j :=$ structural deficit limit, Germany 0.35% of GDP (Spain 0.4% of GDP)[7]

The deficit ceiling ($\Delta b_{c,j}$) is calculated as the sum of a cyclical component (second term on the rhs of equation (2)) and a structural component (first term on the rhs of equation (2)) 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 (2) shows that the government is allowed to exceed the structural deficit limit if the economy is in a recession (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:

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[5] 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.

[6] 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).

[7] A cap of 0.4% of GDP is intended to be set for the structural budget balance in Spain from 2020 (Economist, September 3rd 2011).

$$g_{y,j}{}^* + r_j\, b_j - tr_{y,j}{}^* \leq \sigma_j \tag{3}$$

with: $g_{y,j}{}^* :=$ cyclcical-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.

3 Impact of debt brakes on external balances

Assuming a New-Keynesian model of an open economy it can be shown that a debt brake can be conducive to a coherent development in a currency union such as the EMU under certain conditions (Carlin and Soskice, 2006). To provide an intuition about the impact of the debt brake on external balances a sketch of such a model is given below.[8]

In such a model an independent central bank, e.g. the ECB, pursues the single goal of union-wide price stability. In order to reach price stability the ECB sets a union-wide nominal interest rate (i) based on a Taylor rule. Market actors make adaptive expectations on union-wide inflation rate (π) and the inflation rate of a EMU member country j (π_j).[9] For simplicity it is further assumed that the inflation rate expected for the next period corresponds to the current inflation rate. In the model a stabilising real interest rate (r^s) is presupposed at which the domestic labour and goods markets of each EMU member are in an equilibrium. In this case, an overall equilibrium in the currency union is reached. Although a union-wide equilibrium means that current-account balances are stabilised, a settlement of these balances is only achieve by chance.[10] The above assumptions lead to the following equivalent equations for the union- wide nominal (i) and real interest rate (r):

$$i = r^s + \pi + (\pi - \pi^T) \tag{4a}$$

$$r = r^s + (\pi - \pi^T) \tag{4b}$$

If the inflation rates of EMU member states correspond to the union-wide inflation rate (π) and the ECB manages to stabilise the union-wide inflation rate at its inflation target (π^T), i.e. at maximum 2%, the real interest rate (r) would be equal to the stabilising interest rate (r^s).

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[8] For a more detailed account see Colombier (2013).

[9] 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).

[10] Note that no distinction between the trade and current-account balance is made in the model.

However, different individual inflation rates (π_j) lead to spreads between real interest rates (r_j) of EMU member countries.[11]

$$r_j = i - \pi_j \tag{5a}$$

If the nominal interest rate, i, in equation (5a) is substituted with the right-hand side of equation (4a), one arrives at the following formula:

$$r_j = r^s + (\pi - \pi^T) + (\pi - \pi_j) \tag{5b}$$

Equation (5b) shows that two conditions must be met to reach an overall equilibrium in the EMU, i.e. a domestic (medium-term-) market equilibrium in each EMU-country. First, the union-wide inflation rate (π) should correspond to the inflation target of the ECB ($\pi = \pi^T$). But to reach a domestic market equilibrium in each EMU member country all individual inflation rates (π_j) should be tantamount to the union-wide inflation rate (π) ($\pi = \pi_j$). However, as conditions of labour and product markets can differ substantially between EMU member states 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 the ECB cannot steer individual inflation rates. Consequently, a common monetary policy cannot even stabilise, let alone reduce, current-account balances. As labour markets in the EMU do not provide sufficient flexibility and mobility to compensate for possibly asymmetric shocks on EMU member countries the only instrument left to accommodate these shocks is fiscal policy (see section 1).[12] Fiscal policy of member countries can contribute to a convergent economic development by stabilising the economy. This can enhance the chances that individual inflation rates and the union-wide inflation rate correspond.

