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WORKING PAPER

Fiscal consolidation, institutions and institutional reform: a multivariate analysis of public debt dynamics

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Abstract

We study the evolution of the public debt to GDP ratio during 40 fiscal consolidation episodes in 21 OECD countries in 1981-2008. We test within a multivariate regression framework eight hypotheses put forward in the literature on the success or failure of consolidation programmes. These hypotheses concern (i) the composition of the consolidation programme, (ii) its size and persistence, (iii) the gravity of the debt situation, (iv) the influence of the international macroeconomic environment, (v) the contribution of a preceding devaluation, (vi) the role of labour and product market institutions and institutional reform, (vii) the ideological orientation of the government, and (viii) the role of strict fiscal rules. We add a new hypothesis emphasizing the influence of public sector efficiency. We also improve on the literature methodologically by controlling for one-off budgetary measures.

Our main findings are the following. Consolidation programmes imply a stronger reduction of the public debt ratio when they mainly rely on spending cuts (except public investment), take place when growth in the international economy is high and interest rates are low, are preceded by a devaluation, are accompanied by product market deregulation, are adopted by left-wing governments, are embedded in a regime of strict and wide fiscal rules, and are executed by highly efficient administrations. Public sector efficiency is important also for the composition hypothesis. Government wage bill cuts do not contribute to lower public debt ratios when public sector efficiency is high. On the hypothesis that consolidation is more likely to succeed in a situation of fiscal emergency, our evidence is mixed. Furthermore, we find no evidence that consolidation programmes would be relatively more effective when they are large or long lasting. Finally, we find no evidence that labour market deregulation contributes to a reduction of the public debt ratio during consolidation periods. Simultaneous labour market deregulation may even be counterproductive during consolidation periods.

JEL codes: E62, H62, H63

Keywords: public debt, fiscal consolidation, fiscal policy composition, fiscal rules, labour and product market institutions, government efficiency

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1. Introduction

The sharp increase in public debt ratios and growing concern about the sustainability of public finances since the recession in 2008-09 have imposed the need for a significant fiscal adjustment and credible debt reduction strategies in most OECD countries.

Many countries have gained experience with fiscal consolidation programmes in the past two or three decades. Analysis of the determinants of the success or failure of fiscal consolidation has also been high on the agenda of many researchers since seminal work by Giavazzi and Pagano (1990) and Alesina and Perotti (1995). The range of existing studies is extremely wide. Whereas some studies focus on individual countries or fiscal episodes (e.g. Giavazzi and Pagano, 1990; Perotti, 2011), most studies have a cross-country or panel setup. As dependent variable, a very large number of studies try to explain the probability of success in debt or deficit reduction (e.g. McDermott and Wescott, 1996; Alesina and Ardagna, 1998; Ardagna, 2004; Guichard *et al.*, 2007; Schaltegger and Feld, 2009; Tagkalakis, 2009; Afonso and Jalles, 2012; Larch and Turrini, 2011). Others focus on the evolution of economic growth, private consumption, or private investment during and after consolidation periods (e.g. Giavazzi and Pagano, 1996; Hjelm, 2002; Alesina *et al.*, 2002; Ardagna, 2004; IMF, 2010a; Alesina and Ardana, 2012). Explanatory variables may relate narrowly to the characteristics of the consolidation programme, e.g. its composition or size (see e.g. Alesina and Perotti, 1995, 1996; McDermott and Wescott, 1996, and Ardagna, 2004, among many others), the economic context within which consolidation takes place (e.g. McDermott and Wescott, 1996; von Hagen *et al.*, 2002), or the institutional environment within which it takes place. As to institutions, some studies focus on fiscal institutions (e.g. Guichard *et al.*, 2007), others on labour and product market institutions (Tagkalakis, 2009; Alesina and Ardagna, 2012), still others on the ideological orientation of government or the number of political parties in government (e.g. Alesina and Perotti, 1995; Ardagna, 2004; Tavares, 2004). In a recent study, Larch and Turrini (2011) pay attention to all these institutions, although they do not introduce them into their empirical model simultaneously.

This paper contributes to the literature by studying directly the evolution of the ratio of public debt to GDP during and after fiscal consolidations. We focus on 21 OECD countries in 1981-2008. To the best of our knowledge, only one study has investigated the dynamics of the public debt ratio during consolidation periods before (see Heylen and Everaert, 2000). Given that ultimately it is the evolution of public debt that matters most in a consolidation context, this scarcity of available studies is surprising. Another advantage of our approach is that it allows to empirically exploit the whole variance in outcomes after consolidation programmes. For us, changes in the public debt to GDP ratio by for example -10, -1, +5 or +25 percentage points are very different outcomes, which are worth being explained, rather than being restricted to either 'success' cases or 'failures'. Compared to Heylen and Everaert (2000) we make progress along several lines. First, we also include more recent fiscal episodes. Second, we test more hypotheses put forward in the literature on the success or failure of consolidation programmes. Next to traditional hypotheses concerning (i) the composition of the consolidation programme, (ii) its size and persistence, (iii) the gravity of the debt situation, (iv) the influence of the international macroeconomic environment, and (v) the possible contribution of a preceding devaluation, we also test the influence of (vi) labour and product market institutions and institutional reform, (vii) the ideological orientation of the government, and (viii) budgetary institutions, in particular the role of strict fiscal rules. Furthermore, we add a new hypothesis to this literature, emphasizing the influence of public sector efficiency. We study all these hypotheses within one common framework, and with one dataset. Third, when defining fiscal episodes, we take the IMF (2010a) criticism seriously and focus on the evolution of *underlying* cyclically-adjusted primary budget balances. The influence of one-off measures is excluded when we select fiscal

episodes and test composition effects. Finally, our analysis allows to distinguish short-run effects of fiscal adjustment policies on the debt to GDP ratio, i.e. effects during the adjustment period, from more persistent longer run effects.

The structure of this paper is as follows. In Section 2 we define 132 fiscal episodes in 21 OECD countries since 1981. Among these, 40 are classified as consolidation episodes, 29 as expansion episodes. The others are 'neutral' periods. In Section 3 we review existing hypotheses on the determinants of the success or failure of fiscal consolidation, and refer to the results of related empirical studies. In Sections 4 and 5 we present the results of our own empirical work, explaining the evolution of the ratio of public debt to GDP during the above defined episodes. Section 6 summarizes our main results and concludes the paper.

2. Fiscal episodes in the OECD, 1981-2008

The fiscal consolidation literature commonly determines consolidation and expansion periods using a criterion based on swings in the cyclically adjusted primary balance in percent of GDP (further *CAPB*). In a recent study, IMF (2010a) criticizes this method. Although the *CAPB* corrects for interest expenditures and business cycle fluctuations, it may sometimes give wrong signals about actual policy changes. Periods in which no specific consolidation measures were taken, were sometimes classified by researchers as consolidations. Also, periods with a deteriorating *CAPB* despite severe consolidation measures were sometimes not selected (IMF, 2010a). An important element is the influence of one-off budgetary measures. When one-off measures are taken, they may typically imply a temporary improvement of the reported *CAPB*, followed by a subsequent deterioration when their effect disappears. From the reported *CAPB*, one might erroneously conclude that a fiscal consolidation year was followed by an expansion year, whereas in reality there was no deliberate policy at all. A second problem is that traditional cyclical adjustment methods may sometimes suffer from measurement errors. They may for example fail to remove swings in tax revenue that are associated with (cyclically affected) asset price movements.

Instead of the *CAPB* as a selection variable for consolidation and expansion periods, we use the underlying cyclically adjusted primary balance in percent of potential GDP (*CAPBu*). The latter corrects the *CAPB* for one-off transactions and budgetary measures. *CAPBu* data are published by the OECD, annual data are available since 1980. On the basis of these data, we then distinguish three kinds of fiscal episodes. Each episode is a period of flexible duration in which the *CAPBu* consistently moves in the same direction. Following Heylen and Everaert (2000), a consolidation period is a period of at least two consecutive years when the *CAPBu* improves by at least 2 percentage points. Besides the requirement that the *CAPBu* improves in each single year of the consolidation period, there should be an improvement by at least 0.25 percentage points in the first year of the consolidation period and at least 0.10 percentage points in the final year. With the latter conditions, we hope to exclude years of mere stabilization. Similarly, we define an expansion period as a period of at least two consecutive years when the *CAPBu* deteriorated by at least 2 percentage points. Periods that do not fit our definition of expansion, nor consolidation are labeled 'neutral'. We will refer to these three kinds of periods as 'fiscal impulse periods'. Applying these criteria to 21 OECD countries in 1981-2008 yields 40 consolidations, 29 expansions and 63 neutral periods. Table 1 shows these different periods and their changes in the *CAPBu*. We also display the associated change in the gross government debt to GDP ratio (*GD*) up to two years after the end of the period.

The definition of fiscal episodes is not uniform in the literature. Heylen and Everaert (2000), Guichard *et al*. (2007) and recently Alesina and Ardagna (2012) also define episodes of flexible duration. Most others, however, specify periods of a fixed number of one or two, and sometimes three years during which the

change of the *CAPB* exceeds a chosen number (e.g. Alesina and Perotti, 1995; Alesina and Ardagna, 1998; von Hagen *et al.*, 2002; Tavares, 2004; Larch and Turrini, 2011). An important advantage of our flexible duration approach is that it allows to study homogeneous episodes as well-defined cases. Each episode ends with a change in policy. Among the 40 consolidation episodes that we define, 37 are followed by

Table 1. Fiscal consolidation, expansion and neutral periods in the OECD: 1981-2008

Consolidation periods					**Expansion periods**				
Country	Code	Period (t_s - t_f)	*ΔCAPBu*	*ΔGD*	**Country**	Code	Period (t_s - t_f)	*ΔCAPBu*	*ΔGD*
Austria	at1	1984-1985	2.32	13.5	**Austria**	at1e	1993-1995	-2.40	9.2
	at2	1996-1997	3.88	1.4		at2e	1998-2000	-2.04	6.3
Belgium	be1	1982-1987	9.47	35.1	**Belgium**	be1e	2002-2005	-2.19	-24.0
	be2	1993-1994	2.77	-3.3	**Canada**	ca1e	1982-1985	-2.65	24.5
	be3	1996-1998	2.41	-21.7		ca2e	2001-2003	-3.55	-10.5
Canada	ca1	1986-1988	3.71	8.3	**Denmark**	de1e	1989-1995	-3.94	7.5
	ca2	1993-1997	7.23	1.1	**Finland**	fi1e	1982-1983	-3.30	4.4
Denmark	de1	1983-1986	10.5	2.2		fi2e	1985-1987	-3.51	-0.8
	de2	1996-1999	2.45	-23.4		fi3e	1990-1992	-6.41	44.3
	de3	2003-2005	4.18	-24.1		fi4e	2001-2004	-4.29	-6.9
Finland	fi1	1993-1996	4.40	16.6	**Hungary**	hu1e	1997-1998	-2.55	-16.5
	fi2	1998-2000	6.46	-15.2		hu2e	2001-2002	-5.04	4.2
France	fr1	1994-1999	3.63	13.2		hu3e	2005-2006	-2.62	13.3
Germany	ge1	2003-2007	2.96	14.4	**Ireland**	ir1e	2000-2002	-5.23	-18.9
Ireland	ir1	1982-1984	5.95	37.3	**Italy**	it1e	2000-2003	-4.37	-6.5
	ir2	1986-1989	6.25	-6.1	**Japan**	ja1e	1992-1996	-5.68	50.0
	ir3	1992-1994	2.59	-21.0	**Netherlands**	ne1e	1989-1990	-3.16	4.8
	ir4	2003-2004	2.05	-7.3		ne2e	2001-2002	-3.04	-1.7
Italy	it1	1982-1983	4.37	-2.3	**New Zealand**	nz1e	1996-1999	-2.80	-18.3
	it2	1990-1993	6.18	27.0	**Norway**	no1e	1987-1992	-7.68	-3.5
	it3	1995-1997	3.19	5.5		no2e	2001-2003	-6.17	14.9
	it4	2006-2007	2.27	7.8	**Portugal**	pr1e	1989-1991	-2.72	0.6
Japan	ja1	1981-1985	3.72	29.7	**Spain**	sp1e	1988-1991	-2.50	16.8
	ja2	2005-2008	3.01	32.9	**Sweden**	sw1e	1990-1993	-6.92	30.6
Netherlands	ne1	1981-1983	3.11	28.9		sw2e	2001-2003	-4.68	-4.4
	ne2	2004-2005	2.59	-9.9	**UK**	uk1e	1990-1993	-5.42	15.6
New Zealand	nz1	1992-1994	3.86	-15.3		uk2e	2001-2004	-5.55	0.9
Norway	no1	1994-1995	5.40	-8.7	**USA**	us1e	1982-1986	-2.69	20.2
	no2	2004-2007	6.39	-0.7		us2e	2001-2003	-5.95	6.9
Portugal	pr1	1982-1984	7.37	19.5					
	pr2	2006-2007	2.73	14.4					
Spain	sp1	1992-1997	5.25	19.8					
Sweden	sw1	1981-1984	4.12	22.8					
	sw2	1986-1987	3.09	-20.0					
	sw3	1996-2000	8.20	-20.8					
	sw4	2004-2005	2.26	-12.0					
UK	uk1	1981-1982	2.72	1.8					
	uk2	1994-1999	6.97	-8.3					
USA	us1	1987-1989	2.00	9.0					
	us2	1993-1998	4.59	-15.8					
Average			4.42	3.16	**Average**			-4.11	5.61

Note: *ΔCAPBu*: change in the underlying cyclically adjusted primary government balance in percent of potential GDP (change in percentage points between t_{s-1} and t_f); *ΔGD*: change in the gross public debt ratio in percent of GDP (change in percentage points between t_{s-1} and t_{f+2}). We indicate by t_s the first year of the consolidation period and by t_f the last year.

