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CHANGES? THE EMU CASE

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Abstract

This paper studies the experiences with fiscal adjustments in the European Union (EU) countries during the transition period to the Economic and Monetary Union (EMU). Using several approaches suggested in the literature on fiscal adjustments and their macroeconomic effects and in the literature on EMU, we analyze the effects of the fiscal adjustments during this period on private consumption. Thereby, we also take the specific context of the transition towards EMU explicitly into consideration. At best mixed evidence for the presence of non-linearities in the relation between fiscal adjustments and private spending is obtained. There is no clear-cut evidence for the hypothesis of "expansionary fiscal contractions" which may have alleviated the burden from fiscal consolidation in the EMU case. The sensitivity of the results for a number of factors is also checked.

JEL Classification: E32, F43.

Keywords: Fiscal Retrenchment, EMU.

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1.   Introduction

In recent years fiscal adjustments and their macroeconomic effects have received a renewed interest among policymakers and academic researchers alike. Giavazzi and Pagano (1990) were among the first to find that fiscal adjustments do not always have the standard Keynesian effects on private spending. Instead, under certain circumstances fiscal consolidations boost private spending to such an extent that the contractionary Keynesian spending effects are reversed. In a similar fashion, fiscal expansions do not always lead to an increase in private spending but may under certain circumstances induce a reduction in private spending. Given these possibilities, the relationship between fiscal policy changes and private spending may turn out to be non-linear. Theoretical models that consider this non-linearity in the relation between fiscal adjustments and private spending were developed by Bertola and Drazen (1993) and Sutherland (1995). In these models the non-Keynesian effects of fiscal policy are grounded upon the positive wealth, expectational and supply-side effects of fiscal consolidations that may be induced.

In an influential empirical paper, Giavazzi and Pagano (1996) estimate the effects of fiscal adjustments on private consumption and find evidence for such non-linearities in the relation between private spending and budgetary adjustments for a panel of nineteen OECD countries during the period 1970-1992. They emphasize that two factors are in particular relevant in order to assess these non-linearities: (i) the size and persistence of the fiscal adjustment and (ii) the initial conditions under which this budgetary adjustment is undertaken (Giavazzi and Pagano, 1996, p.85). Giavazzi and Pagano (1996) focus exclusively on the first factor and find evidence for non-linear effects of fiscal adjustments on private consumption. Perotti (1999) is a recent example of a study that concentrates on the second factor: the initial fiscal stance. For the same panel of nineteen OECD countries but for a larger sample period (1965-1994) he finds that initial conditions can also account for a non-linear relationships between private spending and fiscal adjustment.

This paper tests for a set of EU-countries for non-linearities in the relation between private consumption and fiscal adjustment during the transition period 1990-1998 that led from the Maastricht Treaty to the establishment of EMU. In order to be admitted to the EMU the Maastricht Treaty stipulated –apart from monetary convergence criteria- two fiscal convergence criteria: the 3% fiscal deficit norm and the 60% government debt norm. The underlying motivation for these norms was the fear that fiscal irresponsibility in individual countries, resulting in excessive deficits and government debt accumulation, may risk the sustainability of the entire monetary union in the long run. In this respect, the period leading up to the start of EMU on January 1st 1999 provides an unique experiment to test for the impact of fiscal adjustments on private spending and to see how this impact might be related to the size and persistence of fiscal adjustments and the initial conditions under which they take place.

To assess the relevance of a non-linear relationship between private consumption and fiscal adjustment, we use the specification of the consumption function as proposed by Giavazzi and Pagano (1996). Our sample period starts in 1990 since that years marks (the start of the discussions about) the introduction of the fiscal convergence criteria, whereas 1998 is the last 'pre-EMU' year and the final evaluation of a country's readiness to join EMU took place in 1998. Based on the existing literature on fiscal adjustments and on the contents of the Maastricht-criteria we consider eight fiscal regime indicators. In section 2 we test for the effects of fiscal adjustments on private consumption taking into account (i) the size and persistence of budgetary adjustments and (ii) the initial conditions in which budgetary adjustments occurred. We then test for (iii) the combined effect of size and persistence of budgetary adjustment as well as initial conditions. Next, we take into consideration (iv) whether budgetary adjustments are successful in the sense of having a lasting effect on government debt. Finally, (v) we take explicitly into consideration the requirements of the Maastricht criteria.

To check the robustness of the results, section 3 provides a check on the sensitivity of the outcomes on a number of factors. First, it is checked how extending the sample period to the period 1970-2000 affects the estimation results. Next, we also estimate the consumption function for a set of non-EMU countries. Finally, we experiment with alternative specifications of the basic consumption equation, notably by including the real interest rate.

In the end our main conclusion is that there is no strong evidence in favour of a non-linear relationship between fiscal adjustment and consumption in the period leading up to the establishment of the EMU. Compared to episodes without fiscal adjustments we find some impact of fiscal adjustments on private consumption but this impact is too weak in order to yield a significant expansionary spending effect of fiscal contractions.

## 2.   Fiscal Adjustments, Consumption and the Transition towards EMU

During the 1990s many EU countries have undertaken substantial fiscal adjustments. It should be noted that the fiscal consolidations that these countries undertook in the 1990s do not only reflect the need/wish to comply with the convergence criteria of the Maastricht criteria. They also are the result of the generally accepted notion that without a sizeable fiscal retrenchment, the fiscal situation risked to become largely unsustainable in the long run and a major threat to the international competitiveness of the European economies.[1]

That the transition phase to EMU has been accompanied by considerable fiscal consolidation efforts in the EU is clearly demonstrated in Figure 1. This figure displays three fiscal indicators to assess budgetary stances in the EU during the period 1970-2000. The Blanchard fiscal impulse (dotted line, right scale) is defined as the structural primary fiscal deficit as a fraction of potential output and serves as an indicator of discretionary policy changes, see Blanchard (1990). A negative value of the Blanchard fiscal impulse implies a

primary deficit and an expansionary fiscal impulse consequently. The primary gap (dashed line, right scale) measures the difference between the primary deficit that would stabilize government debt at its current level and the actual primary deficit (both as a fraction of GDP) and is an indicator of fiscal sustainability, see also Blanchard (1990). A positive value of the primary gap indicates that the actual primary surplus is smaller than the one required to achieve government debt stabilization at the current level. The present discounted value of the government financing needs (as a fraction of GDP) (solid line, left scale), L, has been introduced by Perotti (1999) as an indicator of initial fiscal conditions. A high value of L results in case of a high level of initial government debt and/or high levels of expected government spending. The government financing need, therefore, is a good indicator of initial fiscal conditions and fiscal sustainability.

Figure 1

Fiscal Positions of 14 EU Countries , 1970-2000
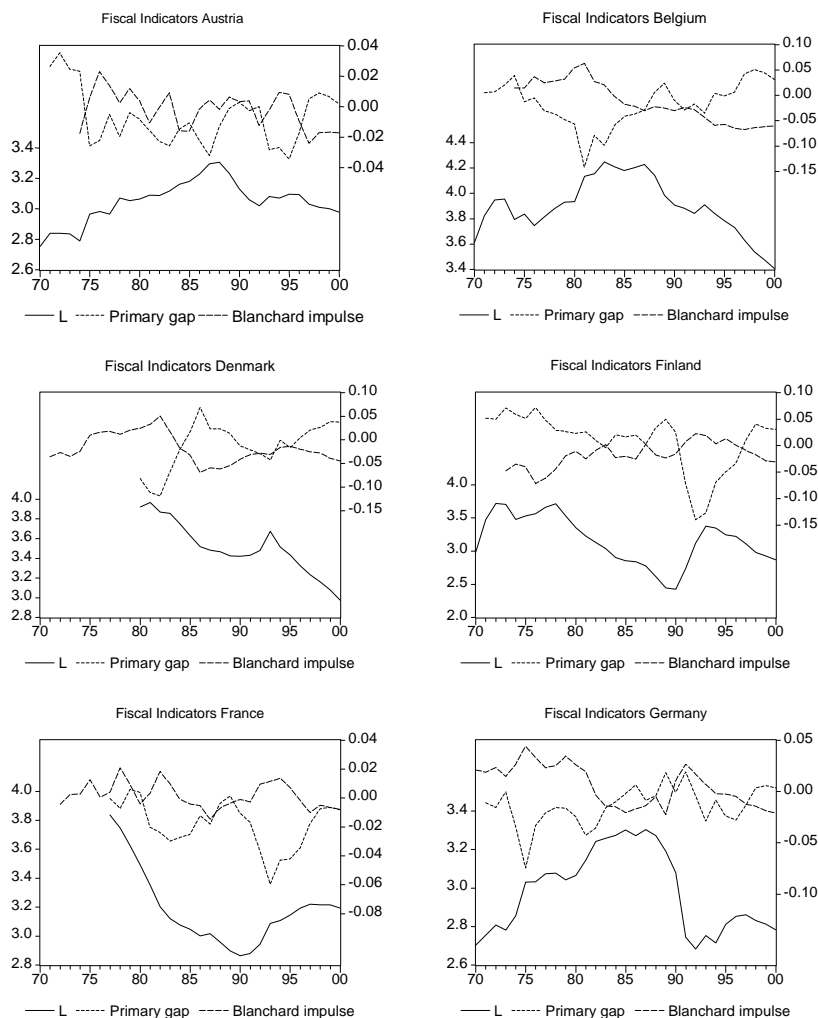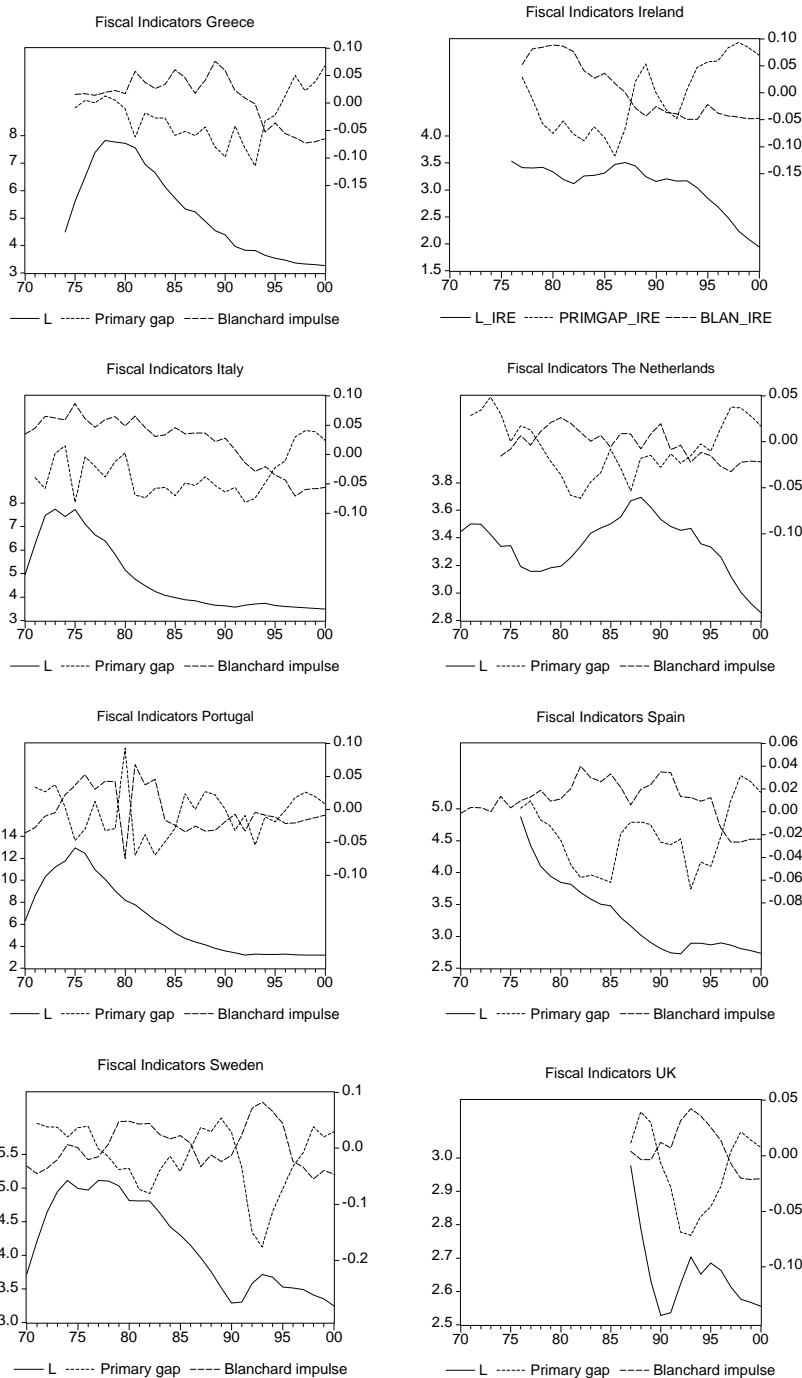
Note:
-Blanchard fiscal impulse (dotted line, right scale): the structural primary fiscal deficit as a fraction of potential output,
-primary gap (dashed line, right scale): the difference between the primary deficit that would stabilize government debt at its current level and the actual primary deficit (both as a fraction of GDP),
-L, government financing needs (as a fraction of GDP) (solid line, left scale): the sum of initial debt and the discounted value of future government spending, using a five-year time horizon.
Source: own calculations from OECD (2000a) and (2000b).