To make the analysis simple, it is assumed that the ECB manages to keep the union-wide inflation rate close to its target level, i.e. $\pi \approx \pi^T$, so that the second term on the right-hand side of equation (5b) is approximately zero. Given that the cyclically adjusted government budget is balanced, a debt-brake allows, in principle, automatic stabilisers to work without interference of discretionary fiscal policy.[13] This can help to absorb asymmetric shocks under certain conditions. For example, if the economy of a current-account deficit country such as Spain is booming, automatic stabilisers act counter-cyclically and thus keep the Spanish inflation rate closer to the union-wide inflation rate. All things being equal, the latter would counteract

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[11] Note that for simplification risk premiums are not taken into account.

[12] As the experiences of the crisis-ridden countries such as Spain, Portugal or Ireland show, it may also not desirable to have a fully flexible labour market as an internal devaluation through cutting wages are quite costly in terms of unemployment. Moreover, as already emphasised in fn. 2 downward flexibility of wages runs the risk of plunging an economy into a deflation.

[13] Nevertheless, to what extent automatic stabilisers can actually act under a debt brake depends on the method chosen to divide GDP into a cyclical and structural component and is open to debate (see e.g. Colombier, 2006, 526-528).

diverging economic developments in the EMU as the spread of the Spanish real interest rate and the union-wide real interest rate would be reduced (see equation (5b)). As a result, the loss of competitiveness would be mitigated and the corresponding current-account deficit lower than without the working of automatic stabilisers. Now assume, that Spain as a current-account deficit country moves into a recession. This means c.p. having lower inflation in this country than in the currency union, which causes an increase in Spanish competitiveness through internal devaluation. Moreover, the real interest rate for Spain would be higher than the stabilising real interest rate (see equation (5b)). This brings about a convergent development in the EMU because the current-account deficit of Span is reduced. But in this case the convergence is slowed down by automatic stabilisers because the stabilisers counteract the disinflationary tendency and the widening interest-rate spread. For a current-account surplus country the situation is reversed. While automatic stabilisers slow down the reduction of the external surplus in an upturn, they decelerate the widening of the external surplus in a downturn. To sum up, according to theory a debt-brake coherent fiscal policy can slow down a diverging economic development in a currency union by giving automatic stabilisers room to manoeuvre. But this is tied to certain conditions.

Additionally, a debt brake could serve as a preventive measure against rising external imbalances in a currency union. Suppose that the economy of a EMU 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 a booming EMU country may increase public outlays, which would give a boost to aggregate demand. 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.

4   Fiscal policy and net exports – empirical results

This part presents the findings of the estimations of the short- and long-term impact of government activity on external balances for Germany, represented by net exports, from 1970 to 2008.[14] The regressions are based on the New Keynesian model of an open economy outlined

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[14] For a more detailed account of the empirical approach see Annex.

in section 3 (Carlin and Soskice, 2006; Colombier, 2013). Deviating from a standard New Keynesian model, I assume that productive public expenditure affects external balances through the supply-side of a national economy. Empirical studies provide solid evidence for a growth-enhancing impact of these public-expenditure items (e.g. Nijkamp and Poot, 2004). These include public expenditure on education and transport and communication infrastructure. Moreover, it is estimated how non-productive primary public expenditure and taxes affect net exports. The fiscal variables are expressed as ratios to GDP so that the tax-to-GDP ratio can be viewed as a proxy for the average tax rate. The real effective exchange rate of Germany, which is based on unit labour costs, the real long-term interest rate of Germany and the GDP aggregated over the second to fourth largest economies of the EMU, which are France, Italy and Spain, enter the regressions as control variables. The aggregated GDP of France, Italy and Spain serves as a proxy for foreign demand for German products. The coefficients of the estimations shown in Table 1 to 3 can be interpreted as elasticity of net exports with respect to the corresponding independent variable.

