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What do deficits tell us about debt? Empirical evidence on creative accounting with fiscal rules in the EU

Jürgen von Hagen
(ZEI, University of Bonn, Indiana University, CEPR)

Guntram B. Wolff
(Deutsche Bundesbank, ZEI, University of Bonn)

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Deutsche Bundesbank, Wilhelm-Epstein-Strasse 14, 60431 Frankfurt am Main,
Postfach 10 06 02, 60006 Frankfurt am Main

Tel +49 69 9566-1
Telex within Germany 41227, telex from abroad 414431, fax +49 69 5601071

Please address all orders in writing to: Deutsche Bundesbank,
Press and Public Relations Division, at the above address or via fax No +49 69 9566-3077

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Abstract

Fiscal rules, such as the excessive deficit procedure and the stability and growth pact (SGP), aim at constraining government behavior. Milesi-Ferretti (2003) develops a model in which governments circumvent such rules by reverting to creative accounting. The amount of this creative accounting depends on the reputation cost for the government and the economic cost of sticking to the rule. In this paper, we provide empirical evidence of creative accounting in the European Union. We find that the SGP rules have induced governments to use stock-flow adjustments, a form of creative accounting, to hide deficits. This tendency to substitute stock-flow adjustments for budget deficits is especially strong for the cyclical component of the deficit, as in times of recession the cost of reducing the deficit is particularly large.

Keywords:

Fiscal rules, stock-flow adjustments, debt-deficit adjustments, stability and growth pact, excessive deficit procedure, ESA 95

JEL-Classification:

E62, H61, H62, H63, H70

Non Technical Summary

Fiscal rules are introduced to restrict profligate fiscal behavior of governments. In a monetary union, the incentive for profligate fiscal behavior arises from the fact that the cost of decentralized fiscal policies may be spread to all members of the union leaving the cost smaller for the individual country deciding on fiscal policy. Recognizing this problem, the governments of the EU have installed fiscal rules, i.e., the excessive deficit procedure (EDP) and the Stability and Growth pact (SGP), to strengthen fiscal discipline.

Fiscal rules necessarily refer to specific budgetary items and data. Governments can revert to creative accounting in order to circumvent fiscal rules by shifting budget items from these specific, restricted to non-restricted positions. Milesi-Ferretti (2003) presents a model in which governments circumvent fiscal rules by creative accounting. Creative accounting is more likely the higher the economic cost of sticking to the rule.

We provide empirical evidence for Milesi-Ferretti's predicitons. In particular, we first document stock-flow adjustments in the European Union which are computed as the first difference of debt levels minus the deficits. Positive stock-flow adjustments imply that the debt level has increased by more than it should have given the deficit. Stock-flow adjustments have been persistent and positive in many EU countries. Persistent positive stock-flow adjustments can result from capital injections, investment in public companies, transactions in financial assets, and other factors.

In a second step, we show evidence of creative accounting in EMU. The fiscal rules of EMU feature a limit on the deficit of 3 percent and on debt of 60 percent. The SGP in particular puts a large weight on the deficit limit. This holds true especially since in the European public debate, the loss of political reputation is significant for countries breaching the deficit limit, but not for those breaching the debt limit. As greater attention is paid to the deficit than to debt levels, we expect governments to shift (restricted) budgetary deficits to (non-restricted) deficits in form of stock-flow adjustments. Our regression analysis shows, that the fiscal rules in EMU have resulted in a systematic relationship between deficits and stock-flow adjustments. Higher stock-flow adjustments reduce the deficit. In addition, we confirm the prediction by Milesi-Ferretti (2003), that creative accounting is used as a cyclical tool. In fact, the cyclical component of the deficit is lowered by increasing stock-flow

adjustments after the introduction of the rule. We perform various control regressions and show that our results are robust to changes in specification. We conclude that the fiscal rules of EMU have induced governments to revert to creative accounting.

Nicht technische Zusammenfassung

Fiskalregeln zielen auf die Beschränkung von verschwenderischem Fiskalverhalten von Regierungen. In einer Währungsunion entsteht der Anreiz für verschwenderisches Verhalten dadurch, dass die Kosten der dezentralisierten Fiskalpolitik auf den gesamten Währungsraum verteilt werden können. Angesichts dieses Problems haben die Regierungen der EU Fiskalregeln, nämlich das Verfahren bei einem übermäßigen Defizit und den Stabilitäts- und Wachstumspakt, beschlossen, um so die finanzpolitische Disziplin zu erhöhen.

Fiskalregeln beziehen sich notwendigerweise auf spezifische Budgetpositionen und Daten. Regierungen können auf kreative Buchführung zurückgreifen, um die Fiskalregel zu umgehen. Dies kann geschehen durch Umbuchungen von Budgetposten von diesen spezifischen, beschränkten Positionen auf nicht beschränkte Positionen. Milesi-Ferretti (2003) entwickelt ein Modell, in dem Regierungen Fiskalregeln durch kreative Buchführung umgehen. Kreative Buchführung ist wahrscheinlicher, je größer die ökonomischen Kosten der Regelbefolgung sind.

Unser Papier legt empirische Evidenz für die Modell basierten Vorhersagen von Milesi-Ferretti vor. Im ersten Schritt dokumentieren wir "stock-flow" Anpassungen in der Europäischen Union, die als erste Differenz der Verschuldung minus dem Defizit berechnet werden. Positive "stock-flow" Anpassungen bedeuten, dass die Verschuldung stärker gestiegen ist, als sie auf Grund des Defizits hätte steigen sollen. "Stock-flow" Anpassungen waren in vielen EU Ländern persistent und positiv. Anhaltende positive "stock-flow" Anpassungen können von Kapitalinjektionen, Investitionen in öffentliche Unternehmen, Transaktionen in Finanzaktiva und anderen Faktoren herrühren.