The indicators clearly suggest significant fiscal consolidation in most EU countries from 1993 onwards. The picture contrasts to a large extent with the earlier experiences of the period 1975-1990 when many countries in the EU experienced considerable fiscal expansions and increasing fiscal deficits and government debt. Detailed and insightful accounts of the

individual country experiences with fiscal expansions and consolidations can be found in Perotti, Strauch and von Hagen (1997) and Hughes Hallet, Strauch and von Hagen (2001).

Like Giavazzi and Pagano (1996), we estimate the following empirical specification of the consumption function[2],

$$\Delta \log(c_t) = \alpha_1 \log(c_{t-1}) + \alpha_2 \Delta \log(y_t) + \alpha_3 \log(y_{t-1}) + \alpha_4 \Delta \log(y_t^{OECD}) + \alpha_5 \log(y_{t-1}^{OECD})$$
$$+ (1 - D_t)(\gamma_1 \Delta \log(\tau_t) + \gamma_2 \log(\tau_{t-1}) + \gamma_3 \Delta \log(tr_t) + \gamma_4 \log(tr_{t-1}) + \gamma_5 \Delta \log(g_t) + \gamma_6 \log(g_{t-1}))$$
$$+ D_t(\delta_1 \Delta \log(\tau_t) + \delta_2 \log(\tau_{t-1}) + \delta_3 \Delta \log(tr_t) + \delta_4 \log(tr_{t-1}) + \delta_5 \Delta \log(g_t) + \delta_6 \log(g_{t-1})) \qquad (1)$$

where c denotes consumption, y income, y^{OECD} income in the OECD area, τ direct taxes, tr transfers and g government consumption, t the time index and D the fiscal regime indicator.[3] All variables are real and in per capita terms. A vector of country dummies that allows for country-specific elements is also included. Giavazzi and Pagano (1996) note that this flexibly distributed lag model accommodates many specifications of the consumption function considered in the literature, in particular the Euler-type specifications and error-correction models.

In this specification, the dummy variable D_t is a dummy that separates two different fiscal regimes. This specification enables a distinction between "normal" times where $D_t=0$- from "non-normal" times where $D_t=1$- and see whether consumption reacts differently to fiscal adjustment for these different regimes. In particular, in the normal or Keynesian regime -where $D_t=0$- we would expect a positive relationship between consumption and government spending, a negative relationship between consumption and taxes and a positive relation between consumption and transfers. In the non-normal or non-Keynesian regime we expect opposite effects: a negative relation between consumption and government spending, a positive relation between consumption and taxes and a negative relation between consumption and transfers.

Adopting this approach enables us to estimate the impact of fiscal adjustments on private consumption during the transition period to the EMU and it allows us to answer the question whether non-linearities have been present in the relation between fiscal adjustment and private spending. Equation (1) is estimated in the form of a panel for the 14 EU countries[4] for the sample period 1980-1998. This specification enables a distinction between short run and long run effects: α_2, α_5, γ_1, δ_1, γ_3, δ_3, γ_5 and δ_5 are the short-run elasticities of the consumption function and α_3/α_1, α_4/α_1, γ_2/α_1, δ_2/α_1, γ_4/α_1, δ_4/α_1, γ_6/α_1 and δ_6/α_1 are their long-run counterparts. See also the Appendix for precise definitions of the variables, regime-indicators and data sources. Table 1 gives the estimation results from estimating (1),

Table 1.   Consumption Regressions, Panel of EU Countries, 1990-1998

	(I)	(II) $D1$	(III) $D2$	(IV) $D3$	(V) $D4$	(VI) $D5$	(VII) $D6$	(VIII) $D7$	(IX) $D8$
Lagged consumption $\log(c_{t-1})$	-0.38** (-4.72)	-0.34** (-4.01)	-0.38** (-4.43)	-0.36** (-4.08)	-0.39** (-4.85)	-0.44** (-4.97)	-0.40** (-4.55)	-0.43** (-4.84)	-0.38** (-4.66)
Income changes $\Delta\log(y_t)$	0.47** (7.42)	0.45** (6.89)	0.43** (6.68)	0.43** (6.71)	0.45** (6.84)	0.45** (6.53)	0.43** (6.47)	0.42** (6.27)	0.42** (6.18)
Lagged income $\log(y_{t-1})$	0.24** (4.21)	0.20** (3.43)	0.23** (3.95)	0.22** (3.74)	0.27** (4.77)	0.27 (4.36)	0.24** (4.05)	0.27** (4.33)	0.25** (4.07)
OECD income change $\Delta\log(y_t^{OECD})$	0.15 (0.87)	0.22 (1.35)	0.27 (1.56)	0.26 (1.51)	0.21 (1.20)	0.22 (1.20)	0.23 (1.32)	0.24 (1.31)	0.24 (1.43)
OECD lagged income $\log(y_{t-1}^{OECD})$	0.15** (3.30)	0.15** (3.16)	0.17** (3.43)	0.16** (3.16)	0.15** (3.20)	0.20** (3.71)	0.16** (3.25)	0.15** (3.21)	0.16** (3.40)
Tax changes $\Delta\log(\tau_t)$	-0.02 (-1.03)								
Lagged taxes $\log(\tau_{t-1})$	-0.02 (-1.11)								
Transfer changes $\Delta\log(tr_t)$	0.13** (3.16)								
Lagged transfers $\log(tr_{t-1})$	0.04* (1.78)								
Public consumption changes $\Delta\log(g_t)$	0.004 (0.09)								
Lagged public consumption $\log(g_{t-1})$	-0.03* (-1.67)								
Tax changes $(1- D_t).\Delta\log(\tau_t)$		-0.003 (-0.12)	-0.004 (-0.16)	-0.001 (-0.05)	-0.02 (-0.85)	-0.03 (-0.95)	-0.02 (0.82)	-0.004 (-0.11)	-0.02 (-0.76)
Lagged taxes $(1- D_t).\log(\tau_{t-1})$		-0.02 (-1.13)	-0.02 (-0.92)	-0.02 (-0.98)	-0.04** (-2.28)	-0.03 (-1.32)	-0.02 (-1.22)	-0.03 (-1.30)	-0.04** (-1.99)
Transfer changes $(1- D_t).\Delta\log(tr_t)$		0.11** (2.18)	0.12** (2.86)	0.13** (3.13)	0.10* (1.87)	0.13** (2.71)	0.14** (3.29)	0.13** (2.84)	0.10** (2.24)
Lagged transfers $(1- D_t).\log(tr_{t-1})$		0.07** (2.88)	0.05** (2.00)	0.05** (2.03)	0.04* (1.72)	0.05* (1.90)	0.06** (2.20)	0.04 (1.52)	0.04 (1.54)
Public consumption changes $(1- D_t).\Delta\log(g_t)$		0.03 (0.62)	0.005 (0.10)	-0.003 (-0.05)	0.02 (0.33)	0.05 (0.80)	0.05 (0.96)	0.03 (0.42)	0.06 (0.99)
Lagged public consumption $(1- D_t).\log(g_{t-1})$		-0.05** (-2.59)	-0.05** (-2.15)	-0.04** (-2.01)	-0.03* (-1.70)	-0.04** (-2.10)	-0.03 (-1.59)	-0.03 (-1.32)	-0.03 (-1.26)
Tax changes $D_t.\Delta\log(\tau_t)$		-0.07* (-1.94)	-0.10** (-2.45)	-0.11** (-2.23)	-0.05 (-1.46)	-0.05 (-1.38)	-0.15 (-1.56)	-0.04 (-1.58)	-0.06* (-1.91)
Lagged taxes $D_t.\log(\tau_{t-1})$		0.02 (0.72)	-0.02 (-1.08)	-0.02 (-0.54)	-0.03 (-1.30)	-0.02 (-0.96)	-0.02 (-0.80)	-0.04 (-1.62)	-0.03 (-1.03)
Transfer changes $D_t.\Delta\log(tr_t)$		0.11* (1.83)	0.23** (2.66)	0.14 (1.48)	0.09* (1.87)	0.18** (2.50)	0.08 (0.62)	0.15** (2.29)	0.17** (2.78)
Lagged transfers $D_t.\log(tr_{t-1})$		0.03 (1.24)	0.05* (1.92)	0.04 (1.23)	0.01 (0.22)	0.05* (1.90)	0.06* (1.83)	0.06** (2.11)	0.04* (1.67)
Public consumption Changes $D_t.\Delta\log(g_t)$		-0.01 (0.15)	-0.08 (-1.17)	-0.06 (-0.41)	-0.01 (-0.05)	-0.05 (-0.81)	-0.01 (-0.09)	-0.01 (-0.10)	-0.08 (-1.37)
Lagged public Consumption $D_t.\log(g_{t-1})$		-0.05** (-2.27)	-0.04* (-1.86)	-0.04 (-1.63)	-0.02 (-0.87)	-0.05** (-2.23)	-0.03 (-1.40)	-0.03 (-1.42)	-0.04* (-2.32)
No.obs.	126	126	126	126	126	126	126	126	126
Adjusted R^2	0.63	0.67	0.65	0.65	0.67	0.63	0.64	0.64	0.65
DW	2.08	2.26	2.14	2.15	2.29	2.09	2.05	2.10	2.06
Wald		2.783** [0.015]	1.557 [0.170]	1.376 [0.231]	2.277** [0.041]	0.715 [0.638]	0.966 [0.452]	0.666 [0.677]	1.550 [0.169]