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 rather robust evidence that an increase of the real exchange rate, i.e. improved competitiveness, promotes net exports. Although the estimations show positive statistically significantly coefficients of the long-run interest rate, which is counterintuitive, the size of the coefficients imply a negligible impact on net exports. Concerning fiscal variables, the estimations provide robust evidence for a positive 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. But the evidence is weaker than for productive public expenditure. The long-term elasticity of the tax ratio emerges as highly statistically significant at a 5% level only in a single regression. At least, in two out of five estimations the coefficient of the tax ratio is weakly statistically significant (10%-level).

*** 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 themselves. 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.

<center>***Insert Table 3 about here***</center>

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 (Colombier, 2013).

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 if the government raises taxes not only do net exports increase in the short term, but they also shrink in the long term. Even so, one should note that the evidence is not so stable in the long term. Although 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 macroeconomic theory.

5   Ex-post simulations of debt-brake-coherent budget balances

In the following, government deficits ceilings of Germany and Spain that are based on a German-type debt brake are calculated for the pre-crisis period from 2002 to 2007. For the simulation of debt-brake-coherent deficit ceilings I assume that forecasts of GDP and government budgets had not suffered from forecast errors since the launch of the common currency in the EMU. In Tables 4a and 4b actual government deficits (Δb) of Germany and Spain are compared with the deficit ceilings under the debt brake (Δb_c).

<center>***Insert Tables 4a and 4b about here***</center>

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 ($\Delta b_c - \Delta b$) that 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. As a result, an implementation of the debt brake in 2002 would have lowered the debt-to-GDP ratio in Spain only slightly by 1.6%. In contrast, the impact of the debt brake on Germany's debt ratio would have been substantial. The debt brake would have reduced the German debt by about 13% of GDP. Although these are only rough calculations, it clearly shows that current economic difficulties of Spain are not caused by government profligacy but by the indebtedness of the private sector and banks, which have been spurred by the housing boom in Spain.

Moreover, if one defines fiscal sustainability as abiding by the debt-brake rule Spain outperforms Germany in the pre-crisis period. Thus, a debt brake would have not contributed much to sustaining public finances in Spain. Therefore, it is all the more important to examine if under a debt brake the divergent economic developments would have been reduced.

*** Insert Table 5a and 5b about here ***

In order to provide an answer, I run a few simple simulations for the pre-crisis period from 2002 to 2007. The simulations are based on the results of the empirical analysis for Germany (see section 3). It is assumed that the debt brake would have been introduced in 2002. For the simulations the median of the statistically significant elasticities is used (see Table 5a). To account for stochastic uncertainty of the estimations the lower- and upper-bound elasticities of the confidence intervals are also applied to the simulations. Two different types of simulations are run.

First, it is analysed how the need to adjust the structural budget balance under the provisions of the debt brake affects external balances (structural adjustment) (see Table 5b). I assume that either tax rates or productive public expenditure are adjusted to abide by the debt brake.[15] As the empirical analysis provides no evidence for a long-term impact of non-productive expenditure on external balances, these expenditure items are not taken into account. Furthermore, the simulations take into account that a variation of the tax rate may exert a short and long-term effect on the economy. The procedure of these simulations is as follows. At first, the impact of the structural adjustments on net exports is calculated by applying the corresponding elasticities (see Table 5b). Then, the historical change in net exports is corrected by the afore-mentioned impact of the structural adjustment.

Second, the impact of automatic stabilisers on net export is simulated. The automatic stabilisers, which are included in the simulations, encompass tax revenues and primary public current expenditure.[16] In these simulations it is assumed that the structural budget balance of the government is in line with the debt brake. Moreover, to isolate the impact of automatic stabilisers on net exports I assume that the economy fluctuates around a stationary equilibrium. The impact of automatic stabilisers is simulated by using the estimates of the short-term

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[15] Note that I carry out the simulations under the assumption that an increase of tax rates brings about rising revenues in the long run. Thus, a tax increase causes a less than proportional decrease in GDP. How the GDP is affected by a tax increase depends on a number of factors such as what type of tax is increased, the initial composition of taxes and the initial tax ratio. A detailed account of these tax effects goes beyond the scope of this analysis.