Data sources: OECD (2010a) and European Commission, AMECO. See Appendix 3 for details.

Neutral periods [1]					Neutral periods [1]				
Country	Code	Period (t_s - t_f)	*ΔCAPBu*	*ΔGD*	**Country**	Code	Period (t_s - t_f)	*ΔCAPBu*	*ΔGD*
Austria	at1n	1981-1983	0.26	13.0	**Italy**	it1n	1981	-2.80	-7.3
	at2n	1986-1992	-0.66	16.7		it2n	1984-1989	-0.78	20.9
	at3n	2001-2008	4.00	4.8		it3n	1994	-0.35	12.6
Belgium	be1n	1981	0.03	32.3		it4n	1998-1999	-0.61	-9.5
	be2n	1988-1992	-1.16	12.9		it5n	2004-2005	-0.43	-4.2
	be3n	1995	-0.05	-9.8	**Japan**	ja1n	1986-1991	0.89	4.5
	be4n	1999-2001	-0.95	-19.8		ja2n	1997-2004	-1.52	78.4
	be5n	2006	0.02	-2.5	**Netherlands**	ne1n	1984-1988	0.23	9.1
Canada	ca1n	1981	2.37	12.8		ne2n	1991-2000	0.00	-28.4
	ca2n	1989-1992	-0.56	25.6		ne3n	2003	0.02	0.7
	ca3n	1998-2000	-0.19	-15.8	**New Zealand**	nz1n	1987-1991	-0.14	-6.9
	ca4n	2004-2005	0.78	-10.1		nz2n	1995	0.05	-18.9
Czech Republic	cz1n	2000-2007	2.49	18.9		nz3n	2000-2006	2.70	-14.5
Denmark	de1n	1981-1982	-1.17	33.4	**Norway**	no1n	1981-1986	0.53	-6.8
	de2n	1987-1988	-1.05	-5.5		no2n	1993	0.02	8.5
	de3n	2000-2002	-1.75	-13.0		no3n	1996-2000	3.64	-0.2
Finland	fi1n	1981	2.02	4.3	**Poland**	pl1n	1997-2007	-1.25	7.0
	fi2n	1984	1.71	1.5	**Portugal**	pr1n	1985-1988	-1.14	4.5
	fi3n	1988-1989	2.64	4.8		pr2n	1992-2005	-1.30	7.0
	fi4n	1997	-0.12	-11.3	**Spain**	sp1n	1981-1987	1.73	18.6
	fi5n	2005-2007	1.14	1.1		sp2n	1998-2007	0.90	-12.6
France	fr1n	1981-1993	-2.36	32.9	**Sweden**	sw1n	1985	-0.27	-9.0
	fr2n	2000-2006	-1.13	9.1		sw2n	1988-1989	0.11	-6.9
Germany	ge1n	1993-2002	0.71	25.4		sw3n	1994-1995	-0.08	4.8
	ge2n	2008	-0.02	14.6	**UK**	uk1n	1983-1989	-0.76	-18.0
Hungary	hu1n	1999-2000	1.67	-4.3		uk2n	2000	0.09	-6.6
	hu2n	2003-2004	0.48	10.1		uk3n	2005-2006	0.72	13.2
Ireland	ir1n	1981	0.02	24.5	**USA**	us1n	1981	1.07	7.1
	ir2n	1985	-0.59	15.2		us2n	1990-1992	-1.10	9.5
	ir3n	1990-1991	-1.51	-5.2		us3n	1999-2000	0.15	-7.4
	ir4n	1995-1999	-0.84	-53.1		us4n	2004-2006	1.70	10.9
	ir5n	2005-2006	0.65	14.7					
					Average			0.17	3.82

Note: *ΔCAPBu*: change in the underlying cyclically-adjusted primary government balance in percent of potential GDP (change in percentage points between t_{s-1} and t_f); *ΔGD*: change in the gross debt ratio in percent of GDP (change in percentage points between t_{s-1} and t_{f+2}). We indicate by t_s the first year of the consolidation period and by t_f the last year.

Data sources: OECD (2010a) and European Commission, AMECO. See Appendix 3 for details.

'neutral' policy. Clearly, this facilitates consistent estimation of policy effects. If one defines episodes as periods of for example one or two years, the next episode may be of a different kind, but it may also be of the same kind. It may then be more difficult to study longer run debt dynamics.

Furthermore, it is not common to use the *CAPBu* as a selection criterion to define fiscal episodes. To check if this variable is indeed more reliable than the *CAPB*, we compare our selection of periods with

[1] Note that in a few cases *ΔCAPBu*>2 in absolute value. Typically, these are longer periods when there is some trend in fiscal policy, but no consistent change of *CAPBu* in one direction. Years of increases are followed by years of decreases, or vice versa. Another possibility is that the 'period' lasts only one year.

the ones found by the IMF. The IMF (2010a) uses a narrative action-based approach to select fiscal adjustments. The authors emphasize five striking years which the commonly used *CAPB*-method incorrectly classifies as consolidations. Moreover, they point out five effective years of consolidation which are not classified as such. Nine of these ten years relate to 1981-2008. Appendix 1 displays these nine years, and reports the change in the *CAPBu*, the change in the *CAPB*, and corresponding values for the size of fiscal policy measures according to the narrative IMF approach. With the exception of only one case (Finland, 1992), the change in the *CAPBu* gives the same signal as the IMF narrative approach. The data that one obtains to evaluate policy using $\Delta CAPBu$ are in general (much) closer to the action-based indicator from the IMF than the data obtained when considering $\Delta CAPB$.

Figures 1 to 2 relate the change in the gross government debt ratio to the change in the *CAPBu* during all consolidation and all expansion periods. Figure 1 confirms the results in Heylen and Everaert (2000). Even if during consolidation severe fiscal measures are taken, this does not guarantee an improvement of the public debt ratio. No negative relationship shows up. In about half of the consolidation periods the debt ratio deteriorates. Among the worst periods we find Ireland, 1982-84, Belgium, 1982-87 and Japan, 1981-85 and 2005-08, with increases in the debt ratio by more than 25 percentage points. However, Figure 1 also reveals many successful consolidation episodes, with debt ratio reductions by more than 20 percentage points (e.g. Denmark, 1996-1999, 2003-2005, Ireland, 1992-1994, and Sweden, 1996-2000). Observations for expansion periods (Figure 2) are much more in line with ex-ante expectations. A clear relationship shows up here, with larger expansions being accompanied by a greater increase in the debt to GDP ratio.

Figure 1. Fiscal consolidation and the evolution of gross government debt in percent of GDP

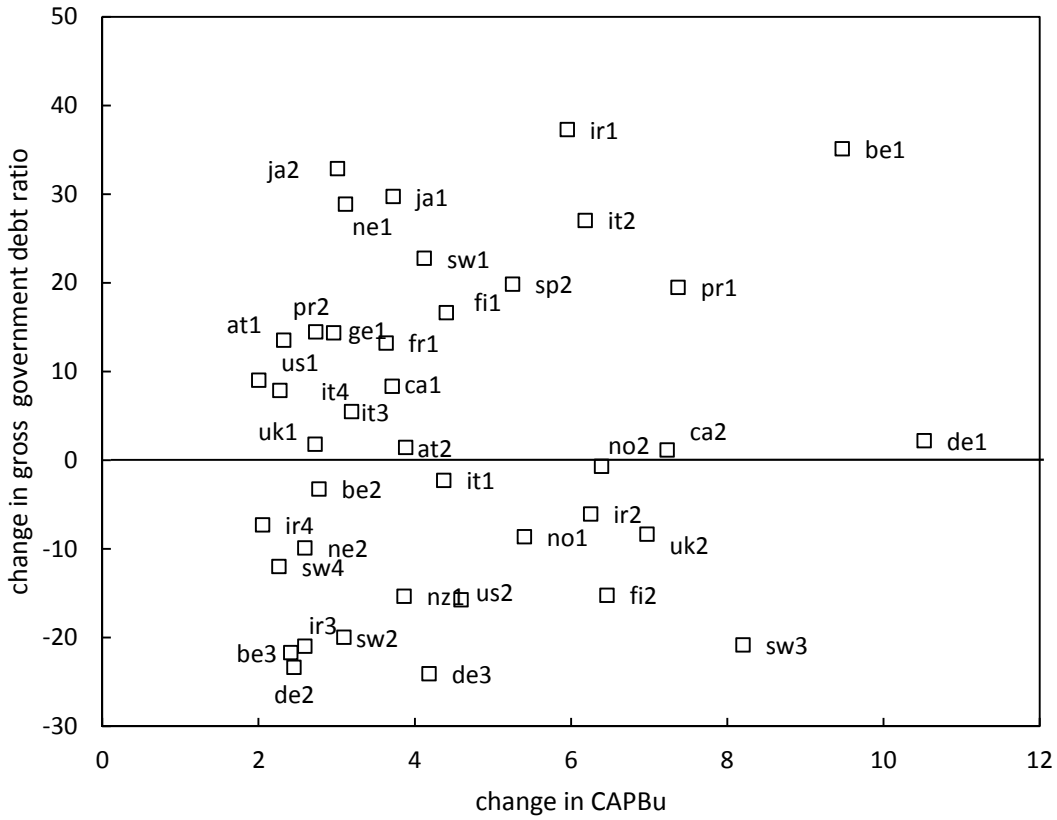
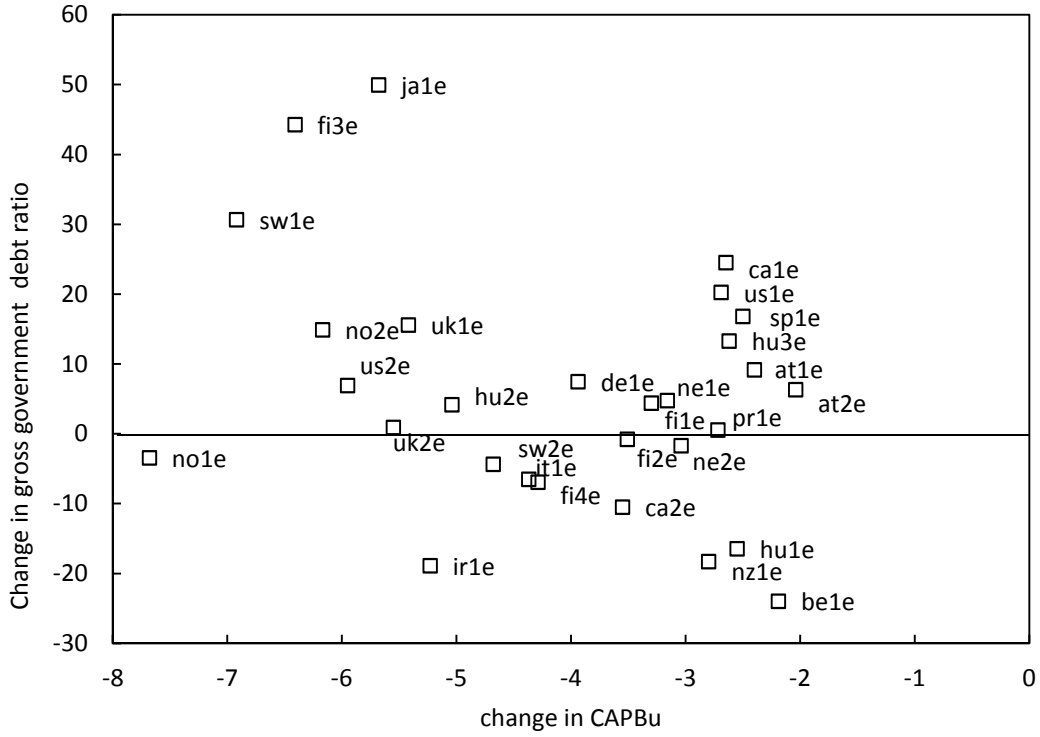


Figure 2. Fiscal expansion and the evolution of gross government debt in percent of GDP



Data and data sources: see Table 1.