Note: Regression of the change in the logarithm of real per capita consumption (Δc_t). t-statistics are given in brackets. *(**) denotes significant at a 10%(5%) level of significance. DW: Durbin-Watson statistic. Wald: Wald test statistic on equality of the coefficients in the "fiscal stress-no fiscal stress regimes" *(**) denotes rejection of the null hypothesis of equality of fiscal effects across both regimes at a 10%(5%) level of significance. Source: own calculations from OECD (2000a), (2000b).

Table 1 uses a number of alternative approaches to distinguish between the Keynesian and non-Keynesian regime (eight in total, columns II-IX)). In that way we can test for a large set of fiscal regime indicators the existence of non-linearities in the relation between private consumption and fiscal adjustments.

The first (I) column in Table 1 ignores the possible non-linearities and imposes simply a linear relation. The estimation results are broadly consistent with a Keynesian relation between private consumption and fiscal adjustment. The short-run elasticity to income equals 0.47, whereas the long run elasticity equals 0.63. From the fiscal policy variables, the strongest effect seems to come from the adjustment of fiscal transfers.[5] The effects from direct taxes are small and not significant at the 90% significance level. A significant positive long run elasticity is found for government spending, whereas the short-run impact is very small and insignificant.

Column (II) estimates (1) using the fiscal regime indicator introduced by Giavazzi and Pagano (1996): $D1_t$ indicates whether a sharp and/or persistent fiscal adjustment has taken place ($D1_t$=1) or not ($D1_t$=0). They define a sharp and/or persistent fiscal adjustment to occur if the cumulative change in the structural primary deficit: (i) exceeds 5% of potential GDP in 4 successive years including t, or (ii) exceeds 4% of potential GDP in 3 successive years, or (iii) exceeds 3% of potential GDP in 2 successive years or (iv) if the change in the structural deficit in year t exceeds 3 percent.[6] Note again that the structural primary deficit as a percentage of potential output is depicted in Figure 1. The values that this fiscal regime indicator and our alternative indicators take for the EU countries during the period 1990-1998 are given in Table 2.

Out of the 126 observations, 29 observations indicate a sharp and/or persistent fiscal adjustment. The estimation results of (1) using this regime indicator, provides some –albeit rather weak- evidence of the non-linear relation between private spending and fiscal adjustment. The short-run effect of government consumption on private consumption seems to differ depending on whether or not sharp, persistent fiscal adjustments are undertaken (i.e. whether $D1_t$ is equal to zero or one). If we compare our estimates with Giavazzi and Pagano (1996, p.81), we also find that the short run effect of government spending changes sign when moving from the Keynesian to the non-Keynesian regime, although the estimated effects seem to be smaller and less significant than theirs. We find a stronger and more significant effect of changes in public transfers on private consumption. In contrast to their results, we do not find much evidence of non-linearities in the effects of direct taxation and transfers on private spending.

Table 2

Fiscal Stress in EU countries, 1990-1998

Indicator	Country and Year
$D1$	Austria 1997, Belgium 1994, Finland 1991-1992[+], Germany 1990-1991[+], Greece 1990[+] and 1991-1997, Italy 1992-1993, the Netherlands 1993, Spain 1997, Sweden 1991-1994[+] and 1995-1998 United Kingdom 1993[+] and 1997-1998
$D2$	Belgium 1990-1997,Greece 1990-1994, Italy 1990-1994, Sweden 1990-1997
$D3$	Belgium 1994, Greece 1990-1994, Italy 1992-1993, Sweden 1991-1997
$D4$	Belgium 1993-1998, Denmark 1993-1994 and 1996-1998, Finland 1992 and 1998, Germany 1991-1992, Greece 1990-1991 and 1996-1997, Ireland 1992-1998, Italy 1997-1998, the Netherlands 1995-1998, Portugal 1996-1997, Spain 1990-1991, Sweden 1991-1992 and 1996-1998, United Kingdom 1992, 1994 and 1998
$D5$	Austria 1993-1996, Belgium 1990-1993, France 1995-1998, Germany 1995-1996, Greece 1990-1993 and 1995-1996, Italy 1990-1994, the Netherlands 1992-1993 and 1995, Portugal 1990-1991 and 1993-1995, Spain 1993-1996, Sweden 1992-1994, United Kingdom 1996
$D6$	Greece 1990-1993 and 1995-1996, Italy 1992-1993, the Netherlands 1993, Sweden 1992-1994
$D7$	Austria 1993-1996, Belgium 1990-1996, Denmark 1991-1993, Finland 1993-1996, France 1992-1998, Germany 1993 and 1995-1998, Greece 1990-1996, Ireland 1991, Italy 1990-1998, the Netherlands 1990-1995, Portugal 1993-1995, Spain 1992-1996, Sweden 1993-1996, United Kingdom 1992-1996
$D8$	Belgium 1990-1998, Denmark 1993-1994, Greece 1990-1998, Ireland 1990-1995, Italy 1990-1998, the Netherlands 1990-1996, Spain 1996, Sweden 1991-1997

Note: Fiscal Regime Indicators, EU Countries 1990-1998. $D1$: indicator of strong, persistent fiscal adjustments as in Giavazzi and Pagano (1997) years accompanied by a '+' sign represents fiscal expansions, the remaining periods correspond with fiscal contractions, $D2$: indicator of high initial government financing needs adopted from Perotti (1999), $D3$: indicator of strong, persistent fiscal adjustments and high initial government financing needs, $D4$: indicator of successful fiscal adjustments as in Alesina and Perotti (1995), $D5$: indicator of Maastricht Treaty, $D6$: indicator that combines the Maastricht Treaty and the strong, persistent fiscal adjustment indicators. $D7$: indicator of fiscal sustainability using the approach by Buiter et al. (1993), $D8$: indicator of higher than average (0.75) public debt to GDP ratio. Source: own calculations from OECD (2000a), (2000b).

Following, among others, von Hagen, Hughes Hallett and Strauch (2001, pp. 67-68) it is useful to allow also for a less strict interpretation of the effects of fiscal adjustments on consumption: it could be argued that non-Keynesian effects are already present if coefficients in the Keynesian regime (D_t=0) are "more Keynesian" than in the non-Keynesian regime (D_t=1). Evidence of non-Keynesian effects could then be defined in a less stringent way than Giavazzi and Pagano (1990, 1996) do. In this alternative interpretation non-Keynesian effects are present if the coefficients on government consumption and transfer changes are smaller in the non-Keynesian regime and the coefficients of direct taxation changes less negative. In

order to test for equality of the coefficients of fiscal adjustments, Table 1 provides a Wald test on the restriction that all fiscal coefficients are equal across the Keynesian and non-Keynesian regime. Acceptance of this hypothesis then would basically imply that the non-linear model does not provide additional information to the linear model -which is broadly Keynesian-estimated in column I and which would therefore be equally well suited to estimate the effects from fiscal adjustments on private consumption. Rejectance of this hypothesis suggests that nonlinearities in some form may be important. As can be seen from Table 1 for the D1-case the Wald statistic does indeed indicate that the coefficients in both regimes are not equal.