In einem zweiten Schritt zeigen wir die empirische Evidenz für kreative Buchführung in der EWU. Die Fiskalregeln in der EWU zeichnen sich durch eine Beschränkung des Defizits auf 3 Prozent und der Verschuldung auf 60 Prozent des BIP aus. Der Stabilitäts- und Wachstumspakt betont besonders die Defizitgrenze. Dies gilt vor allem deshalb, weil in der öffentlichen europäischen Debatte der Verlust von Ansehen besonders groß ist für Länder, die die Defizitgrenze brechen, die Überschreitung des Verschuldungskriteriums wird dagegen offenbar als weniger gravierend empfunden. Da dem Defizit mehr Aufmerksamkeit gezollt wird, erwarten wir, dass Regierungen (beschränkte) Defizite in (nicht beschränkten) Defiziten durch "stock-flow" Anpassungen ver-

wandeln. Unsere Regressionsanalyse zeigt, dass die Fiskalregeln in der EWU zu einer systematischen Beziehung zwischen Defiziten und "stock-flow" Anpassungen geführt haben. Höhere "stock-flow" Anpassungen reduzieren das Defizit. Außerdem bestätigen wir die Vorhersage von Milesi-Ferretti (2003), dass kreative Buchführung als zyklisches Instrument verwendet wird. Die zyklische Komponente des Defizits wird durch Erhöhung von "stock-flow" Anpassungen reduziert. Verschiedene Kontrollregressionen bestätigen die Robustheit unser Ergebnisse gegenüber Veränderungen der Spezifikation. Wir schlussfolgern, dass die Fiskalregeln der EWU dazu geführt haben, dass Regierungen auf kreative Buchführung zurückgreifen.

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1 Introduction

Fiscal rules aim at constraining behavior of governments. They are introduced to reduce rent seeking behavior of politicians, to mitigate common pool problems and ultimately to prevent undesired fiscal outcomes (von Hagen 2002). The European Monetary Union (EMU) provides an important example. Governments in a monetary union have an incentive to run excessive deficits and accumulate excessive debts. Hight deficits and debt levels increase the pressure on the central bank to monetize them and create inflation. Anticipating this, the private sector adjusts inflation expectations upwards, resulting in higher nominal interest rates.[2] But since the (expected) inflation from monetizing a given amount of government debt is spread over all members of the monetary union, the cost of excessive deficits and debts in terms of higher inflation and interest rates is smaller, and the incentive for profligate fiscal behavior is larger, for each individual government than in the case of a national currency.

Recognizing this problem, the governments of the EMU member states have decided on a set of rules to strengthen fiscal discipline. The fiscal rules of the European Monetary Union (EMU) feature a limit on the annual general government budget deficit of three percent of GDP and a limit on general government debt of 60 percent of GDP. As many EMU countries exceeded the debt limit at the start of EMU, the deficit limit is considered to be the more important one.

Fiscal rules necessarily refer to specific budgetary items and data. Governments can shift fiscal expenditures off the budget, i.e., revert to creative

[1]Authors: Jürgen von Hagen, ZEI, University of Bonn, Indiana University and CEPR, vonhagen@uni-bonn.de; Guntram B. Wolff, Deutsche Bundesbank, Economics Department and ZEI, University of Bonn; Wilhelm-Epstein-Str.14, D-60431 Frankfurt am Main, email: guntram.wolff@bundesbank.de. We would like to thank Joerg Breitung, Kirsten Heppke-Falk, Heinz Herrmann, Jana Kremer, Wolfgang Lemke, Rolf Strauch, and the fiscal policy departments of the ECB and the Deutsche Bundesbank for many very helpful discussions. Research assistance by Sascha Heise is gratefully acknowledged. Remaining errors are ours. The opinions expressed in this paper do not necessarily reflect the views of the Deutsche Bundesbank or its staff.

[2]In the absence of perfect international capital mobility, high debt levels may also lead to higher real interest rates.

accounting, to circumvent the rules. Milesi-Ferretti (2003) analyzes the effect of fiscal rules on creative accounting in a model based on von Hagen and Harden (1995, 1996). In this model, the government has an incentive to circumvent the rule by hiding fiscal policies in less visible positions. The likelihood of creative accounting decreases in the cost the government has to bear if the cheating is detected. Furthermore, creative accounting is more likely, the higher the economic costs of sticking to the rule are. If strict rules hinder the appropriate handling of (business cycle) shocks, the likelihood of creative accounting will increase in the model.[3] When calculating an optimal fiscal rule, creative accounting should be taken into account such that the rule is stricter than an optimal rule in the absence of creative accounting.

The effects of fiscal rules have been investigated by a number of authors. The literature in general assesses the effect of a fiscal rule on the fiscal aggregate constrained by the rule and in a second step the effect of the rule on the other non-constrained fiscal positions. von Hagen (1991) empirically investigates the effects of fiscal restraints on state budgets in the US. Fiscal restraints effectively change the probability of fiscal outcomes, they also induce substitution of non-restricted for restricted debt instruments. Bunch (1991) and Sbragia (1996) show that debt limits on state or local governments in the US have led to increased use of non-constrained public authorities to issue debt. Poterba (1994) shows that more restrictive state fiscal institutions are correlated with more rapid fiscal adjustment to unexpected deficits. Kiewiet and Szakaly (1996) show that restrictive provisions to limit debt issuance at the state level result in the devolution of debt issuance to governments at the local level. Bohn and Inman (1996) find for a sample of 47 US states that only balance requirements enforced as constitutional (not statutory) constraints by an independently elected (not politically appointed) state supreme court do have significant positive effects on a state's general fund surplus. Strauch (1998) shows that constitutional expenditure limits in the US induce a shift from the (constrained) current budget to the (unconstrained) investment budget.

Dafflon and Rossi (1999) survey the accounting tricks governments used in the run-up to the Euro. They find that the methodological rules of the European system of accounts are weak and that numerous countries have used

[3]It is shown that more transparency of the budget is only desirable at very low levels of budget transparency, since in this case, governments tend to let the budget fluctuate too much. At high levels of transparency, a further increase of transparency would hinder the working of automatic stabilizers too much and is therefore not optimal.

tricks to qualify for EMU membership. Milesi-Ferretti and Moriyama (2004) investigate the measures taken by EU countries in the run up to EMU membership. They find that reductions in government debt have been accompanied with strong decumulation of government assets. The authors therefore argue that the fiscal rules of Maastricht have led to significant fiscal operations in the run up to the Euro, which improved the official figures but had no effect on the actual fiscal position of the government. The bottom line of this research is that fiscal rules do have an effect on the fiscal aggregates to which they refer. All authors have furthermore found that governments engage in activities to compensate for the loss of flexibility due to the rule. This is done by shifting fiscal activity from restricted to non-restricted instruments.