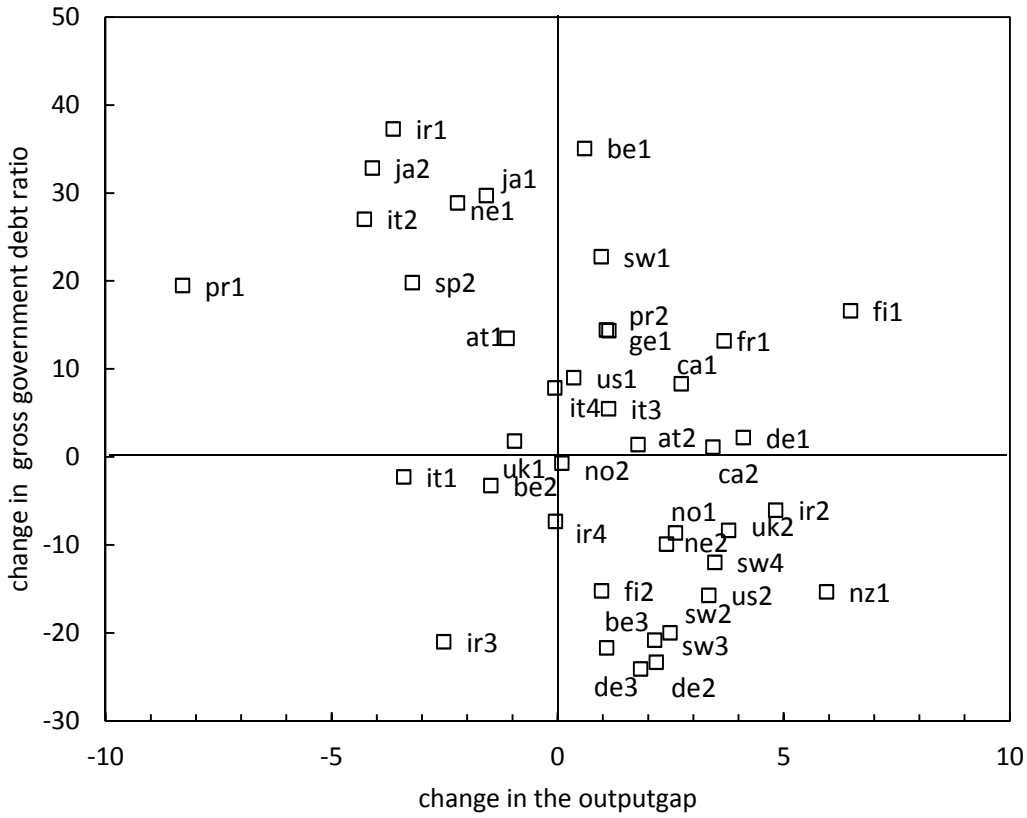
To explain the striking differences in the outcome of fiscal consolidation programmes for the public debt ratio, Heylen and Everaert (2000) point to differences in economic growth during the consolidation period. They call growth much more important than the size of the consolidation programme. Figure 3 confirms their argument. It relates the change in the gross debt ratio between t_{s-1} and t_{f+2} to the change in the output gap between t_{s-1} and t_{f+1}.[2] This change in the output gap indicates the cumulated difference between actual real GDP growth and potential real growth in the years t_s to t_{f+1}. A clear negative relationship emerges. Strong growth really seems to be a necessary condition for consolidation policy to succeed. Only three episodes can be observed in Figure 3 where consolidation efforts have led to a fall of the government debt ratio in times of weak growth (Belgium, 1993-1994; Ireland, 1992-1994, and Italy, 1982-1983). On the other hand, Figure 3 also reveals that strong growth is not a sufficient condition. In about 40% of the episodes with a rising output gap, the debt to GDP ratio increases.

3. Fiscal consolidation, growth and the public debt ratio: hypotheses

The previous section has shown the absence of a clear relationship between the size of consolidation efforts and the change of the public debt ratio. It also indicated economic growth as crucial for the success of consolidation. These findings have inspired a huge amount of research into the determinants of growth during and after consolidation. Seminal contributions have been made by Giavazzi and Pagano

[2] We indicate by t_s the first year of the consolidation period and by t_f the last year (see heading of Table 1).

Figure 3. Consolidation periods, output gap evolution and evolution of the gross debt



Data sources: OECD (2010a) and European Commission, AMECO. See also Appendix 3.
Note: the change in the output gap and the change in the government debt ratio are in percentage points.

(1990, 1996) and Alesina and Perotti (1995, 1996). Alesina and Perotti (1996), Alesina and Ardagna (1998) and Heylen and Everaert (2000) present early surveys of the literature. For recent discussions, we refer to IMF (2010a) and Larch and Turrini (2011).

Theoretically, the net effect of tight fiscal policy on growth is uncertain. For decades economists have paid attention mainly to its *negative Keynesian effects*. The Keynesian view predicts that fiscal consolidation undermines economic growth because it leads to a reduction of aggregate demand. The fall in demand occurs either directly when the government reduces its consumption or investment, or indirectly when households reduce their consumption because higher taxes or lower transfers affect their disposable income. The multiplier mechanism implies that consumption and investment cuts are more contractionary than tax rises or transfer reductions. Moreover, the fall in aggregate demand may be reinforced when private investment responds negatively to the (expected) fall in output caused by lower private consumption or government spending. This is the well-known accelerator mechanism discussed in many macroeconomics textbooks. As a result of these negative demand effects, consolidation efforts have only limited or no effect on the debt to GDP ratio. Debt may be reduced, but so may GDP. Many authors argue that in the short-run the impact of consolidation on growth is likely to be negative indeed (IMF, 2010a; OECD, 2010b).

Since the 1990s, however, this view has also been criticized[3]. Several authors have emphasized that fiscal consolidation also induces positive demand effects. In addition to standard *crowding-in effects on private investment* and *wealth effects on consumption*, caused by *falling real interest rates* (and rising asset prices) that result from lower government deficits, attention has been paid to favourable expectation effects and credibility effects, among others. The idea behind *expectation effects* (also called Ricardian effects) is that fiscal consolidation - if it is believed to be long lasting - implies a permanent reduction in future taxes on households and firms. A reduction of government consumption today will then raise private spending because consumers and businesses will feel that their permanent income has increased. An increase in taxes or a reduction in transfers may then leave private spending unaffected, even if it reduces current disposable income. Furthermore, as argued by Blanchard (1990), fiscal consolidation - to the extent that it reduces uncertainty about future fiscal policy - may reduce precautionary savings which further supports current aggregate demand. Favourable *credibility effects* follow if fiscal consolidation increases the authorities' solvency and, as a consequence, reduces the risk premium (default risk, inflation risk) on government debt. This effect reinforces the fall in real interest rates and the crowding-in and wealth effects mentioned above. In addition to demand effects, it has been argued that consolidation also generates a number of *supply effects*, which might be positive as well. Intelligent consolidation programmes may induce lower union wage claims and rising competitiveness, as we illustrate below. Whether all these positive effects are strong enough to overrule the negative Keynesian effects is uncertain, however. In this respect the literature points at the crucial role of the characteristics of a consolidation programme and at the circumstances in which consolidation takes place. Several important hypotheses have been put forward. In the remaining part of this section we review these hypotheses as well as some of the related empirical evidence.

3.1. Composition and the role of public sector efficiency

The importance of the composition of consolidation efforts has been emphasized in particular by Alesina and Perotti (1995, 1996). In their view, *consolidation programmes that rely mainly on government consumption cuts (especially cuts in the wage bill) and social transfer cuts have a high probability of success*, i.e. a high probability of generating strong economic growth and reducing the debt ratio. *Programmes that rely mainly on tax rises and government investment cuts, on the other hand, are expected to fail*.

Alesina and Perotti justify this hypothesis on several grounds. They argue that government wage bill and transfer cuts, in contrast to tax rises and investment cuts, induce favourable credibility and expectation effects on demand, as well as favourable supply effects. Positive credibility effects follow from the fact that governments that tackle the politically more delicate components of the budget (e.g. public employment, social security) signal that they are really serious about fiscal adjustment, and bringing down public debt. The risk premium will fall. As for expectation effects, cuts of public employment and transfers are more sustainable than investment cuts. Although their impact may be the same, one cannot postpone investment (e.g. the maintenance of public infrastructure) forever. Furthermore, given the experience of the past that tax increases tend to elicit higher spending, these provide the least convincing signal of a permanent change in fiscal policy. Therefore, the probability that the public considers fiscal consolidation to be long lasting (and revises its permanent income upwards) will be higher when it relies mainly on government wage bill and transfer cuts. The supply effects of government consumption and transfer cuts are also believed to be more favourable. If taxes are raised or public investments cut, supply effects will be negative. Higher taxes will – especially in the short run and

[3] For earlier work, see e.g. Feldstein (1982) and Barro (1989).

in unionized economies – cause higher labour costs, either directly (due to a rise of employer contributions to social security) or indirectly (when workers ask higher gross wages to compensate for their decreased after tax income). A cut in government investment will, ceteris paribus, reduce the capital stock in the economy. Some authors (see e.g. Baxter and King, 1993) expect this to cause negative effects on private investment also, leading to a further reduction of the economy's supply potential. On the other hand, government wage bill cuts (especially public employment cuts) and transfer cuts may induce positive supply effects. These occur because spending cuts may pave the way for tax cuts and because lower public employment and transfers (e.g. unemployment benefits) may change the perspectives of unions and lead to wage moderation in the private sector (Ardagna, 2004). Note that in a second round these supply effects may also act upon the demand side of the economy. In general, beneficial supply developments will strengthen the favourable credibility and expectation effects of fiscal consolidation, whereas adverse supply developments will undermine them. Further, and more specifically, the evolution of wage costs will influence the international competitiveness and profitability of firms, and thus affect exports and investment (Alesina and Perotti, 1996; Alesina and Ardagna, 1998).

Empirically, the composition hypothesis has received the support of a lot of authors, e.g. McDermott and Wescott (1996), Perotti (1996), Alesina and Ardagna (1998, 2012), von Hagen *et al.* (2002) and Schaltegger and Feld (2009). Heylen and Everaert (2000) confirm the favourable effects from transfer cuts, and from *not* cutting public investment, but they do not find favourable effects from public wage bill cuts. Tagkalakis (2009) and Larch and Turrini (2011) confirm the contribution to successful consolidation of social spending cuts via a reduction of the generosity of the unemployment benefit system, but they find no prominent role for government wage bill cuts in successful consolidation either.