As mentioned in the introduction, Giavazzi and Pagano (1996) indicate that from a theoretical point of view not only the size and persistence of budgetary adjustment may matter for its effect on private spending but also *the initial conditions* under which such adjustments take place. Perotti (1999) investigates in more detail this possibility for the OECD countries during the period 1965-1994. To assess the initial conditions, an interesting approach is adopted by Perotti (1999). For all countries and years the present discounted value of the financing needs, L, of the government (as shown in Figure 1) is calculated.[7] A high value of L in this approach suggests initial conditions that are conducive to fiscal stress and the result of high initial debt and/or high expected government expenditures. The distribution of the calculated financing needs are considered and cut-off values of 90% and 80% are imposed to separate observations with initial conditions with fiscal stress from normal conditions. Observations that have a higher value of L than the cut-off value are then cases of initial conditions with significant budgetary stress. In those cases the fiscal regime indicator D_t has a value of one and the non-Keynesian effects of fiscal adjustments are expected to operate. For the observations below the cut-off value D_t equals zero and the Keynesian relation is expected to hold.

We also adopted this approach and calculated the *initial conditions indicator* $D2_t$: the calculation of this dummy variable $D2_t$ is based on a cut-off value of 80% of the distribution of L.[8] The resulting values for the dummy variable $D2_t$ are shown in Table 2. Table 2 illustrates that in this case fiscal stress is concentrated among countries with a high level of government debt (Belgium, Greece and Italy) and/or large government outlays (Sweden). In column (III) we estimate (1) using this fiscal indicator based on Perotti (1999). The results are rather similar to column (II). Also in this case, we find only limited evidence for non-linearities in the relationship between fiscal adjustment and private spending during the preparation for the EMU. Short-run effects of government spending are of opposite signs in the Keynesian and non-Keynesian regime, suggesting a non-linearity but the significance is limited to say the least. As before, we do not find much evidence for non-Keynesian effects in the case of taxation and transfers.

An interesting additional question, combining $D1_t$ and $D2_t$, is whether conditions that feature sharp, persistent budgetary adjustment and/or initial conditions of fiscal stress give

possibly more favourable evidence of non-Keynesian effects. In order to test for this possibility we define the fiscal indicators $D3_t$ that combines sharp, persistent budgetary adjustment, as identified earlier by $D1_t$, with initial conditions that indicate budgetary stress, as defined earlier by the indicator $D2_t$. This fiscal indicator $D3_t$ is tabulated in Table 2. The estimation results of (1) using $D3_t$ is given in Table 1 in column (IV). Also in this case there seems to be no strong evidence in favour of significant non-linearities in the relation between consumption and fiscal policy changes.

In a set of related papers, Alesina and Perotti (1995, 1996) and McDermott and Wescott (1996) inter alia analyze the differences between *successful and unsuccessful budgetary adjustments* for the set of OECD countries. Success of a fiscal adjustment is defined as the ability of a fiscal policy tightening today to achieve a lasting debt reduction at some future point in time. The question whether or not a fiscal adjustment is successful or not, is also highly relevant for the possible non-linearities in the relation between fiscal adjustment and private spending. It is likely, that non-Keynesian effects of fiscal consolidations are probably to be expected among successful rather than the unsuccessful fiscal consolidations since only these adjustment will produce a future debt stabilization and therefore only successful fiscal consolidations are likely to induce the positive wealth and expectational effects that drive the non-Keynesian effects of fiscal adjustments. Similarly, we expect that fiscal expansions will display non-Keynesian effects in case they are successful in the sense of resulting in debt explosions. In these cases, contractionary fiscal expansions will result as the normal, Keynesian type relation between fiscal expansions and private spending is replaced by a non-Keynesian type relation.

We also want to apply this approach to the EMU case that is the object of our analysis. To do so, we define, as in Alesina and Perotti (1995), a very tight fiscal policy (i.e. a fiscal consolidation) as a situation where the Blanchard fiscal impulse, as defined earlier and graphed in Figure 1, falls below -0.015. A successful fiscal adjustment in year t is defined as a very tight fiscal stance in year t which leads to a reduction of the gross debt to GDP ratio in year $t+3$ of at least 5 percentage points (compared to the debt to GDP ratio in period t)[9]. Similarly, a very loose fiscal policy results if the Blanchard fiscal impulse is larger than 0.015. A successful fiscal expansion in year t is defined as a very loose fiscal stance in year t which leads to an increase of the gross debt to GDP ratio in year $t+3$ of at least 5 percentage points. In Table 1 the fiscal indicator $D4_t$ indicates whether a fiscal adjustment has been successful ($D4_t=1$) or not ($D4_t=0$), using this approach.[10] Data on government debt and GDP for the year 2001 are taken from OECD projections.

We then use this definition of the successfulness of fiscal adjustments to test whether that factor can cause non-linearities in the effects of fiscal adjustments on private spending. To do so, we estimate in column (V) of Table 1, (1), using $D4_t$ as the fiscal regime indicator. It is found that the estimation results are broadly similar with the other approaches. The Wald

test, however, indicates that the fiscal effects in both fiscal regimes are not equal thereby giving some support for the existence of non-Keynesian effects. The short-term effects of government consumption are indeed of opposite sign in both regimes, although the level of significance is limited.

It can be argued that in the context of EMU, additional aspects mattered in assessing the initial conditions countries were facing. In particular, countries were expected to satisfy the fiscal convergence criteria before being allowed to enter EMU. These specific requirements could have been a further reason for non-Keynesian effects. In case a country would or was expected not to comply with the well-known convergence criteria, fiscal expansions could have had non-Keynesian effects. Private agents may than have realised that non-compliance reduced fiscal sustainability and that a large fiscal consolidation must be undertaken in the near future in order to restore compliance with the fiscal convergence criteria. Alternatively, fiscal consolidations under these circumstances may have expansionary effects as agents will be increasingly confident that fiscal sustainability is restored. This straightforward interpretation of the Maastricht criteria as an indicator of fiscal sustainability is also suggested by Perotti, Strauch and von Hagen (1997).

To test for non-linearities specific to the conditions of the Maastricht Treaty we considered the following fiscal regime indicator in estimating equation (1). $D5_t$ determines whether a country complies with the fiscal criteria of the Maastricht Treaty ($D5_t=0$) or not ($D5_t=1$). As noted, non-compliance with the fiscal criteria is then considered to be a situation of fiscal stress and therefore a possible source of our sought-after non-linearities. A country is assumed to satisfy the fiscal convergence criteria in case (i) its fiscal deficit is smaller than 3% of GDP, (ii) its government debt is smaller than 60% of GDP, or is declining as a percentage of GDP in case it is higher than 60%. The values of $D5_t$ are again tabulated in Table 2: in roughly one third of the cases, we find that the fiscal convergence criteria Maastricht Treaty have not been met. In column (VI) of Table 1, the estimation results are given from estimating (1) using this approach. This simple and straightforward indicator gives similar estimation results as the previous indicators that were directly taken from the fiscal retrenchment literature.

The next indicator, $D6_t$, combines the initial conditions indicator associated with the fiscal convergence criteria of the Maastricht Treaty ($D5_t$) with the indicator of sizeable and persistent fiscal adjustment ($D1_t$). Here we again explore the notion that initial conditions and size and persistence may interact in the non-linearity of the relation between fiscal adjustment and private spending. Theory would suggest that such a combination of sizable, persistent fiscal adjustments in adverse initial conditions –in the sense here of failing to comply with the fiscal convergence criteria stipulated in the Maastricht Treaty-, are more likely to produce significant non-linearities. This prediction, is however not very much supported by the estimations of (1), using $D6_t$ as the fiscal regime indicator, as seen in Table 1, column (VII).

The estimation results suggest rather modest effects of fiscal adjustments on private spending. As in the case of $D5_t$, the Wald test suggests that the coefficients do not differ significantly between the 'fiscal stress' and the 'no fiscal stress' regime.

$D7_t$ uses the framework proposed by Buiter et al. (1993) to assess fiscal sustainability in the context of EMU.[11] More specifically it tests whether the current combination of economic growth, interest rates, primary deficit and government debt is consistent with achieving a steady-state level of debt of 60% of GDP. If not, the fiscal indicator $D7_t$ takes a value of 1 and indicates at initial conditions of fiscal stress according to this approach. Using this approach, Buiter et al. (1993) analyze in detail the logic behind the reference values of 3% for the fiscal deficit and 60% for the debt to GDP ratio in the Maastricht Treaty. Mongelli (1997) also applies this approach to the EMU experience and considers the possibility of endogenous fiscal discipline and its implications for fiscal sustainability. This indicator reveals that in a large number of cases (80 out of 126), the steady-state level of debt to GDP exceeds 60%. The estimation results of (1) using this fiscal regime indicator in column (VIII) of Table 1 confirm broadly the earlier results.

Finally, government debt itself can be regarded as a crucial indicator of the initial fiscal conditions and the burden of fiscal consolidation. It can also be a possible source of nonlinear effects of fiscal adjustments: in the theoretical framework of Sutherland (1997), it is indeed the debt level that triggers the switch from the Keynesian to the non-Keynesian regime. To see what are the effects of the initial debt level during the transition of EMU, we have divided the observations into high and low debt observations. $D8_t$ then measures whether an observation belongs to the high ($D8_t$=1) or low debt ($D8_t$=0) category. High debt occurs if the public debt-to-GDP ratio exceeds the sample average of 0.75. It is expected that fiscal adjustments in the high debt case are inducing significantly more fiscal stress and are more likely to produce non-Keynesian effects. Table 2 tabulates the values of $D8_t$ and column (IX) of Table 1 gives the estimation results when this indicator is used in estimating (1). The point estimates for the effects of changes in government spending differs by 0.14 between both regimes, the largest difference found in the estimations so far. According to the Wald test we, however, (marginally) fail to reject the hypothesis that the set of coefficients are equal across both regimes.

3.   Sensitivity Analysis

The aim of this section is to a check the sensitivity of the results in Section 2. First, it is checked how extending the sample period to the period 1970-2000 affects the (i) estimation results (Table 3, panel a). Next, (ii) we also estimate the consumption function for a set of non-EMU countries (Table 3, panel b). Finally, (iii) we experiment with alternative specifications of the basic model (Table 4).