In this paper we extend this line of research and test the model by Milesi-Ferretti (2003). In particular, we document stock-flow adjustments in the European Union, which are computed as the first difference of debt levels minus the deficits. Positive stock-flow adjustments imply that the debt level has increased by more than it should have given the deficit. Stock-flow adjustments have been persistent and positive in many EU 15 countries. We then investigate the effect of the fiscal rules in Europe, more precisely of the excessive deficit procedure (EDP) and the Stability and Growth pact (SGP). The SGP in particular puts a large weight on the deficit limit in the EMU. This holds true especially since in the European public debate, the loss of political reputation is significant for countries breaching the deficit limit, but not for those breaching the debt limit. As greater attention is paid to the deficit, we expect that governments try to shift budgetary deficits (restricted) to non-budgetary deficits (non-restricted) in form of stock-flow adjustments. We find that these stock-flow adjustments are related to deficits after the fiscal rules have become effective. Recorded deficits have been lowered by increasing stock-flow adjustments, thus by shifting debt accumulation from the restricted to the non-restricted instrument. In addition, we confirm the prediction by Milesi-Ferretti (2003), that creative accounting is used as a cyclical tool. In fact, the cyclical component of the deficit is lowered by increasing stock-flow adjustments after the introduction of the rules.

The remainder of the paper is organized as follows: The next section presents accounting identities, data and measurement issues and the amount of stock-flow adjustment in the European Union. In section 3, we enlarge on our estimation strategy and present the evidence on creative accounting in the

EU, section 4 concludes.

2 Deficits and debt: stock-flow adjustments

2.1 Accounting identities

Standard textbooks in macroeconomics give Equation (1) as the fundamental relationship between deficits D and debt B. In this definition, the deficit is calculated as the difference between expenditure and revenue, where expenditure includes interest payments.

$$B_t = B_{t-1} + D_t \tag{1}$$

From this equation, one can derive that the current debt level is equal to the accumulated past deficits plus the initial debt level (Equation 2).

$$B_t = B_{t-n} + \sum_{i=0}^{n-1} D_{t-i} \tag{2}$$

In practice, Equation (1) does not always hold, if the deficit is defined as the difference between budgetary expenditures and revenues. A residual can be computed according to

$$B_t - B_{t-1} - D_t = SFA_t \tag{3}$$

This residual is called stock-flow adjustment, or debt-deficit adjustment. Note that a positive stock-flow adjustment means that the stock of government debt has increased between period t and $(t-1)$ by more than the budget deficit in period t indicates. The official definition shows that the concept of stock-flow adjustment is a residual statistical one. As the European Commission states, stock-flow adjustments "result primarily from financial operations, e.g., debt issuance policy to manage public debt, privatization receipts, impact of exchange rate changes on foreign denominated debt. In general, these should tend to cancel out over time. However, large and persistent stock-flow adjustments (especially if they always have a negative impact on debt developments) should give cause for concern, as they may be the result of the inappropriate recording of budgetary operations and can lead to large ex-post upward revisions of deficit levels." (European Comission, DG for Economic and Financial Affairs 2003, p.79).[4]

[4]For recent evidence on upward revisions because of persistent stock-flow adjustments, see Balassone, Franco, and Zotteri (2004).

2.2 Data and measurement issues

Deficit and debt figures very much depend on their precise definition and measurement (e.g., Blejer and Cheasty, 1991). In this article we use data published in the AMECO database, which is based on Eurostat data. This database was chosen as it forms the basis of the EDP and the SGP. Eurostat follows the ESA 95 accounting standard to measure deficits and debt. The data refer to the general consolidated government sector, which includes the central, state and local government and the social security sector.[5] The definition of debt under the EDP, on which our data is based, slightly differs from ESA 95, as debt is recorded at face value in the EDP and not at market value as in the ESA 95.[6]

Stock-flow adjustments result from five main issues: (1) Issuance of zero coupon bonds. Imagine a bond which is issued for 90 Euro to cover a deficit and has a face value of 110. This operation is recorded as a deficit of 90 and a stock-flow adjustment of 20 in the year of issuance, since the debt level at face value increases by 110. In the following 4 periods until maturity, an interest of 5 accrues, impacting on the deficit, the debt level stays constant, the stock-flow adjustment is -5 in each period. As can be seen, stock-flow adjustments of zero coupon issuances should cancel out over time. (2) Revaluation of debt denominated in foreign currency changes the face value of the debt, without having any impact on the budget. Revaluation of foreign denominated debt should only matter if a country has a depreciating currency over a long period. Foreign denominated debt does not play any significant role in any of the EU 15 countries. Exchange rate effects are less than 0.2 percent of GDP in general (ECB 2004, Table 6.3.2). (3) Time of recording effects: Deficits are measured in accrual terms, while debt is a cash concept. For example, when UMTS licenses are sold, this has an effect on the deficit in the year of selling, so when the receipts accrue, however, debt is only reduced when the (cash) receipts are used to buy back the debt. The time of recording effect should usually cancel out after some years.[7]

[5]For details on the precise definitions see Eurostat (2002, p.8-16)

[6]"Debt means total gross debt at nominal value outstanding at the end of the year and consolidated between and within the sectors of general government" (Eurostat 2002, p. 190).

[7]Interest accrued affects net borrowing/net lending. "For government debt under EDP (at nominal value, not including accrued interest) interest due but not paid is to be recorded under Other accounts payable (F.79), as long as it is not paid (ESA95, 5.131). In the EDP, interest arrears under Other accounts payable are not accounted for in the government debt"

The only two remaining issues, where long and persisting positive stock-flow adjustments can be expected, are investments in public companies and privatization of companies (4) and transactions in financial assets (5). Privatization (of financial assets) reduces gross debt, however it has no effect on the deficit according to the rules of the EDP and the SGP. Similarly, buying new companies, or providing additional finance to (state-owned) companies in form of capital injections, is not recorded as a deficit relevant operation, while it nevertheless increases the debt level.[8] In the case of transactions in financial assets (5), debt is a gross concept, while deficits are a net concept. If the government increases its deposits and issues debt, the effect on the deficit is zero, however gross debt increases. Similarly, investing budget surpluses in equity or buying equity by issuing debt results in positive stock-flow adjustments.

2.3 Debt vs. accumulated deficits: descriptive evidence

A natural test for the persistence of stock-flow adjustments is to compare the debt level (column B of Table (1)) with the accumulated deficits as described in Equation (2) (column C of Table (1)), both measured in percent of GDP of 2003.[9] Calculating the difference of actual debt levels and accumulated deficits in percent of GDP (B-C) shows that all countries have sustained positive stock-flow adjustments. Finland and Greece have 64 and 43 percentage points of GDP more debt than budget data suggest. They are followed by Denmark (30), Luxembourg (29), Germany (15), and Austria (14). The cases of Finland and Luxembourg are noteworthy as the debt level should be negative if one added the deficits and surpluses. In both countries, budget surpluses have thus been used in the last years to buy assets instead of paying back debt.