Taking the ambiguity in the literature on the effects of government wage bill cuts as a starting point, we advance in this paper a new hypothesis emphasizing the role of public sector efficiency. It says that wage bill cuts may contribute to debt reduction if public sector efficiency is low, but that it will not contribute when public sector efficiency is high. In the latter case, downsizing the public sector may have negative effects on overall productivity and growth. Such negative effects may undermine competitiveness, and reduce asset prices and private agents' permanent income. Investment and consumption will then fall. Angelopoulos *et al.* (2008) provide evidence on growth that may support our hypothesis. They find that the relationship between the size of the public sector and economic growth depends critically on public sector efficiency. At low efficiency, a growing public sector reduces growth. At high efficiency they find the opposite. Furthermore, it will be our hypothesis that efficient public authorities are more successful in setting up and implementing consolidation programmes. There are two elements in this hypothesis. A first one is that the same consolidation programme will be more effective in bringing down the public debt ratio when it is adopted by a more efficient government apparatus. Private agents may then see the programme as more credible, and believe it to be more durable. A second element is that more efficient governments adopt better consolidation programmes when it comes to size and composition. Efficiency in collecting tax revenue may be one element to explain this. Also, tax compliance and acceptance of expenditure cuts may be higher when citizens have stronger appreciation for, and more confidence in governments that are more efficient.

3.2. Size and persistence

A second hypothesis has been advanced by Drazen (1990), Giavazzi and Pagano (1996) and McDermott and Westcott (1996). It states *that large and persistent fiscal consolidations have a higher probability to be successful*. Large and persistent consolidations are far more likely expansionary thanks to favourable

credibility and expectations effects. In contrast to small and temporary ones, drastic adjustments lasting for, say, more than two years prove that policy makers are serious about fighting debt and deficits. At least their persistence shows willingness to realize certain objectives that take time and to bear the political costs that may come with consolidation (Feldstein, 1982). Drastic adjustments also provide a stronger signal of a change in the policy regime and, thus, of future tax reductions. That is why they may be accompanied by a more vigorous private consumption and investment growth, and thus by stronger output growth. Blanchard (1990) adds that drastic and persistent adjustments provide clarity. They reduce uncertainty about future fiscal policy and may therefore also reduce precautionary savings, which further contributes to demand. Various more recent studies have found evidence in favour of this hypothesis. Among these are Heylen en Everaert (2000), Ardagna (2004) and Afonso and Jalles (2012). Other studies cannot confirm it, e.g. Alesina and Perotti (1996) and Larch and Turrini (2011).

3.3. Emergency effects

A third hypothesis is that *fiscal consolidation has a higher probability of success when the economy is in a situation of emergency, i.e. when the debt ratio is very high or has risen strongly recently*. The reason is again related to favourable expectation effects on private consumption and investment. In economies with very high debt ratios and/or strong recent debt increases, consumers and investors will be aware that a fiscal crisis is near. In these circumstances fiscal consolidation may raise private consumption and investment. Blanchard (1990) and Sutherland (1997) have proposed models generating this result for private consumption. Basically, the idea is the following. At low and sustainable debt levels, current consumers will face the burden of fiscal adjustment (e.g. tax increases) without clear perspectives of also reaping the benefits of this adjustment. The unfavourable Keynesian effects of tight fiscal policy may then dominate. If, on the other hand, the economy is close to the brink, current consumers will also benefit. They will understand that fiscal adjustment reduces the probability of a crisis and of disruptive tax increases in the near future. Fiscal adjustment will then raise their permanent income and stimulate their consumption. At high debt levels, consumption behaviour will be much more Ricardian.

Empirical evidence is mixed. Several authors confirm the hypothesis (e.g. Nicoletti, 1989; Alesina and Ardagna, 1998; Perotti, 1999; Ardagna, 2004), while others report evidence against it (Heylen and Everaert, 2000; Pozzi *et al*., 2004). Pozzi *et al.* (2004) show that high government debt implies tighter credit conditions for consumers and an increasing sensitivity of private consumption to disposable income. At high debt, it will according to their evidence be harder for consumers to act in a Ricardian way.

3.4. International macroeconomic context

Our fourth hypothesis follows from observations by Alesina and Perotti (1995) and McDermott and Wescott (1996) among others. It says that *fiscal consolidation has a higher probability of success if the international macroeconomic situation is supportive, i.e. characterized by high real output growth and low interest rates*. To the extent that these conditions favourably influence national growth and interest rates, debt reduction becomes easier (see also Equation 2). By contrast, to reduce debt ratios in the midst of a global recession is much harder, especially if at the same time interest rates are rising. Heylen and Everaert (2000) confirm the hypothesis. In line with this, IMF (2010a) and OECD (2010b) emphasize that monetary accommodation can offset the negative short-run impact from fiscal consolidation on growth. Von Hagen *et al.* (2002) and Ardagna (2004), however, find no evidence that accompanying monetary easing raises the likelihood of successful consolidation.

3.5. Exchange rate changes before consolidation

Our fifth hypothesis goes back to Giavazzi and Pagano (1990). These authors noticed that relatively successful consolidation episodes in Ireland (1987-1989) and Denmark (1983-1986) were preceded or accompagnied by large devaluations. Heylen and Everaert (2000) confirm this idea, but find that several unsuccessful consolidations were also preceded by a devaluation (e.g. Belgium, 1982-97). Their hypothesis is that a devaluation in the eve of a consolidation increases the probability of success if that devaluation belongs to a credible consolidation programme, i.e. a programme with a good composition. Lambertini and Tavares (2005) confirm the positive role that a devaluation may play. A key element is the increase in competitiveness and exports that may follow from a devaluation, and that may counter negative demand effects from fiscal tightening. More recently, Perotti (2011) also emphasized the crucial role of competitiveness and rising exports for fiscal consolidation to be expansionary.

3.6. Labor and product market institutions

The literature reveals various ways in which labour and product market institutions may matter for the outcome of fiscal consolidation. Both the existing level of institutions and possible changes in the context of labour or product market reform, may be important. However, the sign of the influence of these institutions is theoretically often ambiguous. Tagkalakis (2009) discusses most channels. He also illuminates the possible trade-offs that policy makers may face between reforming labour and/or product markets and initiating fiscal consolidation.

One of the reasons for tax based consolidations to fail is that they induce higher wage claims and labour costs. Theory suggests that this adverse effect will mainly occur in economies with powerful, but uncoordinated unions and uncoordinated wage setting. It will not occur in highly competitive labour markets, where unions may be too weak to claim higher wages, or in economies with strong but coordinated unions and coordinated wage bargaining (Calmfors and Driffill, 1988). In the case of coordination, unions internalize the negative aggregate effects from asking higher wages. They know that if they raise wage claims, wages will rise in large parts of the economy. This will create additional unemployment and new fiscal problems, such that in the end union members pay anyway. It is therefore better to accept the loss of purchasing power from the beginning. Ardagna (2004) finds evidence supporting this hypothesis. Along the same line of arguments, encompassing unions may also better see the long-run advantages of fiscal consolidation, and convince workers to accept the efforts needed. Tagkalakis (2009), however, also points to counter arguments. Strong and coordinated unions may undermine the success of fiscal consolidation when they use their power to organize opposition, or to push the composition of consolidation into the wrong direction. They may for example block off transfer cuts or cuts in the public wage bill. They may even cause higher expenditures, for example to compensate any losers of consolidation policies. Tagkalakis' evidence tends to support these counter arguments. He finds that weaker unions/weaker degrees of coordination raise the likelihood of successful consolidation. In their recent study Alesina and Ardagna (2012) cannot confirm either view on the influence of unions.

Similar ambiguity exists on the effects of (changes in) employment protection legislation and product market regulation. On the one hand, deregulated goods and labour markets may imply higher employment, higher firm entry, and higher productivity and growth. In deregulated markets, interest groups are typically also less powerful, implying less opposition to efficient fiscal consolidation. It would then follow that flexible markets and/or complementary deregulation and structural reform raise the chances for successful consolidation. On the other hand, deregulation and reform may also imply short-

run disruptions, more firings, more need to compensate losers, and a loss of political negotiation capital for the government (Tagkalakis, 2009). Flexible markets and/or structural reform may then undermine the success of fiscal consolidation. The existing empirical evidence is mixed. When it comes to product market deregulation, Tagkalakis (2009) finds that it does not raise the likelihood of successful fiscal consolidation, Larch and Turrini (2011) and Alesina and Ardagna (2012) find that it does. For the labour market, Tagkalakis (2009) and Larch and Turrini (2011) agree in finding no positive contribution from a reduction of employment protection legislation. Alesina and Ardagna (2012), by contrast, claim that labour market deregulation improves the outcome of fiscal consolidation. Their evidence is not strong however.

3.7. Political institutions: ideology, fragmentation

A large literature has studied the effects of political institutions. Some studies investigate effects on the likelihood that a fiscal adjustment programme is started, others concentrate on the chances that this programme is successful or fails (see e.g. Mierau *et al*., 2007, for a survey). Our attention goes out to two institutions: the ideological orientation and the degree of fragmentation of the government. Moreover, we concentrate on their influence on the chances for success. As for decisions to start a fiscal adjustment, Mierau *et al.* (2007) find that these are primarily driven by economic factors and hardly affected by political variables.

As to ideology, political parties from the left are traditionally associated with bigger government, higher (social) expenditures, and higher taxes, but not necessarily more unbalanced budgets. These preferences may explain why in periods of consolidation, governments from the left may find it more difficult to cut transfers and the public wage bill, and why they may prefer revenue based strategies and tax increases (Tavares, 2004). Given the importance of the precise composition of fiscal consolidation, the hypothesis may follow that *left-wing policy makers have lower probabilities to bring down public debt rates if necessary.* Right-wing governments would prefer spending cuts to reduce debts and deficits, which would raise their chances for successful consolidation. Alesina and Perotti (1995) tested this hypothesis, but could not find support for it. Ardagna (2004) even shows the opposite. According to her results, left-wing governments are more likely to implement fiscal stabilizations associated with a persistent reduction of the debt to GDP ratio. One possible explanation is that left-wing governments face less resistance to reform than right-wing ones. Unions for example may be more willing to offer their support to left-wing governments and allow them to cut government spending and/or increase tax rates.

As to the role of government coherence, a popular hypothesis is that *less fragmented governments have a higher possibility to be successful in fiscal consolidation,* independently of their political orientation. Single party governments have the necessary power to reduce transfer and social security programs, whereas coalition governments may fail to do the same, due to internal conflicts about the redistributive consequences of these policy measures. Moreover, more fragmented governments tend to prefer tax-based consolidation. They are not motivated to reduce expenditures. Given that each group in the government only has to finance one part of the expenditures, the gain from cutting them is limited. For a discussion of the effects of fragmentation on fiscal outcomes, see e.g. Volkerink and de Haan (2001) and Perotti and Kontopoulos (2002). As to its effects in the context of fiscal consolidation, some studies find that single party governments are generally more successful than coalition governments (see e.g. Alesina and Perotti, 1995). Larch and Turrini (2011), however, find no significant effect from a variable measuring the political fragmentation of parliament, nor from the size of the majority in parliament. In an earlier version of this paper we also tested for a role of fragmentation. It showed up totally insignificant. We have therefore decided to drop it in the empirical analysis and results that we present later in this paper.

3.8. Budgetary institutions: fiscal rules

Various authors have studied the effects of the introduction of fiscal rules on budgetary performance and the likelihood of successful consolidation. Such rules may include balanced budget rules, expenditure rules, debt ceilings, etc. They may be imposed by national or supranational authorities. Most studies tend to confirm the hypothesis that *fiscal consolidation programmes that are embedded in, or complemented by, strict and wide fiscal rules have a higher probability to be successful*. Rules would shape policy makers' incentives and behaviour, they would make the programme more credible, and imply larger and more durable effort (see e.g. Guichard *et al.*, 2007; IMF, 2009; Larch and Turrini, 2011). Other studies also find positive correlation between rules and good fiscal performance, but they raise questions about causality (Debrun and Kumar, 2007; Lavigne, 2011). Causality may run from fiscal performance to rules, rather than the other way round. Debrun and Kumar (2007, p. 506) suggest that responsible governments may adopt strict rules to reveal the nature of their (unobservable) preferences. IMF (2009, p. 3) argues that rules contribute to prudent fiscal policies, but they are often introduced at the end, i.e. to lock-in earlier consolidation efforts, rather than at the beginning of fiscal adjustment.

In recent work, Abbas *et al.* (2011) have studied the degree to which governments in Europe implement announced budgetary consolidation plans. In line with the majority opinion, they find higher degrees of implementation in the presence of stronger national fiscal rules.

Along similar lines, other authors have studied the effects of fiscal institutions on fiscal performance. Institutions concern the mechanisms and procedures related to the planning, implementation and monitoring of the budget. Although questions can again be raised about causality, the evidence tends to be that having good institutions matters (see Fabrizio and Mody, 2006, and their discussion of the literature).