[16] Note that primary public current expenditure, i.e. expenditure without investment spending, do not exactly correspond to non-productive primary public expenditure, which is used in the empirical part of this chapter (see section 4). But due to limited data availability for the Spanish case primary public current expenditure are applied to the simulations as a proxy for non-productive primary public expenditure.

elasticities of fiscal variables and by taking the sensitivity of these fiscal variables with respect to business-cycle fluctuations into account (see Table 5a).

The simulations 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 5b). This finding presupposes that the absolute value of the tax-rate elasticity is well-above zero (see Table 5a). The results are inconclusive with respect to a cut in productive public expenditure because two opposing effects are at work. To be debt-brake coherent the German government had to reduce productive public expenditure by 3.5% of GDP in 2002. As a result, German competitiveness and net exports would have been lowered (see Table 5b). But in the following years it would have been possible to increase productive public expenditure under a debt break so that the first impact would have been compensated to some extent. Therefore, net exports are related to productive public expenditure in a non-linear way. In contrast, a structural adjustment of the Spanish budget through a tax increase would have barely affected net exports.

The simulations for automatic stabilisers suggest that the counter-cyclical fluctuations of primary public current expenditure items does not affect Spanish net exports. In contrast, evidence is provided that tax revenues could have considerably contributed to a shrinking of the Spanish trade deficit. This is caused by the fact that due to the debt brake Spanish fiscal policy had been forced to be more restrictive in the boom phase. In contrast, automatic stabilisers would have had almost no impact on the German trade balance. This finding comes as no surprise because Germany experienced a complete business cycle between 2002 and 2007. In addition, one should bear in mind that these simulations are carried out under the assumption of a stationary economy. Nevertheless, the simulations also suggests that a sufficiently high sensitivity of net exports with respect to taxes would have allowed for small adverse effects. Overall, the results concerning tax revenues meet expectations from theory (see section 3). Thus, the working of this automatic stabiliser appears to prove beneficial in terms of reducing external imbalances under certain conditions. Contrary to tax revenues primary public current expenditure do not seem to affect net exports considerably. Moreover, the structural adjustments needed under a debt brake might support a convergent development in a currency union as is shown for the German case. However as, in particular, the findings for the Spanish case demonstrate, this result also seems to be sensitive to the idiosyncratic nature of the economic situation.

6 Conclusion

This present paper shows that a debt-brake can contribute to a convergent economic development in a currency union, but only under special 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, on top of this, 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. But overall, the present simulations for Germany and Spain show that the way the debt brake affects external balances depends on various factors, in particular, 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. Thus, from this present analysis one can infer that the impact of national debt brakes on current-account balances is limited.

Additionally, the simulation exercise carried out in this chapter shows that Spanish public finances were sustainable in the pre-crisis years, whereas Germany's public finances were not. This finding clearly supports the view held by some economists such as De Grauwe (2011) that it is the coordination failure in the EMU and not government profligacy, which is key to resolving the current economic crisis of the EMU.

From the results of this present analysis two crucial policy conclusions can be drawn. First, the fiscal compact that contains the debt brake as a key component will not suffice to align EMU economies and even cannot prevent further divergent developments. Second, to tackle the structural problems of the EMU, European governments have to resort to measures that can effectively contain divergent developments among EMU economies such as union-wide automatic stabilisers. Therefore, a partly delegation of fiscal responsibilities to the EU level seems to be a sine qua non for restoring a balanced economic development in the EMU.

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Annex

Empirical approach and data

Macroeconomic and fiscal data are taken from the annual macroeconomic (AMECO) database of the European Commission's Directorate-General for Economic and Financial Affairs. Decomposed fiscal data stem from the IMF Government Finance Statistics.