Table 3. Consumption Regressions, Panel of (a) EU Countries (b) non-EU Countries, 1970-2000

	(a) EU Countries				(b) non-EU Countries			
	(I)	(II) $D1$	(III) $D2$	(IV) $D4$	(I)	(II) $D1$	(III) $D2$	(IV) $D4$
Lagged consumption $\log(c_{t-1})$	-0.21** (-6.80)	-0.29** (-7.62)	-0.23** (-6.78)	-0.24** (-6.77)	-0.16** (-3.33)	-0.33** (-5.16)	-0.28** (-5.44)	-0.22** (-3.75)
Income changes $\Delta\log(y_t)$	0.69** (17.62)	0.72** (17.13)	0.66** (16.69)	0.68** (16.32)	0.72** (6.35)	0.62** (4.64)	0.63** (5.80)	0.66** (4.83)
Lagged income $\log(y_{t-1})$	0.17** (6.64)	0.25** (8.18)	0.18** (6.64)	0.16** (5.25)	0.08 (1.09)	0.29** (2.87)	0.16** (2.22)	0.12 (1.32)
OECD income change $\Delta\log(y_t^{OECD})$	0.10 (1.53)	0.08 (1.06)	0.09 (1.28)	0.08 (1.04)	0.14 (0.87)	0.30 (1.39)	0.27* (1.76)	0.19 (1.00)
OECD lagged income $\log(y_{t-1}^{OECD})$	0.03** (2.93)	0.03** (2.31)	0.03** (2.66)	0.04** (3.29)	0.07** (3.40)	0.11** (3.31)	0.10** (5.02)	0.07** (2.78)
Tax changes $\Delta\log(\tau_t)$	-0.01 (-0.90)				-0.06** (-2.35)			
Lagged taxes τ_{t-1}	-0.01* (-1.96)				0.02 (0.89)			
Transfer changes Δtr_t	0.05** (2.37)				0.02 (0.36)			
Lagged transfers tr_{t-1}	-0.02* (-1.96)				-0.01 (-0.61)			
Public consumption changes Δg_t	0.13** (4.30)				0.30** (3.73)			
Lagged public consumption g_{t-1}	0.04** (2.78)				0.02 (0.48)			
Tax changes $(1-D_t).\Delta\tau_t$		-0.01 (-0.74)	-0.03* (-1.79)	-0.01 (-0.40)		-0.01 (-0.19)	-0.05* (-1.84)	-0.04 (-0.91)
Lagged taxes $(1-D_t).\tau_{t-1}$		-0.01 (-1.30)	-0.02** (-2.24)	-0.01 (-0.83)		-0.01 (-0.29)	0.03* (1.83)	0.03 (0.86)
Transfer changes $(1-D_t).\Delta tr_t$		0.03 (0.98)	0.02 (0.83)	0.03 (1.16)		0.08 (1.25)	0.02 (0.43)	0.02 (0.34)
Lagged transfers $(1-D_t).tr_{t-1}$		-0.03** (2.06)	-0.01 (-1.03)	-0.02* (1.78)		-0.04 (-1.22)	0.001 (0.02)	-0.01 (-0.23)
Public consumption changes $(1-D_t).\Delta g_t$		0.14** (3.27)	0.18** (4.55)	0.13** (3.20)		0.14 (1.23)	0.23** (2.66)	0.31 (2.88)
Lagged public consumption $(1-D_t).g_{t-1}$		0.05** (2.70)	0.04** (2.58)	0.04** (2.64)		0.01 (0.11)	-0.02 (0.50)	0.01 (0.27)
Tax changes $D_t.\Delta\tau_t$		0.02 (0.76)	-0.000 (-0.04)	-0.01 (-0.30)		-0.19** (-2.15)	-0.11* (-1.66)	-0.07 (-1.18)
Lagged taxes $D_t.\tau_{t-1}$		-0.02* (-1.77)	-0.01 (-1.42)	-0.003 (-0.37)		-0.03 (-0.81)	-0.01 (-0.19)	0.04 (1.15)
Transfer changes $D_t.\Delta tr_t$		0.05* (1.73)	0.06** (2.07)	0.05* (1.65)		-0.02 (-0.13)	0.07 (1.06)	0.09 (0.82)
Lagged transfers $D_t.tr_{t-1}$		-0.04** (-2.61)	-0.02* (-1.77)	-0.04 (3.24)		-0.06 (-1.60)	-0.04 (1.60)	0.01 (0.40)
Public consumption changes $D_t.\Delta g_t$		0.06 (1.33)	0.08 (1.64)	0.09* (1.89)		0.28 (1.06)	0.51 (3.84)	0.30* (1.72)
Lagged public consumption $D_t.g_{t-1}$		0.06** (3.36)	0.04** (2.45)	0.06** (3.60)		0.05 (0.92)	0.06 (1.19)	-0.02 (-0.37)
No.obs.	378	318	378					
Adjusted R^2	0.67	0.70	0.67	0.68	0.45	0.47	0.54	0.47
DW	1.87	2.26	1.91	1.97	1.97	2.02	1.79	2.09
Wald		4.00** [0.000]	0.86 [0.519]	2.45** [0.025]		2.17* [0.051]	5.99** [0.000]	1.65 [0.140]

Note: Regression of the change in the logarithm of real per capita consumption ($\Delta\log(c_t)$). *t*-statistics are given in brackets. *(**) denotes significant at a 10%(5%) level of significance. DW: Durbin-Watson statistic. Wald: Wald test statistic on equality of the coefficients in the "fiscal stress-no fiscal stress regimes" *(**) denotes rejection of the null hypothesis of equality of fiscal effects across both regimes at a 10%(5%) level of significance. Source: own calculations from OECD (2000a), (2000b).

Ad (i) It may well be that our focus on the rather short period of EMU preparation and implemetation (1990-1998) is not an optimal choice when searching for non-linaerities in the effects of fiscal adjustments and that the seeming absence of them in our results is rather the result of the choice of our sample period than a general result. Therefore, we have estimated in panel (a) of Table 3, equation (1) for a much longer sample: 1970-2000. Since during a large part of the sample the issue of EMU was irrelevant, we exclude the specifications that are EMU specific, i.e. the specifications with $D5_t$-$D8_t$,

Compared to Table 1 there are some differences in the estimation results for this extended sample period. The effect of transfers on consumption seems to decrease and the effects of government spending to increase. On the other hand, Table 3 reveals no stronger evidence for non-linearities in the effects of fiscal adjustments on consumption, apart from the proposed weaker interpretation which would identify non-linearities already with a reduction of the value of the coefficients and not only with a change of the sign of the coefficients (as in the strong interpretation underlying the analysis of Giavazzi and Pagano (1997)). Table 3 also suggests that short term effects are more of a Keynesian type while long run effects are more of a non-Keynesian (i.e. neo-classical) nature, a result that is intuitively plausible and irrespective of non-linear effects. We also estimated equation (1) for the EU countries for the sample period 1970-1989 (not shown here). The estimation results for this "pre-Maastricht treaty" period are very similar to those shown in Table 3, panel (a). In particular, we find that, as opposed to the period 1990-1998, the impact of changes in government spending is very significant to the extent that a decrease in public consumption during the period 1970-1989 has a significant negative (=standard Keynesian) effect on private consumption. This is weak or indirect evidence in favour of the presence of non-Keynesian effects because it suggests that "the cost of fiscal consolidation was smaller in the 1990s than in earlier periods" (von Hagen et al., 2001, p. 67).

Ad (ii) It is important -and interesting in itself- to compare the experiences with fiscal adjustments in the EU with the experiences in non-EU countries. Therefore, we consider in this section a set of six non-EU countries: Australia, Canada, Japan, New Zealand, Norway and the United States. Figure 2 displays the same fiscal indicators as in Figure 1 for the EU countries.

Figure 2

Fiscal Positions of 6 non-EU Countries , 1970-2000
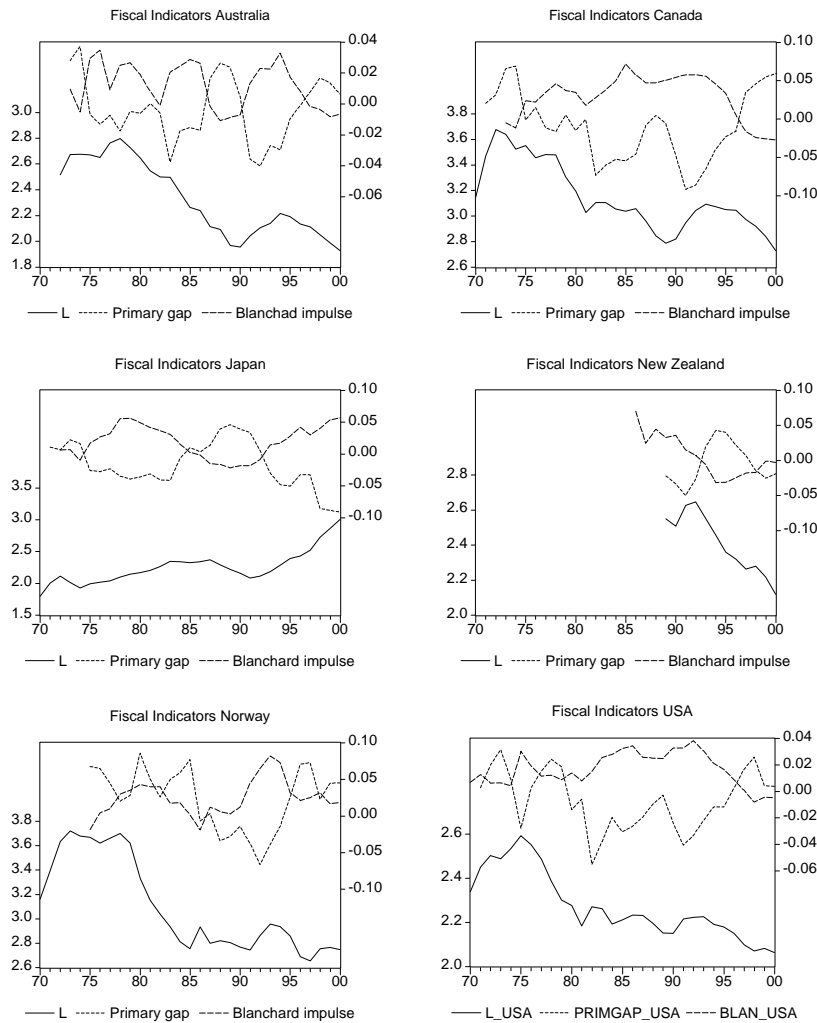
Note:
-Blanchard fiscal impulse (dotted line, right scale): the structural primary fiscal deficit as a fraction of potential output,
-primary gap (dashed line, right scale): the difference between the primary deficit that would stabilize government debt at its current level and the actual primary deficit (both as a fraction of GDP),
-L, government financing needs (as a fraction of GDP) (solid line, left scale): the sum of initial debt and the discounted value of future government spending, using a five-year time horizon.
Source: own calculations from OECD (2000a), (2000b).