4. Dynamics of the public debt ratio: empirical specification and method

In this section we first derive the basic specification underlying our empirical analysis. Next we discuss a number of extensions and our estimation methodology. We also give insight in our data.

4.1. Basic econometric specification

Our starting point is Equation (1), the well-known formula for the dynamics of the government debt ratio. In this equation, GD_t is the ratio of nominal gross government debt to nominal GDP at the end of year t, PB_t is the nominal primary balance in percent of nominal GDP in t, $r_{n,t}$ the nominal interest rate on outstanding government debt, $g_{n,t}$ the growth rate of nominal GDP, and SF_t the stock-flow adjustment in percent of GDP. The latter captures the effect on the public debt ratio from the accumulation of financial assets for example, and remaining statistical adjustments.

$$\Delta GD_t = -PB_t + \frac{(r_{n,t} - g_{n,t})}{(1+g_{n,t})} GD_{t-1} + SF_t \qquad (1)$$

Equation (2) follows from (1) after splitting up the primary balance in three components. We have already defined $CAPBu_t$ as the underlying cyclically adjusted component. Furthermore, $CCPB_t$ is the cyclical component in percent of GDP, and $ONEOFF_t$ captures the effect on the primary balance of one-off budgetary measures. It is defined as net revenue.

$$\Delta GD_t = -CAPBu_t - CCPB_t + \frac{(r_{n,t} - g_{n,t})}{(1+g_{n,t})} GD_{t-1} - ONEOFF_t + SF_t \qquad (2)$$

with: $PB_t = CAPBu_t + CCPB_t + ONEOFF_t$

Equation (2) shows the major influence of real economic growth as a driver of the change in the debt ratio, which we highlighted at the end of Section 2. This influence runs via two channels. First, for given inflation, higher real growth reduces the burden of inherited debt, $\left((r_{n,t} - g_{n,t})/(1+g_{n,t})\right) GD_{t-1}$. Second, by raising tax receipts and reducing unemployment benefit expenditures, higher growth raises the cyclical component of the primary balance, *CCPB*. Both channels contribute to debt reduction (*ΔGD*<0). The other main determinants of the change of the public debt ratio are the underlying cyclically adjusted primary balance ($CAPBu_t$) and the interest rate ($r_{n,t}$). Fiscal policy makers control the former. The latter will depend also on actions from monetary policy makers. Finally, Equations (1) and (2) show the influence of the historical fiscal situation as reflected by GD_{t-1}.

Starting from Equation (2), we impose three major rearrangements to derive the basic econometric specification that we estimate in Section 5. First, in our regressions, we will not include the cyclical component of the primary balance (*CCPB*), nor the domestic interest and growth rates (g_n, r_n). It is clear from the literature that the evolution of these variables is highly endogenous. They are affected by the precise characteristics of discretionary policy and by the context within which policy is executed. By not controlling for *CCPB*, g_n and r_n in the regressions, we allow the exogenous fiscal policy variables and context variables to pick up the endogenous effects that they bring about. Fiscal policy variables that we include are the *CAPBu* and *ONEOFF*. These policy variables are cyclically adjusted and expressed in percent of potential GDP. They typically result from decisions taken before the year *t*. As context variables we include international nominal growth and interest rates (*GROWTH*, *INTEREST*), and we control for the possible influence of a *preceding* devaluation (*DEVAL*) on domestic growth and interest rates. Later we also introduce other variables, like institutions, to test other hypotheses that we formulated in Section 3. A final element in Equation (2) concerns the effects on the gross public debt ratio from stock-flow adjustments. It will be harder to account for these. Most of them are small and will show up in the error term. An important exception, however, concerns stock-flow adjustments due to deliberate government support to the banking sector (capital injections) during financial crises (see IMF, 2010b, p. 14). To capture these we introduce *CRISIS* dummies related to the recent financial crisis and to the banking crisis in Finland and Sweden in the early 1990s. Taking these arguments into account generates the following straight-forward empirical specification for the change in the government debt ratio in country *i* and year *t*.

$$\Delta GD_{i,t} = \alpha_i + \beta_1 CAPBu_{i,t} + \beta_3 BURDEN_{i,t} + \beta_4 ONEOFF_{i,t} + \beta_5 DEVAL_{i,t} + \beta_6 CRISIS_{i,t} + \upsilon_{i,t} \qquad (3a)$$

with: $BURDEN_{i,t} = \frac{(INTEREST_t - GROWTH_t)}{(1+GROWTH_t)} GD_{i,t-1}$

$\beta_1,\ \beta_4,\ \beta_5 < 0$ and $\beta_3,\ \beta_6 > 0.$

In this equation β_1 captures the effect on the change of the debt ratio from the level of the government's (underlying cyclically adjusted primary) surplus. Our expectation from Equation (2) would be that β_1 is close to -1. It may differ from this value, however, when it picks up the above mentioned endogenous responses of domestic interest and growth rates (for given international interest and growth) to changes

in the government's basic fiscal position. $BURDEN_{i,t}$ is a new variable. It captures the automatic 'snowball' component of debt dynamics, as well as the effect from (exogenous) international nominal growth and interest rates on their domestic counterparts. Finally, α_i is a country-specific fixed effect, and $\upsilon_{i,t}$ is the country and year specific error term. The fixed effect may for example capture the influence of variables that explain structurally higher or lower potential growth or interest rates in individual countries during the period under consideration[4].

As our second rearrangement we introduce richer dynamics. Equation (3b) allows for different short-run and equilibrium (or longer run) effects from discretionary policy changes on the change of the debt ratio.

$$\Delta GD_{i,t} = \alpha_i + \beta_1 CAPBu_{i,t-1} + \beta_2 \Delta CAPBu_{i,t} + \beta_3 BURDEN_{i,t} + \beta_4 ONEOFF_{i,t} + \beta_5 DEVAL_{i,t} + \beta_6 CRISIS_{i,t} + \upsilon_{i,t} \quad (3b)$$

Fiscal consolidation efforts for example bring about a *temporary* $\Delta CAPBu>0$ which may imply a *permanent* increase of the level of *CAPBu* and permanently better debt dynamics (more favourable ΔGD) in the subsequent periods. The coefficient β_1 measures this permanent (longer run) effect, whereas β_2 captures the temporary effect during the consolidation period. If short-run and equilibrium effects are the same, it would follow that $\beta_2=\beta_1$, and we return to Equation (3a). The Keynesian view however would be that due to negative (positive) effects from fiscal consolidation policies (expansion policies) on domestic growth, β_2 would be smaller in absolute value. Non-keynesian effects, however, may raise β_2. According to the hypotheses reported in the previous sections, the composition of underlying tax and/or expenditure changes may play a key role here. As a final remark on dynamics, note that even temporary effects on the change in the debt ratio (ΔGD) give rise to permanent effects on the level of *GD*.

Our third rearrangement is to move from the annual specification in (3b) to a multi-annual one in Equation (4). This rearrangement reflects the focus in this paper on the evolution of the public debt ratio during well-defined multi-annual fiscal episodes. Equation (4) follows from summing Equation (3b) over all years that are part of the same episode. In Appendix 2 we illustrate the derivation of Equation (4) for the case where a fiscal episode includes two years.

$$\Delta GD_{i,T} = \alpha_i . DURATION_{i,T} + \beta_1 AvgCAPBu_{i,T} . DURATION_{i,T} + \beta_2 \Delta CAPBu_{i,T} + \beta_3 BURDEN_{i,T} . DURATION_{i,T} + \beta_4 ONEOFF_{i,T} + \beta_5 DEVAL_{i,T} + \beta_6 CRISIS_{i,T} + \upsilon_{i,T} \quad (4)$$

In this equation, $\Delta GD_{i,T}$ is the change in the ratio of public debt to GDP in country i during episode T, $AvgCAPBu_{i,T}$ is the average annual underlying cyclically adjusted primary balance in % of potential GDP during this episode, $DURATION_{i,T}$ indicates the length of the episode in years, and $\Delta CAPBu_{i,T}$ is the change in *CAPBu* during the episode[5]. $ONEOFF_{i,T}$ is the sum of all annual one-off measures over the fiscal episode T, $DEVAL_{i,T}$ indicates the size of a devaluation in the year before the episode, and $CRISIS_{i,T}$ again captures the effect of stock-flow adjustments during banking crisis in T. The analogy with Equation (3b) is clear. Whereas β_1 captures the permanent effects on debt dynamics from changing a country's basic financial position reflected by $AvgCAPBu_{i,T}$, β_2 measures the more temporary effect from deliberate policy actions

[4] Note that we include no time dummies in Equation (3a). International growth and interest rates and the crisis dummies in the regression pick up the main time effects common to all countries.

[5] $\Delta GD_{i,T}$ is computed as the change in GD_i between t_{s-1} and t_{f+2}, where t_s is the first year of the episode and t_f the last one. $\Delta CAPBu_{i,T}$ is the total change in $CAPBu_i$ between t_{s-1} and t_f. Finally, $AvgCAPBu_{i,T}$ is an annual average computed over all years from t_{s-1} to t_{f-1}.

($\Delta CAPBu_{i,T}$). The data for $\Delta GD_{i,T}$ and $\Delta CAPBu_{i,T}$ are reported in Table 1. Remember that we calculate $\Delta GD_{i,T}$ over a period including two years after the end of the fiscal episode. Since many of the exogenous determinants of the evolution of the debt ratio operate via all kinds of effects on private agents' behaviour and growth (e.g. credibility effects, expectation effects), it may take some time for these effects to materialize. As a final variable in Equation (4), we computed $BURDEN_{i,T}$ from average international interest and growth rates during the episode *T* and from the level of a country's government debt ratio in the year before the start of the episode *T*. The latter we indicate as *GDINIT*. Algebraically,

$$BURDEN_{i,T} = \left(Avg\left(\frac{INTEREST_t - GROWTH_t}{1 + GROWTH_t} \right)_T \right).GDINIT_{i,T}$$

4.2. Extensions: composition, non-linearity, institutions

In our empirical analysis we extend Equation (4) in three ways. The first one allows to test for composition effects. It has been shown in many studies that the way in which governments change their *CAPBu* may matter for the effects of fiscal policy (see Section 3.1). We introduce this idea in our Equation (4) by substituting one of the following two decompositions for $\Delta CAPBu_{i,T}$:

$$\Delta CAPBu_{i,T} = \Delta INCu_{i,T} - \Delta NIEXPu_{i,T} + \Delta OTHERu_{i,T} \quad (5)$$

$$\Delta CAPBu_{i,T} = \Delta TAXB_{i,T} + \Delta TAXT_{i,T} - \Delta WAGE_{i,T} - \Delta NONWAGE_{i,T} - \Delta SOCEXP_{i,T} - \Delta SUBS_{i,T} - \Delta INV_{i,T} + \Delta OTHERu2_{i,T} \quad (6)$$

The same decompositions can be made for the level of $AvgCAPBu_{i,T}$. In (5) we make use of a rather general decomposition of $\Delta CAPBu$. This decomposition distinguishes changes in underlying current government revenues ($\Delta INCu$) and changes in underlying non-interest expenditures ($\Delta NIEXPu$). A very small rest category of changes in underlying 'other' net revenue closes the equation. One can think of net capital transfers received by the government. The median of the absolute value of $\Delta OTHERu$ over all countries and years in our dataset is less than 0.1% of GDP. Equation (6) is a much more detailed decomposition of $\Delta CAPBu$. At the revenue side, we distinguish changes in cyclically adjusted direct taxes on business (*TAXB*), and changes in the sum of cyclically adjusted direct taxes on households, indirect taxes, and social security contributions paid by workers and firms (*TAXT*)[6]. At the expenditure side, we decompose changes in non-interest expenditures into changes in government wage consumption (*WAGE*), government non-wage consumption (*NONWAGE*), social security benefits paid (*SOCEXP*), subsidies (*SUBS*) and investment in physical capital (*INV*). Again, a component $\Delta OTHERu2$ closes the equation. This component is larger than $\Delta OTHERu$. It includes changes in net capital transfers, property income, and other current expenditures (e.g. transfers outside social security). In Table 2 below we report all variables that will occur in our regressions, with their definition. All fiscal policy data are provided by the OECD, or computed from OECD data. They are adjusted for the cycle and for one-offs, and always expressed in percent of potential GDP.