Extra-budgetary debt accumulation in the form of stock-flow adjustments thus plays a considerable role in many EU-15 countries, with substantial variations across countries.[10] Stock-flow adjustments constitute a significant part

(Eurostat 2002, p. 199). Thus, interest payments are recorded in the deficit when they accrue, even if they are not paid yet, and should in this case lower stock-flow adjustments as they are not recorded in the debt according to EDP. In the long-run, interest payments are without effect on stock-flow adjustment.

[8]The sale of non-financial assets, however, reduces the deficit, as it is recorded as negative investment or more precisely negative public "gross fixed capital formation".

[9]We thereby also test, whether Equation 2 holds.

[10]Also the US has a significantly higher debt level than given by the sum of deficits with a difference of 9 percent of GDP in the period 1980-2003.

Table 1: Debt and accumulated deficits in percent of GDP

Country	**debt, 1980**	**debt, 2003**	**sum of deficits**	**difference**
	A	**B**	**C**	**B-C**
Austria	36	66	52	14
Belgium	79	103	100	3
Denmark	36	43	13	30
Finland	11	45	-19	64
France	20	63	54	9
Germany	31	64	49	15
Greece	25	101	58	43
Ireland	75	33	25	8
Italy	58	106	99	7
Luxembourg	9	5	-24	29
Netherlands	46	55	53	2
Portugal	32	58	53	5
Spain	17	51	47	4
Sweden	40	52	50	2
United Kingdom	53	40	39	1

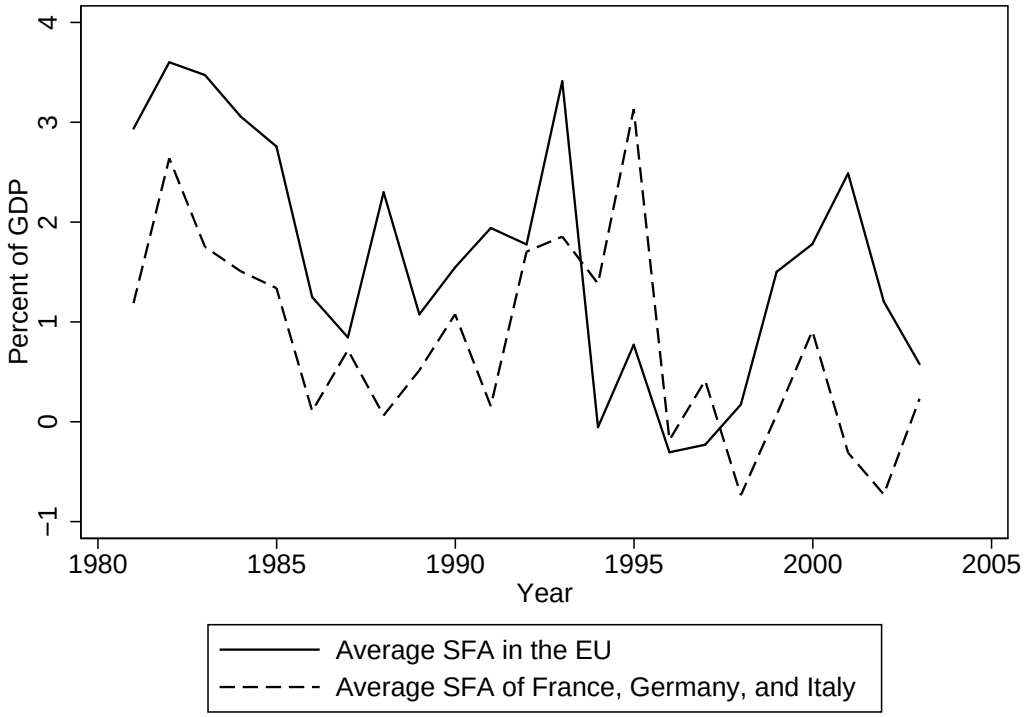
Source: Ameco, own calculations; The accumulated absolute deficits were added to the initial debt level of 1980 (column A) for all countries, except Greece (1988), Luxembourg and Ireland (1990), Sweden (1993), and Spain (1995) due to data constraints. This cumulative debt measure was divided by GDP of 2003.

of the overall debt accumulation in the member states of the EU. The (unweighted) annual average stock-flow adjustment in the EU amounts to 1.56 percent of GDP in the period 1981-2003. As Figure (1) shows, the unweighted average ratio of stock-flow adjustments to GDP is more than 3 percent in some years. Stock-flow adjustments are declining in the investigated period. In 1996, extra-budgetary debt accumulation was at its lowest. It increases again to more than two percent in 2001. A similar pattern can be seen for the average of three large EU economies, France, Germany and Italy. This result confirms the evidence presented in Milesi-Ferretti and Moriyama (2004), who show that gross debt was declining by selling assets and not by improving the inter-temporal position of the government in form of lowered deficits. This was a convenient way to fulfill the Maastricht criterion of falling debt levels for the highly indebted countries.

Stock-flow adjustments of selected countries deserve particular attention. In Germany, the debt level increased by more than 6 percent of GDP in addition to the deficit in 1995, when the German federal government officially assumed the debt previously hidden in the Treuhandanstalt.[11] In Greece,

[11]In fact, when the Treuhandanstalt was dissolved, the debt of 204 billion DM were carried forward to the Erblastentilgungsfond. The German statistical office wanted to classify this as an increase of the debt and of the deficit. Theo Waigel, the finance minister at the

Figure 1: Average stock-flow adjustments in percent of GDP.



Source: Ameco database, Author's calculation.

stock-flow adjustment was almost 19 percent in 1994, when the debt of the Greek government at the Bank of Greece was officially recorded as public debt. Denmark experienced a stock-flow adjustment of 10 percent in 1982 and 1993, Finland of 12 percent in 1992, Sweden of almost 8 percent in 2001. Portugal had values of above 8 percent in the mid 1980s. The negative stock-flow adjustment of Belgium in 1996 is noteworthy. This operation was designed to show that Belgium had a declining debt level and would therefore be qualified for EMU membership. It was a pure booking operation, with no actual reduction of the debt level by reduced spending or higher taxes. In summary, we find significant evidence for the existence of stock-flow adjustments. The period of negative stock-flow adjustment resulted from the Maastricht rules, which imposed either a debt level of 60 percent of GDP or below or falling debt levels in order to qualify for the EURO.

time, however objected and argued that this debt should not impact on the deficit according to the Maastricht criteria. Eurostat accepted this view, which explains the large stock-flow adjustment in this year (Münster, 1997). Münster further argues that this booking favorable to the fulfillment of the Maastrict criteria could be related to the fact that the independence of Eurostat is questionable because of the pressure of the Commissioner Yves-Thibault de Silguy.