With the exception of Japan, these countries also started fiscal consolidation efforts around 1993 as positive or at least less negative Blanchard impulses, lower values of the primary gap and lower financing needs clearly indicate. Moreover, these countries had generally speaking a similar experience with fiscal expansion in the 1970s and 1980s, with the building up of the welfare state and Keynesian inspired fiscal expansion policies.

In panel (b) of Table 3 we estimate the consumption function (1) for this panel of six non-EU countries for the period 1970-2000. The estimation results for the non-EU panel are in line with the results for the EU panel: while the effects of taxes and government consumption seem to be somewhat stronger and the effect of transfers somewhat weaker than

in the EU case, the estimation results are comparable with the case of the EU countries in panel (a). Based on the Wald test statistic In this case the specification using the Perotti (1999) approach (here, *D2*) gives some evidence that the coefficients are not equal across both fiscal regimes for this indicator.

Ad (iii) The conclusions that were drawn based upon the results in Section 2 may not only be sensitive to the sample period or the countries in the sample -although this sensitivity may have been limited, according to the results in (i) and (ii), at least-; it may also be the case that the specific functional form (1) is not accurate in estimating the impact of fiscal adjustments on private consumption thus biasing our view. Therefore, this section also wants to consider alternatives. In particular, we want to consider two possible alterations: (a) we want to include the real interest rate as a possible explanatory variable to account for the effects of borrowing costs/liquidity constraints on private consumption. As has been suggested by Perotti (1999) borrowing costs and liquidity constraints may be important when consumers' decide on their consumption decisions, in particular in the case of consumption of durables[12]. (b) we want to simplify the fiscal variables by simply focusing on the effects of total government expenditure, ge_t, (again real, per capita and in national currency, as before) and total government revenue, gr_t. Perotti (1999) also uses (innovations in) government spending and revenues when analysing the impact of fiscal adjustments on consumption.

For more insight into the dynamics of real private consumption *c*, real government expenditures *ge,* and real government revenues *gr* (all per capita), Figure 3 displays their adjustment during the period 1970-2000.
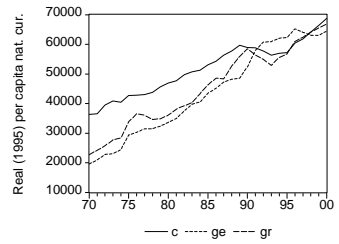
Figure 3

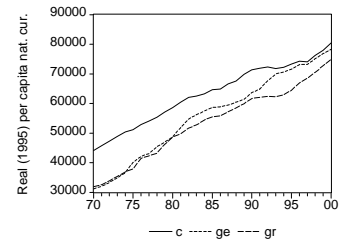Private Consumption, Government Expenditure and Revenue, 1970-2000
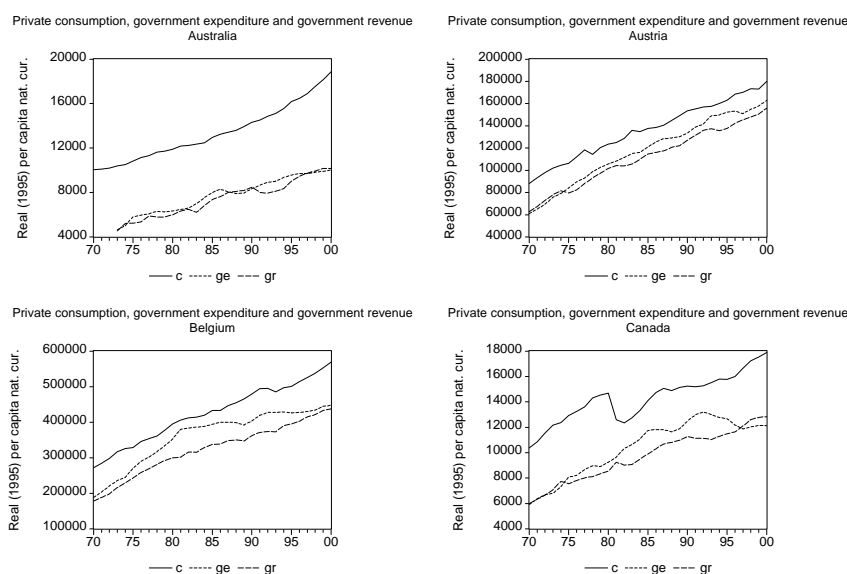
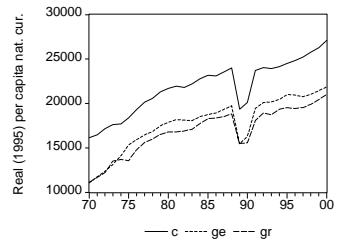Private consumption, government expenditure and government revenue
Denmark
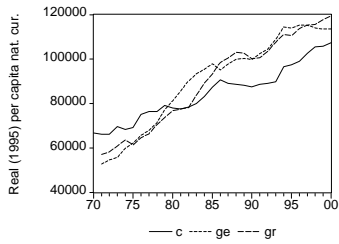
Private consumption, government expenditure and government revenue
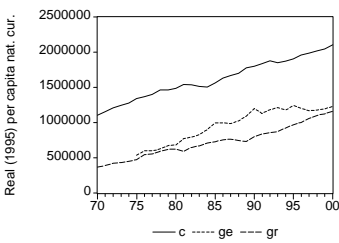Finland

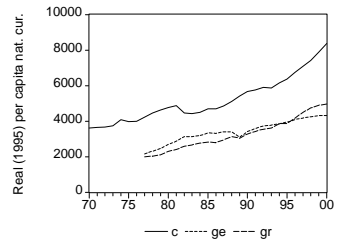Private consumption, government expenditure and government revenue
France

Private consumption, government expenditure and government revenue
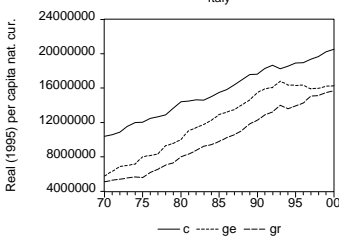Germany

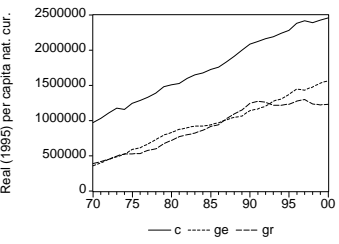Private consumption, government expenditure and government revenue
Greece

Private consumption, government expenditure and government revenue
Ireland

Private consumption, government expenditure and government revenue
Italy

Private consumption, government expenditure and government revenue
Japan

Private consumption, government expenditure and government revenue
The Netherlands

Private consumption, government expenditure and government revenue
New Zealand

Private consumption, government expenditure and government revenue
Norway

Private consumption, government expenditure and government revenue
Portugal

18

Private consumption, government expenditure and government revenue
Spain

Private consumption, government expenditure and government revenue
Sweden

Private consumption, government expenditure and government revenue
UK

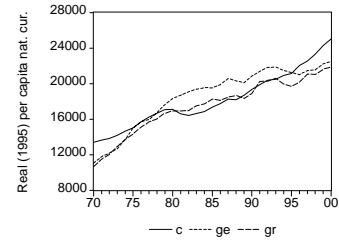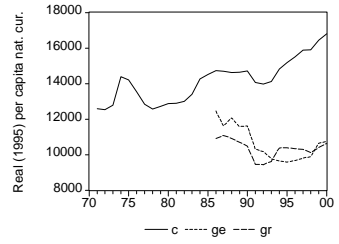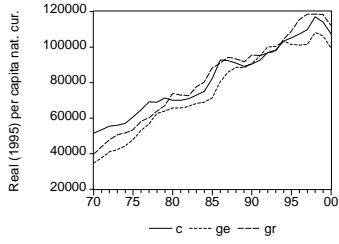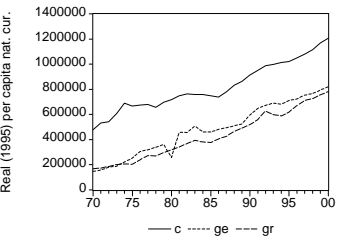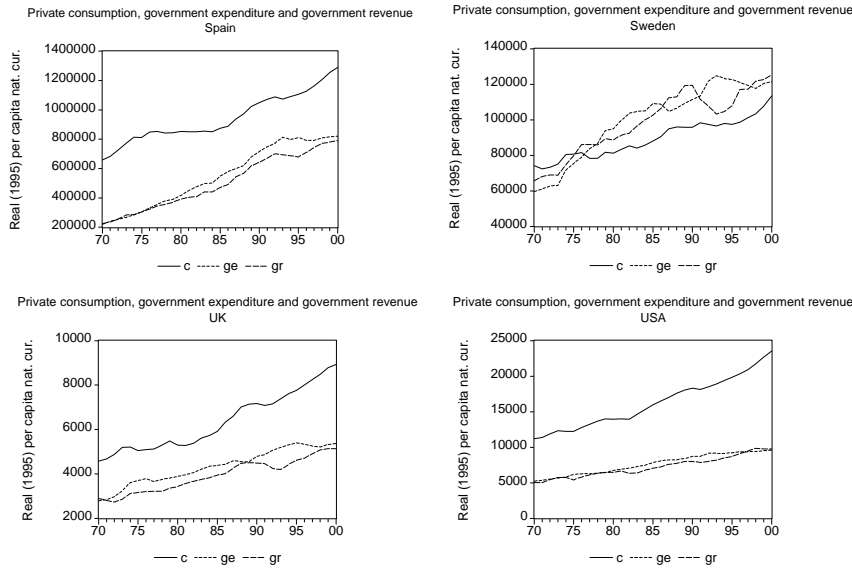Private consumption, government expenditure and government revenue
USA

1995 is used as a base year. The graphs indicate clearly how real per capita consumption has been fluctuating around a long-run growth path. The difference between real government expenditure and real government revenue reflects the deficit experiences in the countries included in the sample: often high deficits in the 1980s and lower deficits or even fiscal surpluses in the late 1990s.