By introducing Equations (5) and (6) for $\Delta CAPBu$ into Equation (4), and by consequently assigning separate coefficients β_{2j} to each component, we fully take into account the government budget identity in our estimations. Kneller *et al.* (1999) have demonstrated the importance of appropriately dealing with this identity in order to obtain unbiased estimates and a correct interpretation of the effects of changes in

[6] In an earlier version of this paper we included each of the three subcomponents of *TAXT* separately. Empirically, however, we could never observe significant differences between their estimated coefficients. This conclusion also holds for the results that we present later in this paper (Table 4). We therefore decided to merge them.

each revenue or expenditure component. Our approach implies that each of the estimated individual coefficients β_{2j} measures the effect of a change in the *CAPBu* on the government debt ratio if this change is brought about by one particular expenditure or revenue component, controlling for (keeping constant) all other components. The composition hypothesis claims that the coefficients β_{2j} may differ strongly. Even if each unit change in a revenue or expenditure variable brings about the same change in the *CAPBu*, its effect on the debt ratio may vary. Changes in different components of the government budget may affect the behaviour of households, firms, investors, etc. differently. Effects on growth may be different, and so may be effects on (the change of) the debt ratio.

A second extension of Equation (4) allows for different coefficients on the fiscal policy variables according to the episode to which they belong: years of neutral policy, consolidation or expansion. One reason for doing this is possible asymmetry in the response of households or firms to fiscal contraction versus expansion. For example, if forward-looking households face borrowing constraints, they may cut consumption more after a tax increase than raise consumption after a tax cut. Pozzi *et al.* (2004) report evidence supporting this hypothesis. The response in real demand and output to fiscal shocks would then be stronger during consolidation. The fall in the ratio of public debt to GDP during consolidation would then be smaller than its rise during expansion. Another factor which may have similar consequences is asymmetry in price or wage flexibility. If prices are more rigid downwards, real output effects during consolidation could again be stronger.

A third series of extensions of Equation (4) concerns the introduction of additional explanatory variables. We introduce these additional variables to test the other hypotheses that we advanced in Section 3. More precisely, these variables relate to the size or persistence (duration) of a particular fiscal episode, the possible situation of emergency that governments may have run into at the time they execute a consolidation programme, and institutions and institutional change (structural reform). Table 2 defines also these additional variables.

4.3. Estimation method

In regression equations like Equation (3b), which use annual data, and where only cyclically adjusted policy variables, predetermined variables, and exogenous foreign variables show up as regressors, the least squares estimation methodology would seem a most reasonable choice. An unexpected domestic growth slowdown for example which would raise the debt to GDP ratio and show up in the error term is not expected to affect these regressors. We know from the literature, however, that the validity of this choice may be challenged. A first reason is imperfect cyclical adjustment of fiscal variables. IMF (2010a, p. 4) demonstrates how traditional methods may for example fail to remove swings in tax revenue that are associated with asset price or commodity price movements. If the latter coincide with the cycle, the traditionally computed *CAPB* may be positively correlated with growth shocks. A second reason is that fiscal policy makers may react to shocks in the public debt ratio (Blanchard and Perotti, 2002). Although Beetsma *et al.* (2008) test this assumption for public spending in the European Union, and find no reaction within the year, this does not exclude that there is a reaction in a multi-annual setting like ours in Equation (4). Even if governments cannot respond within the same year, it may be possible in periods lasting longer. For example, consolidating governments that are hit by an adverse shock to the debt ratio may adjust their earlier plans. They may change tax codes or spending rules to raise their *CAPBu*, or take *ONEOFF* policy measures, in order to reach the goals for the debt ratio that they may have set. The use of the *CAPBu* may make us somewhat less vulnerable to the first problem. Given also the second problem, however, the possibility of correlation between the error term and some of our explanatory variables

Table 2. Description of variables

Fiscal policy variables	
GD	Gross public debt in % of GDP.
GDINIT	Gross public debt in % of GDP in the year before the start of a fiscal episode.
GDINIT2	Gross public debt in % of GDP two years before the start of a fiscal episode
CAPBu	Underlying cyclically adjusted primary balance, in % of potential GDP.
CAPBuINIT	Underlying cyclically adjusted primary balance in the year before the start of a fiscal episode.
CAPBuINIT2	Underlying cyclically adjusted primary balance two years before the start of a fiscal episode.
ONEOFF	One-off budgetary measures (net revenue), in % of potential GDP.
INCu	Underlying current receipts, in % of potential GDP.
NIEXPu	Underlying non-interest expenditures, in % of potential GDP.
TAXB	Cyclically adjusted direct taxes on business, in % of potential GDP (corporate tax).
TAXT	Sum of cyclically adjusted direct taxes on households, indirect taxes on production and imports, and social security contributions, in % of potential GDP.
WAGE	Government final wage consumption expenditures, in % of potential GDP.
NONWAGE	Government final non-wage consumption expenditures, in % of potential GDP.
INV	Government fixed capital formation, in % of potential GDP.
SUBS	Subsidies, in % of potential GDP.
SOCEXP	Social security benefits paid by general government, in % of potential GDP.
OTHERu(u2)	Underlying other net revenue, in % of potential GDP.
DURATION	Number of years of the fiscal episode.
International macro-context	
INTEREST	'International' nominal short term interest rate, in % [(a)]
GROWTH	'International' nominal GDP growth rate, in % [(a)]
BURDEN	See main text.
CRISIS08	Dummy variable taking the value 1 in all fiscal episodes including the years 2006, 2007 or 2008 ($\Delta GD_{i,T}$ computed for these episodes includes 2008).
CRISIS91sf	Dummy variable taking the value 1 in fiscal episodes in Sweden and Finland covering 1991-92.
Institutions	
EPL	Overall strictness of employment protection. Scale from 0 (least) to 6 (most restrictive).
UNION	Trade union density, in %.
COOR	Index from 1 to 5 rising in the degree of wage bargaining coordination.
PMR	Index for product market regulation. Varies from 0 (least) to 6 (most regulated).
LEFT	Dummy variable taking the value 1 if the government is left-wing and 0 otherwise.
PSEAdm	Index of government efficiency in administration. Varies in the data from about 0.5 (least efficient) to about 5 (most efficient).
PSEAvg	Index of overall government efficiency in administration**,** education, infrastructure and stabilization. Varies in the data from about 0.7 to about 4.
FRI	Fiscal Rule Index, covering all types of numerical fiscal rules (budget balance, debt, expenditure, and revenue rules) at all levels of government. Varies in the data from -1 (no rules) to about 2.2 (strictest regulation).
Other variables	
SIZE/PERSIST	Several indicators (see discussion in Section 5.1. - size and persistence).
EMERGENCY	Several indicators (see discussion in Section 5.1. - emergency).
DEVAL	Percentage of official nominal devaluation of the home currency in the year before the fiscal episode.

Notes: For a detailed description of all variables, and our data sources, see Appendix 3.

(a) For all European countries except the UK, *INTEREST* and *GROWTH* are the (weighted) average short term nominal interest rate and the average nominal GDP growth rate among 21 European OECD countries. For Canada we use interest and growth data from the US. For the US we use average data for Canada, Europe, and Japan. Finally, for Japan, New Zealand and the UK, we take the average of the data for Europe and the US.

cannot be excluded ex-ante. If serious, this would impose the use of IV methods. Considering this possibility, it was very important for us to test the endogeneity of $\Delta CAPBu_{i,T}$, $AvgCAPBu_{i,T}$ and $ONEOFF_{i,T}$. We used the Wu-Hausman test as described in Davidson and MacKinnon (1993, p. 237-242). Since the reliability of this test depends crucially on having strong instruments for the potentially endogenous variables, we first define these instruments and demonstrate their strength.

For $AvgCAPBu_{i,T}.DURATION_{i,T}$ and $\Delta CAPBu_{i,T}$ in Equation (4) we define instruments that reflect the fiscal situation before the start of the episode. A first instrument that we use for both these potentially endogenous variables is the *CAPBu* one year before the start of the episode. We call this variable *CAPBuINIT*. As a second instrument for $AvgCAPBu_{i,T}.DURATION_{i,T}$ we specify the *CAPBu* two years before the start of the episode (*CAPBuINIT2*). For $\Delta CAPBu_{i,T}$ we define the public debt ratio two years before the start of the episode (*GDINIT2*) as our second instrument. The explanatory power of these variables for fiscal policy in later years has been shown before in the literature. Mierau *et al.* (2007) and Tagkalakis (2009) for example show a highly significant effect from a weak fiscal position on the likelihood of future fiscal adjustment in a panel of OECD countries. Moreover, since *CAPBuINIT* and *CAPBuINIT2* will have been decided by policy makers at least one or two years before the episode *T*, they are predetermined with respect to Equation (4). Also *GDINIT2* is a predetermined variable. This makes them valid instruments provided that there is no autocorrelation in the error term υ[7]. As instruments for $ONEOFF_{i,T}$ we define three dummy variables. A first dummy is also predetermined. It is 1 if the beginning of a fiscal episode is preceded by a change of the government and the government's ideological orientation. Typically, these are occasions where political parties from either left or right take power after years of opposition. It can be expected that they come with a coherent new vision and programme. Moreover, such governments are more likely to enjoy the political capital and window of opportunity brought by change (Haggard and Webb, 1994; Mierau *et al*., 2007). It is our hypothesis that they rely less on one-off revenues. The remaining two dummies capture specific policy actions in two countries which are unrelated to shocks in domestic growth and the debt ratio. Such well-observable cases are particularly helpful to identify the effects of one-off measures on the public debt ratio. The first of these dummies is 1 for Finland in 1995 when the government had to compensate farmers for falling agricultural prices after joining the European Union (OECD, 1995). The second dummy is 1 for Japan in 1998 when the government made a one-time capital transfer to the Japan National Railway (IMF, 2010a, p. 27). As a final remark, we mention that the six instruments that we define do not themselves belong in Equation (4). Tests show that they do not matter for the change in the debt ratio beyond their influence on $\Delta CAPBu_{i,T}$, $AvgCAPBu_{i,T}$ and $ONEOFF_{i,T}$.

To assess the instruments' explanatory power in our sample of fiscal episodes we first ran simple regressions of $\Delta CAPBu_{i,T}$ and $AvgCAPBu_{i,T}.DURATION_{i,T}$ on a constant and their two instruments and of $ONEOFF_{i,T}$ on a constant and its three instruments. We obtained R^2 statistics of 0.38, 0.65 and 0.26 respectively. All instruments have the expected sign and are significant at the 2% level in these regressions. Then, for each of the three potentially endogenous variables, we executed Wald tests on the significance of their instruments in the so-called first stage regression, i.e. a regression of the potentially endogenous variable on all exogenous variables in Equation (4) and on all six instruments. These Wald tests yield F-statistics far above Staiger and Stock's (1997) rule of thumb value of 10. More precisely, we obtain values of 19.9, 31.5 and 82.8 in the first stage regressions for $\Delta CAPBu_{i,T}$, $AvgCAPBu_{i,T}.DURATION_{i,T}$ and $ONEOFF_{i,T}$ respectively.

[7] A direct test of autocorrelation is not possible in our setup since this delivers no series of residuals at annual frequency. The evidence that we obtain from overidentifying restrictions tests, however, is consistent with the hypothesis that this condition is satisfied (see footnote 8).

Having defined instruments with good explanatory power finally allowed us to reliably execute the Wu-Hausman test. Augmenting our basic specification (Equation 4) with the three residual series from the first stage regressions for $\Delta CAPBu_{i,T}$, $AvgCAPBu_{i,T}.DURATION_{i,T}$ and $ONEOFF_{i,T}$ and re-estimating with the least squares method, resulted in highly insignificant coefficients for these residual series. A Wald test could not reject their joint insignificance (*p*-value 0.58). We can as a result not reject the null that our regressors in Equation (4) are exogenous and least squares estimates are consistent[8]. Given also its efficiency, we use this method. Details on all above mentioned tests are available upon request.