2.4 Stock-flow adjustments as a measure of creative accounting

Accounting flexibility allows governments to have persistent positive stock-flow adjustments especially in the area of public companies and transactions in financial assets. Stock-flow adjustments might, however, be a weak measure of creative accounting if significant net acquisition of financial assets explains these adjustments. For example, a government, which invests budget surpluses in capital forming pension insurances would have long lasting positive stock-flow adjustments, without engaging in creative accounting. To test for this possibility, we check the correlation between the net acquisition of financial assets and stock-flow adjustment, both in percent of GDP and found an insignificant coefficient of 0.21 for the period and countries for which data were available, namely for the period 1996-2002, for Austria, Belgium, Finland, France, Germany, Italy, Netherlands, Portugal, and Spain.[12]

But even if stock-flow adjustment reflect asset acquisitions, this could still be a way to change official deficit figures. The data on asset acquisition do not reflect the evolution of the value of these assets. It is possible, that the asset acquisition is only a hidden subsidy, or capital injection into a company. The public company could then engage in standard public expenditure, driving down the value of its assets without any impact on the gross debt level of the government, nor on the net borrowing. Even though sales (privatization) of public companies are very present in the public debate, overall there might be more small and unnoticed capital injections explaining sustained positive stock-flow adjustment. In the regression analysis we perform several robustness checks to account for the possibility of large asset purchases, without finding any of our results changed. We therefore believe that stock-flow adjustments can be interpreted as a measure of creative accounting.

[12]The correlation coefficients have to be interpreted carefully as the data on assets refer to the non-consolidated general government sector, while the deficit and debt data are consolidated across government sectors. The data source for net asset accumulation is Annual National Financial Accounts (ANFA) dataset.

3 Fiscal rules and stock-flow adjustments

3.1 Approach

The descriptive data analysis shows that stock-flow adjustments matter in EU countries. Furthermore, stock-flow adjustments seem to have increased in recent years. One possible explanation for this could be the strict rule imposed on the deficit by the EDP and the SGP.

To test Milesi-Ferretti (2003)'s basic proposition that fiscal rules can induce governments to engage in "bad" or even "ugly" creative accounting, we investigate the relationship between deficits and stock-flow adjustments. The SGP is a fiscal rule with a particular focus on budget deficits. It requires the deficit to stay below the 3 percent reference value and to have a balanced budget in the medium term. An obvious way to reduce deficits without improving the inter-temporal fiscal position, is to shift deficits from the budget to stock-flow adjustments. This allows to keep the overall "true" deficit constant, while window dressing the reported deficit, to which the SGP applies.

More specifically, consider a government allocating expenditures and taxes optimally over time. Given its policy objective function, the government's optimal decision implies an optimal change in public debt, $\Delta B_t = \Delta B_t^*$. Recalling equation (3), the measured deficit in period t is $D_t = \Delta B_t - SFA_t$. Suppose that the government is subject to a fiscal rule prohibiting deficits in excess of some upper limit, D^*. The deficit limit then implies

$$D_t = \Delta B_t - SFA_t \leq D^* \tag{4}$$

We assume that, in the absence of a binding fiscal rule, the stock-flow adjustment is a random variable uncorrelated with the actual deficit. Hence, we do not expect a systematic relationship between stock-flow adjustments and the deficit before 1998. In the presence of a binding fiscal rule ($\Delta B_t^* \geq D^*$), however, the government uses the stock-flow adjustment actively to keep the deficit below the limit.[13] Given the optimal change in public debt the government wants to achieve, there is a negative correlation between the deficit and the stock-flow adjustment. Thus, we expect a significant negative relation between stock-flow adjustments and the budget deficit for the period 1998-2003, when the countries adopting the euro had to comply with the SGP.

[13]Note that, depending on the probability and cost of being caught with creative accounting, the optimal change in public debt is not necessarily the same with and without a deficit limit; see Milesi-Ferretti (2003).

In a first step we calculate the correlation coefficients between stock-flow adjustments and deficits in the two periods for all EU 15 countries. In the first period (1980-1997), the correlation is -0.03 and insignificant, in the second period (1998-2003) it is -0.53 and statistically significant.

This simple correlation analysis allows neither for country-specific effects nor for autocorrelation in the variables caused by business cycle fluctuations. We therefore employ the following more elaborate panel econometric approach. Remember that from identity (3), we know that the change of the total debt level in percent of GDP in country i at time t ($\Delta b_{it} = \frac{B_{it}-B_{i,t-1}}{Y_{it}}$) is the sum of stock-flow adjustment in percent of GDP (sfa_{it}) and the deficit in percent of GDP (d_{it}), i.e., $\Delta b_{it} = sfa_{it} + d_{it}$. The following regression allows to estimate the impact of the fiscal rule.

$$\Delta b_{it} = \alpha_0 + \alpha_1 sfa_{it} + \alpha_2 D_t + \alpha_3 sfa_{it} \cdot D_t + \mu_i + \varepsilon_{it} \tag{5}$$

where D_t is a dummy that takes a value of 1 for the years 1998-2003 and zero otherwise. For $D_t = 0$, α_1 is given by:

$$\begin{aligned} \alpha_1 &= \frac{cov(\Delta b_{it}, sfa_{it})}{var(sfa_{it})} \\ &= \frac{cov(sfa_{it} + d_{it}, sfa_{it})}{var(sfa_{it})} \\ &= \frac{var(sfa_{it}) + cov(d_{it}, sfa_{it})}{var(sfa_{it})} \\ &= 1 + \frac{cov(d_{it}, sfa_{it})}{var(sfa_{it})} \end{aligned} \tag{6}$$

If $\alpha_1 = 1$, we know that until 1997 the covariance between deficits and stock-flow adjustments is zero. A coefficient smaller (larger) one implies a negative (positive) covariance between *sfa* and d. The coefficient α_2 measures the effect of the dummy (the fiscal rule) on the level of the change in debt levels.

α_3 measures the effect of the fiscal rule on the relationship between *sfa* and the change in debt levels. For $D_t = 1$, $\alpha_1 + \alpha_3$ are given by:

$$\alpha_1 + \alpha_3 = 1 + \frac{cov(d_{it}, sfa_{it})}{var(sfa_{it})} \tag{7}$$

Given that our hypothesis of no relation between d and *sfa* before the introduction of the rule holds true, i.e., $\alpha_1 = 1$, the coefficient α_3 then directly measures the covariance between deficits and stock-flow adjustments after 1997. A negative coefficient α_3 implies, that the covariance between deficits and stock-flow

adjustments became negative in the second period. An increase in the stock-flow adjustment (sfa_{it}) would therefore result in a lower deficit.