Given these considerations, the following alternative consumption function was chosen, where r is the real (long term) interest rate, ge is real government expenditures per capita and gr is real government revenue per capita

$$\Delta \log(c_t) = \alpha_1 \log(c_{t-1}) + \alpha_2 \Delta \log(y_t) + \alpha_3 \log(y_{t-1}) + \alpha_4 \Delta \log(y_t^{OECD}) + \alpha_5 \log(y_t^{OECD})$$
$$+ \alpha_6 \Delta r_t + \alpha_7 r_{t-1} + (1 - D_t)(\gamma_1 \Delta \log(ge_t) + \gamma_2 \log(ge_{t-1}) + \gamma_3 \Delta \log(gr_t) + \gamma_4 \log(gr_{t-1})) \qquad (2)$$
$$+ D_t(\delta_1 \Delta \log(ge_t) + \delta_2 \log(ge_{t-1}) + \delta_3 \Delta \log(gr_t) + \delta_4 \log(gr_{t-1}))$$

The estimation results are provided in Table 4. Again the countries are divided into an EU part (panel (a)) and a non-EU part (panel (b)). The first column displays the results for the basic linear form, whereas columns (II), (III), (IV) -as in Table 3- estimate the non-linear models using the approaches of Giavazzi and Pagano (1997), Perotti (1999) and Alesina and Perotti (1995), respectively. In the non-linear models a real interest effect is included. In the non-EU countries changes in the real interest rate as well as in government spending and government revenues are more important for private consumption than the EU countries. Because the estimation results in Table 4 are more in line with those in shown Table 3, it could be asked whether or not equation (2) is to be preferred over equation (1). The former has the advantage that it needs only two single aggregate fiscal measures, government expenditure and government revenue, whereas the latter picks out three -albeit important- fiscal categories, direct taxes, transfers and government spending. The advantage of simplicity needs to be traded off against the lack of (fiscal) detail. Further research is needed to make a detailed decomposition of government expenditure and government revenue in estimating (2)

and to see if this fundamentally alters our conclusions from estimating equation (2). For the EU-countries we also estimated equation (2) for the period 1990-1998 and in that case we find similar results as those reported in Table 4, panel (a) and notably that the real interest rate is insignificant.

Table 4. Alternative Consumption Function, Panel of (a) EU Countries (b) non-EU Countries, 1970-2000

	(a) EU countries				(b) non-EU countries			
	(I)	(II) D1	(III) D2	(IV) D4	(I)	(II) D1	(III) D2	(IV) D4
Lagged consumption: $\log(c_{t-1})$	-0.18** (-6.14)	-0.26** (-7.01)	-0.17** (-5.70)	-0.25** (-6.66)	-0.18** (-3.94)	-0.26** (-4.19)	-0.19** (-3.60)	-0.18** (-3.23)
Income changes: $\Delta\log(y_t)$	0.77** (18.56)	0.78** (17.34)	0.74** (17.60)	0.70** (15.45)	0.74** (5.39)	0.68** (4.51)	0.70** (5.55)	0.76** (5.42)
Lagged income: $\log(y_{t-1})$	0.18** (6.05)	0.25** (7.69)	0.20** (6.38)	0.19** (5.48)	0.17** (2.45)	0.35** (3.31)	0.28** (3.09)	0.19** (2.15)
OECD income change: $\Delta\log(y_t^{OECD})$	0.11* (1.74)	0.12 (1.51)	0.06 (0.95)	0.14* (1.79)	0.15 (0.94)	0.21 (1.03)	0.18 (1.13)	0.06 (0.32)
OECD lagged income $\log(y_{t-1}^{OECD})$	0.02* (1.88)	0.02 (1.58)	0.02 (1.65)	0.03* (1.82)	0.05** (2.31)	0.07** (2.55)	0.04* (1.86)	0.05* (1.76)
Real interest rate changes: Δr_t		-0.01 (-0.11)	0.05 (1.30)	0.03 (0.54)		0.35** (2.94)	0.29** (3.14)	0.27** (2.45)
Lagged real interest rate: r_{t-1}		0.05 (1.19)	0.05 (1.49)	0.04 (0.89)		0.25** (2.35)	0.16* (1.92)	0.13 (1.41)
Expenditure changes: $\Delta\log(ge_t)$	0.08** (3.96)				0.20** (3.07)			
Lagged expenditure: $\log(ge_{t-1})$	-0.01* (-0.48)				-0.04 (-1.42)			
Revenue changes: $\Delta\log(gr_t)$	-0.02 (-0.77)				-0.11* (-1.69)			
Lagged revenu: $\log(gr_{t-1})$	-0.01 (-0.52)				0.02 (0.42)			
Expenditure changes: $(1-D_t).\Delta\log(ge_t)$		0.08* (1.78)	0.14** (4.09)	0.06** (2.27)		0.02 (0.20)	0.07 (0.91)	0.15* (1.76)
Lagged expenditure: $(1-D_t).\log(ge_{t-1})$		-0.03* (-1.74)	0.002 (0.09)	0.02 (0.75)		-0.07** (-2.02)	-0.08** (-2.67)	-0.03 (-0.64)
Revenue changes: $(1-D_t).\Delta\log(gr_t)$		0.01 (0.17)	-0.02 (-0.47)	0.02 (0.45)		-0.13 (-1.46)	-0.10 (-1.39)	-0.07 (-0.93)
Lagged revenu: $(1-D_t).\log(gr_{t-1})$		0.01 (0.59)	0.04* (1.66)	-0.02** (-0.67)		-0.05 (-0.96)	-0.01 (-0.20)	-0.03 (-0.49)
Expenditure changes: $D_t.\Delta\log(ge_t)$		0.06** (2.65)	0.04 (1.64)	0.06** (2.05)		0.17 (1.30)	0.26** (1.99)	0.07 (0.46)
Lagged expenditure: $D_t.\log(ge_{t-1})$		-0.03* (-1.24)	-0.01 (-0.61)	-0.02 (-0.64)		-0.10* (-1.74)	-0.03 (-0.54)	-0.11** (-2.10)
Revenue changes: $D_t.\Delta\log(gr_t)$		-0.06 (-1.19)	-0.10** (-1.99)	0.01 (0.27)		0.04 (0.26)	-0.07 (-0.51)	-0.23** (-2.11)
Lagged revenu: $D_t.\log(gr_{t-1})$		0.01 (0.31)	-0.02 (-0.93)	0.01 (0.49)		-0.02 (-0.28)	-0.06 (-0.95)	0.06 (0.97)
No.obs.	407	332	396	329	161	133	157	138
Adjusted R^2	0.65	0.69	0.65	0.65	0.42	0.45	0.45	0.45
DW	1.85	1.71	1.82	1.78	1.85	1.79	1.64	1.82
Wald		6.00** [0.000]	3.34** [0.011]	1.67 [0.157]		0.96 [0.431]	1.97 [0.102]	1.38 [0.244]

Note: Regression of the change in the logarithm of real per capita consumption ($\Delta\log(c_t)$). t-statistics are given in brackets. *(**) denotes significant at a 10%(5%) level of significance. DW: Durbin-Watson statistic. Wald: Wald test statistic on equality of the coefficients in the "fiscal stress-no fiscal stress regimes" *(**) denotes rejection of the null hypothesis of equality of fiscal effects across both regimes at a 10%(5%) level of significance. Source: own calculations from OECD (2000a), (2000b).

4. Conclusions

Using a well-known specification for the private consumption function, due to Giavazzi and Pagano (1996), this paper has tested whether for a panel of 14 EU-countries evidence can be found for a non-linear relationship between fiscal adjustments and private consumption during the 1990-1998 transition period towards EMU. We have tested for evidence of non-linearities in the relationship between private consumption and fiscal adjustment, considering the effects of (i) the persistence and largeness of the adjustment, (ii) the initial conditions under which budgetary adjustments occur, (iii) their combined effects, (iv) the successfulness of fiscal adjustments and (v) the specific fiscal requirements of the Maastricht Treaty. In addition, a sensitivity analysis was undertaken to test the robustness of the conclusions concerning the effects of fiscal adjustments during the transition to the EMU. Three directions were explored: (i) the sensitiveness of the result w.r.t. the sample period was considered, (ii) a set of control countries was subjected to the same estimation methodology, (iii) the effects of using an alternative definition of fiscal variables and a proxy for borrowing costs were considered

In all cases, the evidence for non-linearities in the effects of fiscal adjustments remains rather limited during the transition period to EMU. In the case of taxation and transfers no evidence of non-linearities results. Some favourable evidence for a non-linear effect is found for in the short-run effects of government consumption on private spending. Also when comparing the transition period 1990-1998 with the period 1970-1989, there is some evidence for a number of our fiscal regime indicators that the impact of fiscal policy on private spending might have been different in the transition period leading to EMU. But overall the effects of fiscal adjustments on private spending –with the possible exception of transfers- appear to have been relatively small, which suggests that the effects of the considerable fiscal consolidation on private spending may have been limited during this transition period to EMU.

Appendix   Data description

The following data were used

Table A.1
Data Definitions and Sources.