5. Empirical analysis

In this section we present the results of an empirical analysis of the evolution of the public debt to GDP ratio in 132 fiscal episodes in 21 OECD countries in 1981-2010. Section 5.1. concentrates on the effects of fiscal policies as obtained from estimating Equation (4) or extended versions of this equation. Extensions allow for different effects from the various subcomponents of the cyclically adjusted primary balance according to Equations (5) or (6), and for different effects from fiscal variables in consolidation, expansion or neutral episodes. In our discussion we will mainly focus on effects during consolidation. In Section 5.2. we investigate the role of institutions and institutional change. To assess the statistical significance of our estimates we report White heteroscedasticity-consistent standard errors. The reason is that we focus on multiple fiscal episodes in each country, which implies that error terms are bound to be dependent over observations[9].

5.1. Basic results

Column (1) in Table 3 contains the results from estimating Equation (4). All variables have the expected sign. With the exception of *ONEOFF,* they are all highly significant. The coefficients on $\Delta CAPBu$ and *BURDEN* are not significantly different from 1 in absolute value. For *BURDEN* this is in line with expectations that one would derive from Equation (2), even if now international growth and interest rates are involved. Note that the strong significance of *BURDEN* in our regressions confirms the importance of international growth and interest rates for each country's debt evolution, most so for high debt countries. For $\Delta CAPBu$ the outcome is as expected if over the fiscal episode the effect of discretionary policy on output and growth is about neutral. The inherited fiscal balance as reflected by the level of *AvgCAPBu*, however, obtains a coefficient which is clearly larger than 1 in absolute value. In line with arguments raised in Section 4.1., having a better fiscal position seems to matter for ΔGD not only by the mere fact of having to borrow less, as in the first term of Equation (2). It may also bring about favourable endogenous domestic interest and/or growth rate effects, affecting the 'snowball' mechanism. Moreover, the fact that ΔGD has been computed over a period up to two years after the fiscal episode may enlarge the induced cumulative effects on interest payments. For *ONEOFF*, by contrast, we find no significant effect. One may imagine that negative credibility or expectation effects on private sector behaviour and/or financial

[8] With more instruments than potentially endogenous variables, 2SLS estimation allows a test of overidentifying restrictions. Estimating for example Eq. (4) by 2SLS, using our set of six instruments, yields a *p*-value of 0.24 for this test. The null hypothesis that we defined valid instruments for the Wu-Hausman test cannot be rejected.

[9] Ideally, one applies standard errors that are clustered on the country level. In practice, however, this is not advisable in our setup with 21 countries. As described by Angrist and Pischke (2009, p. 310-320), when the number of clusters is small (less than 42), clustering biases estimated standard errors downward. Moreover, the Bell and McCaffrey adjustment to reduce this bias proves unfeasible technically in our case. Angrist and Pischke (their footnote 17, p. 320) mention this problem when regressors are dummy variables that are 1 for one of the clusters and 0 otherwise. Our crisis dummy *CRISIS91sf* comes very close to this example.

markets explain (part of) this result. As to the other explanatory variables, our results confirm that a preceding devaluation may contribute significantly to a reduction of the public debt ratio. Finally, the *CRISIS* dummies capture direct stock-flow adjustments of more than 10 percentage points on the debt to GDP ratio in all countries during the 2008 financial crisis, and even more than 20 percentage points in Sweden and Finland during their banking crisis in the early 1990s.

In column (2) we allow the coefficient on Δ*CAPBu* to differ during fiscal consolidation episodes, expansion episodes and neutral periods. Differences are remarkable. Effects of discretionary action on the debt ratio are much smaller during consolidation than in expansion. Our regression results do not provide a sharp explanation for this finding, but it clearly seems that domestic output (and therefore the denominator in the debt ratio) responds much more to policy in consolidation than in expansion, for example due to asymmetry in private sector behaviour. In line with the evidence of Pozzi *et al.* (2004) that we referred to at the end of Section 4.2., households may cut consumption after tax increases, but not raise it after tax cuts. Also, they may not raise consumption after public expenditure cuts, but reduce it after public expenditure increases. These asymmetries notwithstanding, it is clear that permanent consolidation efforts imply a better future *CAPBu* level. The effect of consolidation efforts may be small and insignificant during the consolidation episode (as revealed by the coefficient on Δ*CAPBu*). By permanently improving (future) *AvgCAPBu*, however, they will permanently facilitate debt reduction. The other estimation results in column (2) are hardly affected by allowing for different coefficients on Δ*CAPBu*.

Note that we also allowed different coefficients on *AvgCAPBu*.*DURATION* in the three regimes, but this did not yield anything significant. The *p*-value on a Wald test that all three coefficients are the same, is 0.79. Throughout all regressions that we report in this paper, it is a robust result that there are no significant differences in the estimated coefficients on fiscal 'level' variables (β_1). Neither do we observe significantly different effects on *BURDEN*.*DURATION* in consolidation, expansion or neutral periods.

Table 3. Estimation results – 1

	ΔGD			
Explanatory variables	(1)	se	(2)	se
Constant	3.23	2.15	2.34	2.04
AvgCAPBu*DURATION	-1.42***	0.16	-1.42***	0.16
BURDEN*DURATION	1.11***	0.22	1.16***	0.22
ΔCAPBu	-1.06***	0.30	-	
ONEOFF	-1.12	0.88	-1.25	0.88
CRISIS08	10.8***	2.22	11.2***	2.19
CRISIS91sf	25.4***	6.08	19.8***	6.49
DEVAL	-2.28***	0.41	-2.68***	0.46
Consolidation				
ΔCAPBu	-		-0.38	0.43
Expansion				
ΔCAPBu	-		-2.41***	0.47
Neutral				
ΔCAPBu	-		0.51	1.23
R-squared	0.77		0.79	
Adjusted R-squared	0.71		0.73	
Country fixed effects (times DURATION)	yes		yes	
Number of obs. (countries)	132(21)		132(21)	

Notes: 'se' indicates White heteroscedasticity-consistent standard errors;
*** (**) (*) indicates statistical significance at the 1% (5%) (10%) level.
For a definition of all variables, see Table 2. *AvgCAPBu* indicates the average level of *CAPBu* during the fiscal episode (see our discussion of Equation 4, footnote 5).

Composition

Table 4 allows for different effects from the various (cyclically adjusted) revenue and expenditure components behind the government balance. Column (3) introduces the basic decomposition of $\Delta CAPBu$ in changes in underlying non-interest expenditures $\Delta NIEXPu$ and current receipts $\Delta INCu$. At the top of the table we decompose *AvgCAPBu.DURATION* accordingly, and as such allow for possibly different permanent effects of taxes and expenditures on debt dynamics, i.e. effects on ΔGD which persist even after the end of a consolidation or expansion episode. Our main results for the consolidation episodes are the following. First, fiscal adjustment efforts have only limited effects on the government debt ratio during the episode itself, which confirms our findings in Table 3. Column (3) reveals a negative coefficient on $\Delta INCu$ during consolidation. The most likely effect from raising taxes on the public debt to GDP ratio during the consolidation period is therefore negative. However, this effect is small and not significantly different from zero. Things are even worse at the expenditure side, where the estimated coefficient on $\Delta NIEXPu$ is even less significant. It also obtains an unexpected negative sign. As a group, expenditure cuts seem ineffective in bringing down the debt ratio, at least during the consolidation period. Stronger impact effects on output, as one typically finds in multiplier studies (e.g. Blanchard and Perotti, 2002), may explain the lower effectiveness at the expenditure side. Another explanation may be that *NIEXPu* pools various expenditure components, with possibly opposite effects on the debt ratio (e.g. public investment versus social transfers). Although these observations may raise doubt about the composition hypothesis, it would be too fast to draw this negative conclusion. Maybe more important, and in line with the composition hypothesis, are our results in the upper part of column (3). When we also decompose the level of *AvgCAPBu*, we observe significant positive effects from *AvgNIEXPu* and significant negative effects from *AvgINCu* with the former being much larger in absolute value. Permanent improvements of the *CAPBu* will have stronger favourable effects on future debt dynamics if these permanent improvements are realized by means of expenditure cuts rather than tax increases. Although, as such, this finding confirms the composition hypothesis that consolidation policies are more effective when they operate at the expenditure side, it can clearly not be concluded that tax policies are ineffective.

In expansionary episodes all policy effects have the expected sign, and are highly significant. Just like in Table 3, these policy effects are again larger than those during consolidations. As to the other variables in column (3), we observe some changes of limited importance compared to our findings in Table 3. The main difference is that now *ONEOFF* becomes statistically significant, whereas the early 1990s crisis dummy in Sweden and Finland (*CRISIS91sf*) loses significance. Both crisis dummies become smaller.

Columns (4)-(6) investigate the composition hypothesis in greater detail. These columns introduce for each policy regime the decomposition of $\Delta CAPBu$ that we put forward in Equation (6). The level of *AvgCAPBu* at the top of the table, however, is still decomposed in its major categories *INCu* and *NIEXPu* (and *OTHERu*) as in column (3). A Wald test cannot reject the null hypothesis that at this level all expenditure subcategories have the same coefficient and all income subcategories have the same coefficient. The upper part of columns (4)-(6) confirms that permanent improvements of the *CAPBu*, realized either by expenditure cuts or by tax increases, do have favourable effects on future debt dynamics, but the effects from permanent expenditure cuts are stronger. During the consolidation period, however, it is more difficult to observe strong effects, at least at first inspection. Straightforward estimation in column (4) yields mainly insignificant coefficients, often with an unexpected sign. At the revenue side, the only significant and robust result is the favourable (negative) effect on the public debt ratio from raising direct taxes on business ($\Delta TAXB$). Although this result goes against the composition hypothesis, Alesina and Perotti (1995) also observed it. So did Heylen and Everaert (2000). At the

Table 4. Estimation results – 2 – composition

	ΔGD							
Explanatory variables	(3)	se	(4)	se	(5)	se	(6) [(b)]	se
Constant	3.37°	2.1	2.27	2.5	4.57°	3.0	5.36°	3.2
AvgINCu*DURATION	-1.18***	0.2	-0.97***	0.2	-0.90***	0.3	-0.93***	0.3
AvgNIEXPu*DURATION	1.46***	0.2	1.12***	0.2	1.09***	0.3	1.21***	0.3
AvgOTHERu*DURATION	-0.68	0.6	-0.44	0.6	-0.37	0.9	0.26	1.3
BURDEN*DURATION	1.30***	0.3	1.10***	0.2	1.12***	0.4	1.08**	0.5
ONEOFF	-2.48***	0.9	-2.31***	0.9	-2.03**	1.0	-2.32*	1.3
CRISIS08	8.50***	2.4	12.7***	2.5	17.3***	3.2	15.0***	4.3
CRISIS91sf	3.15	6.1	14.0*	7.7	9.53	7.3	16.7**	7.5
DEVAL	-2.03***	0.7	-1.62***	0.6	-2.30	2.0	-0.33	2.1
Consolidation								
ΔINCu	-0.51	0.8	-		-		-	
ΔTAXB	-		-7.87***	2.2	-4.54**	2.0	-4.40	3.1
ΔTAXT	-		-0.28	1.2	1.31	1.5	1.09	1.7
ΔNIEXPu	-0.20	0.6	-		-		-	
ΔSOCEXP	-		1.88	2.1	0.20	2.0	0.49	2.6
ΔSUBS	-		1.86	3.6	7.86***	2.8	11.0***	3.5
ΔINV	-		-3.90	2.9	-8.09***	2.5	-11.4***	3.7
ΔWAGE	-		-4.28*	2.4	6.56°	4.3	13.2**	6.6
ΔNONWAGE	-		-2.68	3.0	-25.3***	7.1	-29.2**	13.5
ΔOTHERu2	-		4.91**	2.3	6.07***	2.3	6.14**	2.9
ΔOTHERu	-11.1***	2.8	-		-		-	
PSEAdm*DURATON	-		-		-3.15**	1.3	-4.04***	1.4
PSEAdm*DURATION*ΔWAGE	-		-		-2.17***	0.6	-2.65***	0.9
PSEAdm*DURATION*ΔNONWAGE	-		-		4.16***	1.0	4.91**	2.1
Expansion								
ΔINCu	-2.39***	0.8	-		-		-	
ΔTAXB	-		-5.55**	2.4	-5.47**	2.3	-4.84*	2.8
ΔTAXT	-		0.85	1.4	-0.23	1.3	-0.06	1.5
ΔNIEXPu	3.08***	0.6	-		-		-	
ΔSOCEXP	-		3.46**	1.7	3.73**	1.7	2.43	1.9
ΔSUBS	-		11.9*	6.2	16.1***	4.6	15.6***	5.3
ΔINV	-		2.09	3.3	-2.0	3.6	-3.80	4.3
ΔWAGE	-		2.95	2.3	7.84*	4.1	7.19*	4.2
ΔNONWAGE	-		2.87	2.7	-5.75*	3.2	0.69	6.8
ΔOTHERu2	-		-1.77	3.2	-0.52	3.3	1.46	3.7
ΔOTHERu	-14.8***	5.0	-		-		-	
PSEAdm*DURATON	-		-		-2.06°	1.4	-2.40°	1.6
PSEAdm*DURATION*ΔWAGE	-		-		-0.29	1.0	-0.31	1.0
PSEAdm*DURATION*ΔNONWAGE	-		-		1.66***	0.6	-0.28	1.6
Neutral [(a)]								
…								
Adjusted R-squared	0.76		0.79		0.84		0.79	
Country fixed effects (times DURATION)	yes		yes		yes		yes	
Number of obs. (countries)	132(21)		132(21)		118(19)		107(17)	

Notes: 'se' indicates heteroscedasticity-consistent (White) standard errors; *** (**) (*)(°) indicates statistical significance at the 1% (5%) (10%)(15%) level. For a definition of all variables, see Table 2.