Alternatively, we can perform the following regression:

$$\Delta b_{it} = \beta_0 + \beta_1 d_{it} + \beta_2 D_t + \beta_3 d_{it} \cdot D_t + \mu_i + \varepsilon_{it} \tag{8}$$

where D_t is again a dummy that takes a value of 1 for the years 1998-2003 and zero for the years before. The effect of the fiscal rules (the treatment effect) can then be calculated accordingly. A negative coefficient β_3 implies, that an increase in the deficits (d_{it}) results in a lower stock-flow adjustment as a consequence of the introduction of the fiscal rule. The coefficients β_3 and α_3 should be of the same sign as they reflect the same covariance. The advantage of the second approach in Equation (8) is that we can separate the correlation of the structural balance with stock-flow adjustments from correlation of the cyclical part of the deficit with stock-flow adjustments.

An obvious problem of this approach is that we have a simultaneous equation bias, which renders the least square estimator inconstistent (Gujarati (1995, pp. 642) and Greene (2000, pp. 652)). We therefore ran two stage least square instrumental variable estimators and instrumented with the lag of the variable. However, in this approach we cannot take account of serial correlation. Serial correlation can be expected as the change in the debt level Δb depends on the business cycle.

We therefore specify a dynamic panel model with the lagged dependent variable included as a regressor. We use the dynamic panel estimator by Arellano and Bond (1991), restricting the number of lagged levels to 5 in the instrument set.[14] To address the simultaneous equation bias, we explicitly allow *sfa* and $D \cdot sfa$ to be endogenous variables. This means that all possible lags until $t-1$ of the two variables in levels are included as instruments for the two endogenous variables.

3.2 Regression results

The empirical results are shown in Table (2). Stock-flow adjustments, as the accounting identity suggests, contribute to the change in the debt level with a coefficient close to one, the 95 percent confidence interval for regression 1 is [0.819,0.992]. Increasing stock-flow adjustment per GDP by 1 percentage

[14] An extension of the instrument set to all possible lags did not change any of our results.

Table 2: Measuring the impact of fiscal rules, benchmark results

	1		2		3	4
sfa	**0.91**	deficit	**0.85**	CAB	**0.80**	**0.82**
	0.04		0.07		0.08	0.07
D	**-1.55**	D	**1.81**	D	**-1.42**	**-1.44**
	0.33		0.46		0.48	0.49
D*sfa	**-0.25**	D*deficit	**-0.32**	D*CAB	**-0.21**	**-0.20**
	0.08		0.10		0.12	0.12
				CD	**1.15**	**1.01**
					0.13	0.13
				D*CD	**-0.88**	**-0.83**
					0.24	0.25
cons	**0.04**	cons	**-0.19**	cons	**0.18**	**0.19**
	0.03		0.03		0.03	0.03
LDV	**0.51**	LDV	**0.17**	LDV	**0.17**	**0.17**
	0.03		0.05		0.05	0.05
obs	263	obs	263	obs	263	263
Sargan p	0.88	Sargan p	1	Sargan p	1	1
autocorr 2, p	0.50	autocorr 2, p	0.76	autocorr 2, p	0.59	0.59

Note: D=1 if year>1997. LDV refers to the lagged dependent variable. CAB=Cyclically Adj. Balance*(-1), CD= Cyclical component. Standard errors are reported below the coefficients. Method: Arellano Bond dynamic GMM panel estimator.

point results in roughly one additional percentage point debt level per GDP. However, this changed in the second period, when an increase in stock-flow adjustment results in $\alpha_1 + \alpha_3$ additional debt, stock-flow adjustments do not translate into higher debt on a one to one basis. As the coefficient α_1 is statistically not different from 1, the estimated coefficient α_3 represents the covariance between stock-flow adjustments and the deficit in the second period, which we find to be significantly negative. In fact, the effect of the fiscal rules is such, that an increase in stock-flow adjustment has a negative effect on the deficit. In regression (1) of Table (2), an increase of *sfa* by 1 percentage point results in a -0.25 percentage point lowering of the deficit. This suggests that stock-flow adjustment is used instead of the deficit in the time period when the fiscal rule was in place. In the earlier period, the regression results do not imply any correlation between stock-flow adjustment and deficits. Thus, our results indicate that the introduction of the fiscal rule led governments to systematically use stock-flow adjustment instead of deficits.[15]

[15]It is possible that strong negative shocks to the budget induce the government to increase deficits and stock-flow adjustments, thereby causing a positive correlation. Our result

The results based on regression equation (8) confirm this finding: In the first period, there is no systematic relationship between stock-flow adjustment and deficits, while in the second period a negative co-variance emerges.[16] An increase in the deficit by one percentage point is associated with a lowering of the stock-flow adjustments by -0.32 percentage points (regression 2 of Table 2).

We then separate the effect of the cyclically adjusted deficit and the cyclical component of the deficit (regression 3 and 4 of Table 2). We use the two official, cyclical adjusted balances of the European Commission, one is based on an HP-filtered trend, the other is based on the output gap in a structural model.[17] In the regression, we include the cyclically adjusted deficit (CAB) also called structural deficit and the cyclical part of the deficit (CD). Again the coefficient on the first period is close to 1 as we expect for the structural deficit and for the cyclical deficit. Thus, in the first period we do not find a significant correlation between deficits and stock-flow adjustments. For the second period, however, there is a clear negative correlation between the structural deficit and stock-flow adjustments for both calculation methods similar in magnitude to the previously estimated coefficient.[18] The cyclical component of the deficit and stock-flow adjustments in the second period are very strongly negatively correlated. In fact, an increase in the cyclical deficit in the second period is almost completely offset by reductions in stock-flow adjustments, indicating that stock-flow adjustments are used to weaken the impact of the cycle on the deficit.

3.3 Robustness checks

To check the robustness of our results, we omit a number of countries and observations, as presented in Table (3) for regressions based on Equation (5) and Table (4) for regressions based on Equation (8). Finland and Sweden

is strengthened, since we find the negative relationship to prevail. The systematic use of creative accounting thus outweighs possible shocks (e.g., resulting from control errors) affecting the deficit and stock-flow adjustments in the same direction.

[16]The 95 percent confidence interval for β_1 is [0.705;0.993]. The H_0 that $\frac{\beta_3}{1-\rho_{LDV}} = 1$ cannot be rejected with a p-value of 0.71. The coefficient β_3 for the interacted term thus again measures the covariance.

[17]For details on the de-trending methodologies of the EU, see European Comission, DG for Economic and Financial Affairs (2004, pp.79).

[18]In most EU countries, the structural deficit represents the largest part of the total deficit.