Variable	Definition	Unit	Source
CON	**Private Consumption**	**mln n.c.**	**OECD Economic Outlook 67**
P	**GDP Deflator**	**index**	**OECD Economic Outlook 67**
POP	**Population**	**persons**	**IMF IFS**
LIN	**Long Term Interest Rate**	**%**	**OECD Economic Outlook 67**
DIR	**Total Direct Taxes**	**mln n.c.**	**OECD Fiscal Positions and Business Cycles**
SSRG	**Social Security Transfers**	**mln n.c.**	**OECD Fiscal Positions and Business Cycles**
TSUB	**Subsidies**	**mln n.c.**	**OECD Fiscal Positions and Business Cycles**
TRPG	**Other Current Transfers Paid**	**mln n.c.**	**OECD Fiscal Positions and Business Cycles**
GCO	**Government Consumption**	**mln n.c.**	**OECD Fiscal Positions and Business Cycles**
NLG	**Net Lending Government**	**mln n.c.**	**OECD Fiscal Positions and Business Cycles**
NLGX	**Primary Government Balance**	**mln n.c.**	**OECD Fiscal Positions and Business Cycles**
NLGXA	**Structural Primary Balance**	**mln n.c.**	**OECD Fiscal Positions and Business Cycles**
GGFL	**Gross Government Debt**	**mln n.c.**	**OECD Fiscal Positions and Business Cycles**
GDP	**Gross Domestic Product**	**mln n.c.**	**OECD Economic Outlook 67**
GDPTR	**Potential Output**	**mln n.c.**	**OECD Economic Outlook 67**
YPG	**Current Gov. Disbursements**	**mln n.c.**	**OECD Fiscal Positions and Business Cycles**
YRG	**Current Government Revenues**	**mln n.c.**	**OECD Fiscal Positions and Business Cycles**

Variable definitions

c: real private consumption per capita $\qquad c \equiv \dfrac{CON}{P} \cdot \dfrac{1}{POP}$

y: real GDP per capita $\qquad y \equiv \dfrac{GDP}{P} \cdot \dfrac{1}{POP}$

τ: real direct taxes per capita $\qquad \tau \equiv \dfrac{DIR}{P} \cdot \dfrac{1}{POP}$

tr: real transfers per capita $\qquad tr \equiv \dfrac{SSRG + TSUB + TRPG}{P} \cdot \dfrac{1}{POP}$

g: real government consumption per capita $\qquad g \equiv \dfrac{GCO}{P} \cdot \dfrac{1}{POP}$

ge: real government expenditures per capita $\qquad ge \equiv \dfrac{YPG}{P} \cdot \dfrac{1}{POP}$

gr: real government revenue per capita $\qquad gr \equiv \dfrac{YRG}{P} \cdot \dfrac{1}{POP}$

ϕ: nominal growth rate $\qquad \phi = d \log (GDP)$

rg: real growth rate $\qquad rg \equiv d \log (GDP) - d \log (P)$

r: real long term interest rate $\qquad r \equiv LIN - d \log (P)$

$BLAN$ Blanchard impulse $\qquad BLAN = \dfrac{NLGXA}{GDPTR}$

$PRIMGAP$: primary gap $\qquad PRIMGAP \equiv \dfrac{NLGX}{GDP} + (r - rg) \dfrac{GGFL}{GDP}$

L: financing requirement $\qquad L = \dfrac{GGFL}{GDP} + \sum_{i=1}^{5} \left(\dfrac{YPG}{GDP} \right)_{t+i}$

*D*1: fiscal stress indicator 1 (based on Giavazzi and Pagano (1996))

$$
\begin{cases}
D1 = 1 \quad \text{if} \quad \left| \sum_{i=0}^{4} (\Delta BLAN)_{t-i} \right| > 0.05 \ \ or \ \left| \sum_{i=0}^{3} (\Delta BLAN)_{t-i} \right| > 0.04 \\[2mm]
or \ \left| \sum_{i=0}^{2} (\Delta BLAN)_{t-i} \right| > 0.03 \ \ or \ \left| (\Delta BLAN)_{t} \right| > 0.03 \\[6mm]
\quad = 0 \qquad \text{otherwise}
\end{cases}
$$

*D*2: fiscal stress indicator 2 (based on Perotti (1999))

$$
\begin{cases}
D2 = 1 \quad \text{if} \quad \text{value } L \text{ lies outside } 80\% \text{ of the sample distribution} \\
\quad = 0 \qquad \text{otherwise}
\end{cases}
$$

*D*3: fiscal stress indicator 3

$$
\begin{cases}
D3 = 1 \quad \text{if} \quad D1 = 1 \text{ and } D2 = 1 \\
\quad = 0 \qquad \text{otherwise}
\end{cases}
$$

*D*4: fiscal stress indicator 5 (based on Alesina and Perotti (1995))

$$
\begin{cases}
D4 = 1 \quad \text{if} \quad BLAN_t > 0.015 \ \text{and} \left(\dfrac{GGFL}{GDP} \right)_{t+3} - \left(\dfrac{GGFL}{GDP} \right)_{t} > 0.05 \\[4mm]
\qquad \text{or} \ BLAN_t < -0.015 \ \text{and} \left(\dfrac{GGFL}{GDP} \right)_{t+3} - \left(\dfrac{GGFL}{GDP} \right)_{t} < -0.05 \\[6mm]
= 0 \qquad \text{otherwise}
\end{cases}
$$

*D*5: fiscal stress indicator 6 ("Maastricht" dummy)

$$
\begin{cases}
D5 = 1 \quad \text{if} \quad \dfrac{NLG}{GDP} > 0.03 \\[4mm]
\text{or} \ \dfrac{GGFL}{GDP} > 0.6 \ \ \text{and} \ \ \dfrac{GGFL}{GDP} - \left(\dfrac{GGFL}{GDP} \right)_{-1} > 0 \\[4mm]
\quad = 0 \qquad \text{otherwise}
\end{cases}
$$

*D*6: fiscal stress indicator 6

$$
\begin{cases}
D6 = 1 \quad \text{if} \quad D1 = 1 \text{ and } D5 = 1 \\
\quad = 0 \qquad \text{otherwise}
\end{cases}
$$

*D*7: fiscal stress indicator 7 (based on Buiter et al. (1993))

$$
\begin{cases}
D7 = 1 \quad \text{if} \quad \left(\dfrac{GGFL}{GDP} \right)_{\infty} = \dfrac{1+\phi}{\phi} \dfrac{NLG}{GDP} > 0.6 \\[4mm]
\quad = 0 \qquad \text{otherwise}
\end{cases}
$$

*D*8: fiscal stress indicator 8

$$
\begin{cases}
D8 = 1 \quad \text{if} \quad \dfrac{GGFL}{GDP} > \left(\dfrac{GGFL}{GDP} \right)_{avg} \\[4mm]
\quad = 0 \qquad \text{otherwise}
\end{cases}
$$

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Endnotes

[1] See Alesina and Perotti (1997) for an interesting analysis of the effects of the welfare state on international competitiveness and empirical evidence about this relation for the OECD area.

[2] We have also considered the effects of fiscal adjustment on private investment, using the same approach as in eq.(1) but replacing private consumption by private investment. The estimation results in case of investment were broadly consistent with those in case of consumption and not presented/discussed further here.

[3] The data set is available from the authors upon request.

[4] Luxembourg is excluded from the set of EU countries. Denmark, Greece, Sweden and the UK are included in the panel, even though they did not enter EMU on January 1, 1999. For these four countries we assume that the possibility of entering EMU existed in the sense that private agents had some positive expectation that their countries might join EMU at some stage. Note that the indicators ($D1$-$D4$) do not relate to the Maastricht criteria directly.

[5] Like Giavazzi and Pagano (1996), we have also estimated (1) using instrumental variables to account for possible endogeneity problems. The estimation results in that case are comparable to the results obtained using OLS and not reported here for space considerations.

[6] Note that $D1_t$ combines both sharp, persistent fiscal consolidations and expansions. In the case of the EU, we find eight strong, persistent fiscal consolidations (Austria 1997, Belgium 1994, Greece 1991-1997, Italy 1992-1993, Netherlands 1993, Spain 1997, Sweden 1995-1998 and UK 1997-1998) and five strong, persistent fiscal expansions (Finland 1991-1992, Germany 1990-1991, Greece 1990, Sweden 1991-1994 and UK 1993) during the period 1990-1998. We have experimented with estimating (1) using only strong, persistent fiscal consolidations, viz. fiscal expansions rather their combination as in $D1_t$ but this did not change much the estimation results.

[7] This present discounted value (PDV) of the financing needs is defined as the sum of government debt plus the expected PDV of future government spending. We have also used a time horizon of five years of government spending and a value of 0.05 for the discount rate in the calculation of expected future government spending. To calculate expected government spending we estimated for each country a VAR(2) model of g_t and which replicated very well the time series. This model was then also used to obtain forecasts for the period 1998-2003.

[8] We have also experimented with a cut-off value of 60% in the calculation of $D2_t$. However, this did not yield qualitatively different results.

[9] McDermott and Wescott (1996) and Alesina and Perotti (1996) also experiment with various alternative cut-off values and definitions of fiscal adjustments and successfulness of fiscal adjustments to test the robustness of the approach in Alesina and Perotti (1995). Using such alternative definitions, broadly speaking, the same results are obtained as in Alesina and Perotti (1995).

[10] $D4_t$ consists of both successful fiscal consolidations and expansions. In the case of the EU, we find 11 successful fiscal consolidations (Belgium 1993-1998, Denmark 1993-1994 and 1996-1998, Finland 1998, Greece 1996-1997, Ireland 1992-1998, Italy 1997-1998, Netherlands 1995-1998, Portugal 1996-1997, Sweden 1996-1998 and UK 1998) and 8 successful fiscal expansions (Finland 1992, Germany 1991-1992, Greece 1990-1991, Italy 1990, Spain 1990-1991, Sweden 1991-1992 and UK 1992 and 1994) during the period 1990-1998. We have experimented with estimating (1) using only successful fiscal consolidations, viz. fiscal expansions rather their combination as in $D4_t$ but this did not affect very much the estimation results.

[11] Buiter et al. (1993) use calculations of the steady-state government debt to GDP ratio and primary gap analysis to assess the fiscal conditions of the EU countries and the prospects (in 1992) to meet the Maastricht criteria and showed how hard it would be to meet, in particular, the debt to GDP criterium.

[12] Apart from the real interest rate one could also think of other (more direct) proxies for private wealth to be included in equation (2), but data as well as space limitations have refrained us from doing so.