A time-series approach is applied in order to avoid certain problems surrounding a panel-data approach, in particular 'parameter heterogeneity' (e.g. Temple, 2000), and to take account of the idiosyncratic nature of economic developments in EMU member states. [17] The estimations are carried out for the largest economy of the EMU, i.e. Germany. The data set for Germany ranges from 1970 to 2008. In order to ensure that the regressions are not spurious it has to be tested whether the chosen variables are stationary. For this I apply robust unit-root tests.[18] The bounds-testing procedure by Pesaran et al. (2001), which allows for I(0)- and I(1)-regressors, is applied to test for cointegation. Furthermore, the robust MM-estimator proposed by Yohai et al. (1991) is applied to the regressions in levels.[19]

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, i.e. the Schwartz Bayesian Information Criterion (BIC). 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:

$$abt(t) = \beta_0 + \beta_1\, abt(t\text{-}1) + \beta_{2,1}\, g_{prod}(t) + \beta_{2,2}\, g_{prod}(t\text{-}1) + \beta_{3,1} t_y(t) + \beta_{3,2} t_y(t\text{-}1) + \beta_4\, g_{prim}(t)$$
$$+\beta_{5,1}\, y_{ea3}(t) + \beta_{5,2}\, y_{ea3}(t\text{-}1) + \beta_6\, r(t) + \beta_7\, \theta_{pure}(t) + v(t) \tag{A1}$$

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

abt:= ratio of exports to imports

g_{prod}:= productive public expenditure, including education and
transport and communication infrastructure;

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

t_y:= total tax revenues;

y_{ea3} := aggregated GDP of France, Italy and Spain;

r:= real long-term interest rate of Germany (deflated by consumer price index)

θ_{pure}:= real exchange rate purified by other regressors of equation (A1).

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[17] For a more detailed account of the empirical approach see Colombier (2013).
[18] The results of the unit-root tests can be obtained upon request from the author.
[19] For the benefits of the high-breakdown MM-estimator see Colombier(2009, section II).

In order to be able to interpret the regression coefficients as elasticities, I use the ratio of exports to imports as the dependent variable, i.e. the adjusted balance of trade (abt).[20] Fiscal variables are expressed as a percentage of GDP. Note that to avoid collinearity between fiscal variables, estimations are either run with tax revenues (t_y) or public expenditure (see Colombier, 2009, 902). 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 (g_{prim}) 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 (see Table 3). Moreover, one can infer from macroeconomic theory that the real exchange rate (θ) depends on the same set of variables as net exports (abt) (Colombier, 2013). Thus, the real exchange rate is an endogenous variable. 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 (A1). Thus, the real exchange rate is 'purified' from the influence of the other regressors.

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[20] Note that the latter can be viewed as an equivalent to net exports (Colombier, 2013).

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***	0.61***	0.23	0.22	0.62***	0.56***	0.71***	t-1	0.45***	0.35***
		(0.11)	(0.17)	(0.19)	(0.20)	(0.20)	(0.18)	(0.23)		(0.12)	(0.12)
Real GDP EA3[a]	t, t-1	0.45***	0.57***	0.52**	0.52**	0.65**	0.53***	0.55**	t	0.40***	0.43***
		(0.10)	(0.16)	(0.19)	(0.19)	(0.23)	(0.16)	(0.22)		(0.10)	(0.08)
Productive public expenditure[b]	t, t-1	0.28**	0.46**	0.08	0.21	0.51**	0.41**	0.47**	t	0.28***	0.24**
		(0.10)	(0.18)	(0.17)	(0.16)	(0.22)	(0.19)	(0.21)		(0.10)	(0.10)
Non - productive primary public exp. [c]	t	-0.04	-0.02				-0.01		t	-0.18	
		(0.14)	(0.12)				(0.13)			(0.13)	
Tax revenues	t, t-1			-1.17*	-1.22*	-0.15		0.11	t		-0.66**
				(0.66)	(0.67)	(0.65)		(0.75)			(0.30)
Purified real exchange rate	t	0.30***			0.51***		0.15	0.11	t	0.38***	0.43***
		(0.11)			(0.17)		(0.20)	(0.24)		(0.10)	(0.10)
Real long-term interest rate	t		0.02			0.02***	0.02***	0.02***	t		
			(0.02)			(0.007)	(0.007)	(0.007)			
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; Ramsey reset test: H0: no misspecification, F 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: see Notes Table 1; Sargan's test on validity of instruments: Chi-square test statistic, H0: valid instruments.