Table 3: Robustness check: Measuring the impact of fiscal rules

	1	2	3	4	5	6
sfa	**0.95**	**0.97**	**0.94**	**0.88**	**0.89**	**0.95**
	0.04	0.04	0.05	0.05	0.05	0.05
D	**-1.11**	**-1.31**	**-1.16**	**-0.88**	**-1.84**	**-0.91**
	0.31	0.32	0.31	0.37	0.37	0.42
D*sfa	**-0.40**	**-0.38**	**-0.33**	**-0.32**	**-0.18**	**-0.36**
	0.09	0.10	0.10	0.09	0.08	0.08
cons	**-0.02**	**-0.01**	**0.00**	**0.00**	**0.03**	**-0.14**
	0.03	0.03	0.03	0.03	0.03	0.05
LDV	**0.45**	**0.44**	**0.46**	**0.53**	**0.50**	**0.41**
	0.03	0.03	0.03	0.03	0.03	0.04
obs.	233	221	220	212	221	183
Sargan p	0.98	0.99	1.00	1.00	1.00	0.99
Autocorr 2, p	0.86	0.80	0.75	0.75	0.43	0.87
omitted	SE, FI	SE, FI, LU	SE, FI, GR	SE, DK, UK	DE, FR	<1991

Note: D=1 if year>1997. LDV refers to the lagged dependent variable. Last line refers to which observations were omitted. Standard errors are reported below the coefficients. Method: Arellano Bond dynamic GMM panel estimator.

are dropped, as Finland had positive stock-flow adjustment because of budget surpluses invested into assets, and so did Sweden in some years. We also drop Finland, Sweden, and Luxembourg, as all three countries had positive stock-flow adjustments because of asset purchases (regression 2). Also some of the Greek figures might be distorted in the early to mid-nineties, and we also know that the data in the later years were wrongly reported (regression 3). Then we also drop the three non-Euro countries, which are officially subject to the fiscal rules, however, without being subject to fines in case of non-compliance (regression 4). In a further regression, we drop Germany and France, as it might be difficult to enforce sanctions against them. They might therefore be less constrained by the fiscal rule (regression 5). We also exclude the observations from the 1980s, as in this period, the emergence of any set of rules was not discussed (regression 6). None of these control regressions changes our results.[19]

In Table 5 we check, whether our results are driven by asset accumulation. To this aim, we eliminate all observations with budget surpluses (regression 1), as one might argue that in times of surplus, no need for creative accounting

[19]With the robustness check, we show that the significance of our regression coefficients does not depend on the choice of countries and methods. It is not possible, however, to compare the magnitude of the regression coefficients, since the standard errors are too large.

Table 4: Robustness check: Measuring the impact of fiscal rules

	1	2	3	4	5	6
deficit	**0.88**	**0.91**	**0.91**	**0.81**	**0.84**	**0.88**
	0.08	0.09	0.08	0.08	0.08	0.10
D	**1.77**	**1.87**	**1.91**	**1.50**	**2.14**	**1.38**
	0.48	0.52	0.41	0.49	0.53	0.65
D*deficit	**-0.27**	**-0.23**	**-0.27**	**-0.28**	**-0.31**	**-0.36**
	0.12	0.15	0.11	0.11	0.12	0.12
cons	**-0.16**	**-0.17**	**-0.16**	**-0.17**	**-0.23**	**-0.18**
	0.04	0.04	0.03	0.04	0.04	0.08
LDV	**0.20**	**0.18**	**0.22**	**0.18**	**0.17**	**0.08**
	0.06	0.06	0.05	0.06	0.06	0.07
obs.	233	221	220	212	221	183
Sargan p	1.00	1.00	1.00	1.00	1.00	1.00
Autocorr 2, p	0.34	0.34	0.44	0.68	0.83	0.80
omitted	SE, FI	SE, FI, LU	SE, FI, GR	SE, DK, UK	DE, FR	<1991

Note: D=1 if year>1997. LDV refers to the lagged dependent variable. Last line refers to which observations were omitted. Standard errors are reported below the coefficients. Method: Arellano Bond dynamic GMM panel estimator.

exists and stock-flow adjustments are not a proxy of creative accounting.[20] In regression 2, we omitted all observations with a deficit of less than 2 percent (a balance of more than −2 percent) of GDP and find our main result confirmed, stock-flow adjustments are used to reduce the deficit also in countries with high deficit levels. We further address the concern that stock-flow adjustments reflect asset accumulation by including net asset transactions (regression 3 and 4). If stock-flow adjustments reflect asset accumulation, changes in assets should contribute to the part of the change in debt level, which is not explained by deficits. The inclusion of this variable does not significantly contribute to debt accumulation.[21] Furthermore, the other coefficients remain unaffected, as compared to regression 4.

To show the robustness of our results to changes in the methodology, we

[20]It is however not clear, why the public sector should invest in financial assets. On the one hand, the interest rate paid on government debt is lower than the interest rate received from financial assets like stock. On the other hand, government officials will probably not invest optimally, as they do not have to bear the consequences of their investment decisions. Furthermore, many investments in, e.g., Finland took place in 2000/2001, when stock markets were probably over-valued.

[21]Net asset accumulation was on average between 0.5 and -0.1 percent of GDP, a relatively small figure compared to the stock-flow adjustment. Since we only had limited data on assets, we do not present these regression results with the more sophisticated method of the Arellano Bond GMM estimator.

Table 5: Robustness checks for asset accumulation: Measuring the impact of fiscal rules

	1	2		3	4
sfa	**0.99**	**0.95**	deficit	**1.1**	**1.0**
	0.04	0.04		0.2	0.2
D	**-0.29**	**0.41**	D	**2.4**	**2.3**
	0.37	0.42		0.8	0.7
D*sfa	**-0.52**	**-0.38**	D*deficit	**-0.7**	**-0.7**
	0.11	0.14		0.2	0.2
			Δ Asset	**-0.3**	
				0.3	
cons	**0.00**	**-0.08**	cons	**-0.6**	**-0.5**
	0.03	0.03		1.0	1.0
LDV	**0.46**	**0.39**			
	0.03	0.03			
obs.	199	151	obs	63	63
Sargan p	0.94	1.00	R^2	0.49	0.49
Autocorr2, p	0.51	0.98			
omitted	surplus	>-2 balance			
method	Arellano Bond	Arellano Bond		pcse	pcse

Note: D=1 if year>1997. LDV refers to the lagged dependent variable. "omitted" refers to which observations were omitted. Standard errors are reported below the coefficients. Methods: Arellano Bond GMM estimator, panel corrected standard errors (pcse).

also report the results of a non-dynamic model, neglecting the simultaneous equation bias (Table (6)).[22] OLS and fixed effect regressions yielded similar results.[23] To control for heteroscedasticity, we also run generalized least squares. However, Monte-Carlo simulations by Beck and Katz (1995) show that GLS provides over-optimistic standard errors in panels of our size, therefore we present the panel corrected standard error results in the Tables. Overall, the model fits the data reasonably well. The size of the coefficients is slightly larger than in the Arellano-Bond GMM estimator, as expected. In the entire investigated period, the average debt accumulation per year given stock-flow adjustments of 0 percent of GDP was roughly 4.5 percent of GDP, in the second period it went however down by almost three percentage points. In this sense the "treatment", the introduction of fiscal rules is successfully reducing debt accumulation, especially the recorded deficit. α_3 remains statistically significant and negative. In the second period, an increase in the deficit by one

[22]For the regressions with different countries dropped, see Tables (7)-(8) in the appendix

[23]The F-test on the fixed effects indicates that country specific effects are significant.

percentage point resulted in roughly -0.3 lower deficits. The coefficients for the cyclical and structural component of the deficit are similar to the benchmark regressions. Especially the cyclical part of the deficit is offset by an equally strong movement of stock-flow adjustments.

We conclude that the regression coefficients robustly capture the impact of fiscal rules in Europe. Our results confirm the model-based predictions by Milesi-Ferretti (2003). In particular, we show that the fiscal rule has resulted in the systematic use of stock-flow adjustments to reduce deficits. This is especially relevant for the cyclical component of the deficit.

4 Conclusions

The imposition of fiscal rules is seen as a way to reduce the bias in political decision making, that makes fiscal policy deviate from what is seen to be optimal for society as a whole. EU countries have decided on a set of rules to constrain deficits and thereby achieve sustainable public finances.

We have tested the hypothesis that governments try to circumvent fiscal rules by means of creative accounting. Our empirical evidence indicates that the introduction of the stability and growth pact and the excessive deficit procedure in Europe have resulted in creative accounting. While stock-flow adjustments have significantly contributed to debt accumulation in the last twenty years in Europe, only after the introduction of the fiscal framework in Europe a systematic relationship between these adjustments and deficits can be detected. Furthermore, this use of creative accounting is especially responsive to cyclical parts of the deficit, where the associated costs of the non-state-contingent fiscal rule are high. Our results confirm the vulnerability of fiscal rules due to creative accounting.

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A Appendix

Table 6: Robustness check: Measuring the impact of fiscal rules with different methodologies.

Δb_{it}	OLS	FE	PCSE	Δb_{it}	OLS	FE	PCSE	PCSE	PCSE
sfa	**0.96**	**1.07**	**0.98**	deficit	**0.98**	**1.04**	**1.01**		
	0.09	0.07	0.05		0.05	0.06	0.08		
D	**-3.56**	**-3.63**	**-2.37**	D	**-0.4**	**-0.16**	**-0.2**	**-0.53**	**-0.52**
	0.54	0.38	0.78		0.4	0.39	0.57	0.61	0.59
D*sfa	**-0.53**	**-0.41**	**-0.32**	D*deficit	**-0.46**	**-0.46**	**-0.47**		
	0.19	0.13	0.11		0.12	0.11	0.13		
cons	**4.34**	**4.15**	**4.13**	cons	**1.73**	**1.48**	**1.07**	**1.11**	**1.24**
	0.3	0.21	0.93		0.28	0.29	0.66	0.52	0.53
				CAB				**1**	**0.95**
								0.069	0.07
				D*CAB				**-0.34**	**-0.34**
								0.15	0.15
				CD				**1.21**	**1.39**
								0.17	0.17
				D*CD				**-0.98**	**-1.12**
								0.36	0.34
R^2	0.43	0.61	0.71	R^2	0.69	0.67	0.71	0.79	0.79
obs	293	293	293	observations	293	293	293	293	293
ctr. d.	no	no	yes	ctr. d.	no	no	yes	yes	yes
				output				trend	potential

Note: D=1 if year>1997. In the panel corrected standard error (PCSE) regressions we took account of possible autocorrelation in the error term. FE refers to standard fixed effect regressions.

Table 7: Robustness check: Measuring the impact of fiscal rules

Δb_{it}	PCSE	PCSE	PCSE	PCSE	PCSE	PCSE
sfa	**1.00**	**1.02**	**1.09**	**0.94**	**0.98**	**1.03**
	0.06	0.06	0.07	0.06	0.06	0.06
D	**-2.31**	**-2.56**	**-2.13**	**-2.18**	**-2.94**	**-2.82**
	0.69	0.70	0.64	0.69	0.82	0.79
D*sfa	**-0.39**	**-0.39**	**-0.41**	**-0.33**	**-0.3**	**-0.44**
	0.12	0.14	0.14	0.13	0.12	0.11
cons	**4.08**	**4.25**	**3.92**	**4.03**	**4.45**	**4.35**
	0.84	0.85	0.84	0.87	0.88	0.78
R^2	0.75	0.76	0.71	0.71	0.72	0.77
obs	259	245	244	236	247	189
ctr. dummies	yes	yes	yes	yes	yes	yes
ommitted	SE, FI	SE, FI, LU	SE, FI, GR	DE, FR	SE, DK, UK	<1990

Note: D=1 if year>1997. In the panel corrected standard error (PCSE) regressions we took account of possible autocorrelation in the error term.

Table 8: Robustness check: Measuring the impact of fiscal rules

Δb_{it}	PCSE	PCSE	PCSE	PCSE	PCSE	PCSE
deficit	**1.11**	**1.14**	**1.18**	**0.97**	**1**	**1.06**
	0.09	0.10	0.08	0.08	0.08	0.11
D	**0.11**	**0.23**	**0.32**	**-0.36**	**-0.23**	**0.61**
	0.53	0.66	0.51	0.51	0.68	0.6
D*deficit	**-0.44**	-0.38	**-0.49**	**-0.41**	**-0.48**	**-0.5**
	0.12	0.17	0.11	0.13	0.15	0.16
cons	**0.64**	**0.46**	**0.35**	**1.24**	**1.11**	**0.46**
	0.64	0.69	0.63	0.63	0.73	0.61
R^2	0.75	0.75	0.75	0.74	0.71	0.74
observations	259	245	244	236	247	189
ommitted	SE, FI	SE, FI, LU	SE, FI, GR	DE, FR	SE, DK, UK	<1990

Note: D=1 if year>1997. All regressions include country dummies. In the panel corrected standard error (PCSE) regressions we took account of possible autocorrelation in the error term.

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