[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[a]	t-1	-0.84 (0.55)	-0.51 (0.71)	-0.71 (0.60)	-0.79 (0.65)
Productive public expenditure[b]	t-1	-0.04 (0.10)	-0.02 (0.16)	-0.005 (0.11)	-0.03 (0.13)
Non-prod. primary public expenditure[c]	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.

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

Table 4a: Ex-post deficit ceilings under the debt brake – Germany (as % of GDP)[a,b,c]

Year	Δb	Δb$_c$	-ε*output gap	Δbc-Δb
		σ =0.35	ε=0.51	
2002	3.85	0.35	0.00	-3.50
2003	4.15	1.20	0.85	-2.95
2004	3.76	1.24	0.89	-2.52
2005	3.32	1.48	1.13	-1.85
2006	1.64	0.28	-0.07	-1.36
2007	-0.24	-0.71	-1.06	-0.47

[a] Red figures indicate breach of debt brake.

[b] Δb >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)[a,b,c]

Year	Δb [a]	Δb$_c$	-ε*output gap	Δbc-Δb
		σ =0.4	ε=0.44 [c]	
2002	0.21	-1.18	-1.58	-1.40
2003	0.35	-0.69	-1.09	-1.04
2004	0.11	-0.61	-1.01	-0.72
2005	-1.27	-0.84	-1.24	0.43
2006	-2.37	-1.55	-1.95	0.82
2007	-1.92	-1.66	-2.06	0.26

[a] Red figures indicate breach of debt brake.

[b] Δb >0:= deficit and vice versa.

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

Table 5a: Elasticities of net exports and fiscal variables applied to simulations

Dependent variable[a,b]	Variable	Elasticity							
		Long-term			Short-term			Girouard/ André (2005)	
		Min	Med	Max	Min	Med	Max	Germany	Spain
Net exports	Tax ratio	-0.03	-1.21	-2.39	0.12	1.29	2.47		
Net exports	Productive public expenditure	0.03	0.50	0.97					
Net exports	Non- prod. primary public expenditure				-0.01	-0.34	-0.67		
Tax revenues									
Personal tax[d]	Output gap							1.61	1.92
Indirect tax	Output gap							1.00	1.00
Primary public current expenditure	Unemployment gap[c]							-0.18	-0.15

Notes: Elasticity: min:= lower-bound value of the confidence interval of a statistically significant coefficient (see Table 1); max:= upper-bound value of the confidence interval; med:= median of statistically significant coefficients (see Table 1).

[a] Elasticity of net exports are taken from the estimations for Germany.

[b] For elasticity of tax revenues and current primary public expenditure see Girouard and André (2005, 22).

[c] Gap between the structural unemployment rate and the unemployment rate (see Girouard and André, 2005, 7).

[d] For simplification the elasticity of corporate taxes is not taken into account. As the elasticity of the corporate tax with respect to the output gap is lower than for a personal tax (Germany: 1.53; Spain 1.15), the results for the personal tax shown in Table 5b may be slightly overstated.

Table 5b: Simulating the impact of fiscal policy under a debt-brake rule on net exports for the period 2002-2007 (as % of GDP)

Variable	Net exports 2007	Net exports simulated 2007					
		Structural adjustment			Automatic stabiliser		
		Min	Med	Max	Min	Med	Max
Germany	7%						
Tax ratio		7%	4%	1%	7%	7%	6%
Prod. publ. exp.		8%	12%	2%			
Primary publ. current exp.					7%	7%	7%
Spain[a]	-7%						
Tax ratio		-7%	-7%	-7%	-5%	-2%	1%
Primary publ. current exp.					-7%	-7%	-7%

Notes: see Notes Table 5a.

[a] Data for productive public expenditure have not been available.