(a) The results for the neutral periods are available upon request. Coefficients are generally insignificant.

(b) The sample here excludes all observations where WAGE<9.2% on average during the fiscal episode (9.2% is the 10th percentile value of WAGE over all observations).

expenditure side during consolidation periods, the only significant result in column (4) is the negative coefficient on *ΔWAGE.* Again, this is surprising from the perspective of the composition hypothesis. However, as we documented in Section 3.1., similar results for *ΔWAGE* were found earlier by Heylen and Everaert (2000) and Tagkalakis (2009). The estimated negative effect on *ΔINV* during consolidation is much more in line with the composition hypothesis. In column (4) this effect is still insignificant, however.

In columns (5) and (6) we introduce a new hypothesis, which brings a much more nuanced picture, and significant estimates for most fiscal policy variables. More precisely, we control in these columns for the level of public sector efficiency in administration (*PSEadm*)[10]. Our main finding is that cutting the public sector wage bill contributes directly to debt reduction only when public sector efficiency in administration is low. Evaluated at the median duration of consolidation periods (3 years), and at median *PSEAdm* (=1.69), we observe in column (6) a coefficient on *ΔWAGE* which is about zero. A positive coefficient on *ΔWAGE* emerges only at lower levels of *PSEadm*[11]. Conversely, when government efficiency is high, downsizing the public sector is not an effective way to bring down the public debt ratio. In this respect, our results are consistent with those of Angelopoulos *et al.* (2008) on growth. Extending the regression as in columns (5) and (6) also affects our estimates for the other fiscal variables. We now obtain significant positive effects on changes in subsidies (*ΔSUBS*) during consolidation, and significant negative effects on changes in public investment (*ΔINV)* and changes in nonwage consumption (*ΔNONWAGE*). The latter effect holds at low levels of public sector efficiency and median duration of consolidation periods. The coefficient on changes in social expenditures remains insignificant.

We conclude from Table 4 that permanent expenditure cuts and permanent tax increases contribute significantly to debt reduction in the longer run, with the effects of the former being stronger. In the short-run, by contrast, the effect of tax increases as a group (*ΔINCu*) may be better than the effect of expenditure cuts (*ΔNIEXPu*), but not much is significant here. We learn that the precise composition of expenditure cuts is very important, probably more important than the composition of taxes. Our results are in favour of cuts in subsidies and (when government efficiency is low) the public sector wage bill. Social benefit cuts may not have much effect during the consolidation period, but only matter in the longer run (by decreasing *AvgNIEXPu*). Reducing expenditures by means of public investment cuts, by contrast, is highly counterproductive when the aim is to bring down the public debt ratio. Overall, our evidence is broadly in line with the composition hypothesis, except when it comes to the effect of changes in government consumption and the government wage bill. Here, our results shed new light. Emphasizing the role of public sector efficiency, they may provide a way out of the existing ambiguity in the literature (see Section 3.1.).

International macroeconomic context / devaluation

Our results in Tables 3 and 4 also shed light on the role of the international macroeconomic context during consolidation, and on the possible contribution of a preceding devaluation (see Sections 3.4. and 3.5.). Low international interest rates and strong international growth clearly contribute to bring down the debt ratio during consolidation periods. They imply a lower *BURDEN* on which we find a significant positive coefficient in all regressions. Note that – given the construction of *BURDEN* – countries with higher initial debt ratios are more sensitive to fluctuations in international growth and interest rates. A

[10] The difference between both columns is the included sample. Column (6) excludes observations where the size of the public sector wage bill is very low (below 9.2% of GDP, which is the 10th percentile). These are most likely the observations where *ΔWAGE<0* is not an option.

[11] Algebraically, and evaluated at *DURATION*=3, it is to see that $\partial(\Delta GD)/\partial(\Delta WAGE) = 13.2 - 2.65 * PSEAdm * DURATION$ is positive as soon as *PSEAdm* < 1.66.

corollary of our results is that it will be much more difficult to reduce the public debt ratio when many countries undertake consolidation efforts simultaneously, at least if it can be assumed that the latter has negative effects on growth in the world economy. Complementary (international) monetary accommodation, keeping interest rates low and supporting growth, may then be of crucial importance. Our results also support the hypothesis that a preceding devaluation improves the outcome of fiscal consolidation policies. We find a negative and quite large coefficient on *DEVAL* in all regressions, which is also significant except in columns (5) and (6) where the underlying sample is smaller.

Size and persistence / emergency

Our results in Table 5 test the size and persistence hypothesis and the emergency hypothesis (see Sections 3.2. and 3.3.). We extend the regressions reported in Table 3, column (2), by additional interaction terms *SP*ΔCAPBu* or *EM*ΔCAPBu*, where *SP* is a variable reflecting the size and/or persistence of the fiscal impulse and *EM* a variable reflecting the emergency of the fiscal situation. We again allow for different effects in consolidation, neutral and expansionary periods. As indicators for *SP* we have used *ΔCAPBu*, which is the most direct indicator for the size of a fiscal impulse, *DURATION* as an indicator for persistence, and a set of dummy variables being 1 when the size and/or duration of the impulse exceeds a given threshold (e.g. larger than 4 percent of potential GDP, longer than 4 years, etc.) As indicators for *EM* we have specified the level of the gross government debt ratio in the year before the start of a fiscal episode (*GDINIT*), the rise of the debt ratio in the period from three years to one year before the start (*DGDREC*), and again a set of dummies being 1 when *GDINIT* exceeds a given threshold (e.g. 60%, 100%). The higher *GDINIT* and *DGDREC*, the more likely is the case of emergency. Since using *DGDREC* did not imply any significant results, we here focus on *GDINIT*.

We report our basic findings for the size and persistence hypothesis in Table 5, columns (7) to (9). In columns (10)-(11) we extend these regressions with emergency variables. The main messages of our results are the following. First, as to the size hypothesis, column (7) suggests that larger fiscal consolidation programmes are more likely to succeed in the sense that they imply a stronger fall in the government debt ratio, but this effect may be vulnerable to decreasing returns. Algebraically, it can be derived from column (7) that $\frac{\partial(\Delta GD)}{\partial(\Delta CAPBu)} = -2.62 + 0.29\Delta CAPBu$. The effect is therefore negative (for reasonable values of *ΔCAPBu*), but it becomes weaker the higher *ΔCAPBu*. Columns (9) and (10) tell us that this decreasing returns result is fairly robust. The estimated coefficient on *ΔCAPBu*ΔCAPBu* maintains its statistical significance at 5 or 10%. Measuring size by dummies, which are 1 when *ΔCAPBu* exceeds a certain threshold and 0 otherwise, implies results that go into the same direction, although it is harder then to find significance (results not shown). A second message from our results goes against the hypothesis that persistence (longer duration) promotes the success of fiscal consolidation. The estimated coefficient on *DURATION*ΔCAPBu* in consolidation periods is always positive, implying that $\frac{\partial(\Delta GD)}{\partial(\Delta CAPBu)}$ becomes smaller (in absolute value) the higher *DURATION*. If a given consolidation effort is spread over more years, it is therefore more likely that its effect on the debt ratio will be smaller, rather than larger. This effect is never significant however. All in all, our results cannot confirm hypotheses that predict any advantages from large or long lasting programmes.

Columns (10)-(11) in Table 5 test the emergency hypothesis. As emergency variables, these columns include the government debt ratio before the start of a fiscal episode (*GDINIT*) and two dummy variables. A first dummy (*DUM60*) is equal to 1 when *GDINIT*>60%, and 0 otherwise. A second dummy (*DUM130*) is equal to 1 when *GDINIT*>130%, and 0 otherwise. Each of these columns confirm the emergency hypothesis in the sense that governments that undertake fiscal consolidation enjoy a bonus in

reducing their debt ratio when the initial debt ratio is high. Our results show a statistically significant bonus of about 3% per year of consolidation for an initial debt ratio between 60% and 130%. This bonus is estimated to be about 6 to 7% for an initial debt ratio above 130%. We observe no significant bonus for initial debt ratios below 60% (result not shown). The literature provides various explanations for these results (see Section 3.3.). Interestingly, however, despite this bonus, our results in columns (10) and (11) also demonstrate that fiscal consolidation at high debt remains a battle that is very difficult to win. Given the positive coefficient on *GDINIT*ΔCAPBu*, one can easily derive that the debt reducing effect from consolidation policies, i.e. $\frac{\partial(\Delta GD)}{\partial(\Delta CAPBu)}$, during the consolidation period gets weaker as initial debt is higher. An obvious explanation may be that consolidation policies have more negative Keynesian effects on growth when the debt ratio is high. Here our results tend to be in line with Pozzi *et al.* (2004) showing that high government debt implies tighter credit conditions for consumers, which raises their sensitivity to disposable income. As a result of stronger negative growth effects, consolidation policies may then end up in their own vicious circle. To close the discussion, it should of course not be forgotten that permanent improvements in *CAPBu* also affect future debt dynamics by permanently reducing borrowing requirements. As we have mentioned before, this effect is captured by *AvgCAPBu* in the upper part of Table 5.

Table 5. Estimaton results – 3 – size and persistence / emergency

	ΔGD				
Explanatory variables	(7)	(8)	(9)	(10)	(11)
CONSTANT	4.19*	3.14	4.16*	3.57	2.61
AvgCAPBu*DURATION	-1.42***	-1.38***	-1.39***	-1.36***	-1.33***
BURDEN*DURATION	1.20***	1.12***	1.17***	1.07***	1.02***
ONEOFF	-1.16	-1.24	-1.22	-1.29	-1.42°
CRISIS08	10.9***	11.5***	11.3***	12.4***	12.5***
CRISIS91sf	14.8*	21.2***	17.1*	12.3**	19.0***
DEVAL	-3.27***	-2.99***	-3.48***	-3.39***	-3.20***
Consolidation					
ΔCAPBu	-2.62**	-1.37	-2.50*	-4.57**	-3.35
ΔCAPBu*ΔCAPBu	0.29**	-	0.29**	0.27*	-
DURATION*ΔCAPBu	-	0.28	0.03	-	0.19
(DUM60-DUM130)*DURATION	-	-	-	-2.76**	-3.03***
DUM130*DURATION	-	-	-	-6.25***	-7.21***
GDINIT*ΔCAPBu	-	-	-	0.048*	0.055**
Expansion					
ΔCAPBu	0.41	-0.58	1.19	-0.32	-2.58
ΔCAPBu*ΔCAPBu	0.49*	-	0.35	0.68**	-
DURATION*ΔCAPBu	-	-0.49	-0.43	-	-0.49°
(DUM60-DUM130)*DURATION	-	-	-	2.38**	1.55
DUM130*DURATION	-	-	-	_ [(a)]	_ [(a)]
GDINIT*ΔCAPBu	-	-	-	0.046*	0.044*
Neutral [(b)]					
…					
R-squared	0.81	0.80	0.81	0.83	0.82
Adjusted R-squared	0.74	0.73	0.74	0.76	0.74
Controlling for country fixed effects (times duration)	yes	yes	yes	yes	Yes
Number of obs. (countries)	132 (21)	132 (21)	132 (21)	132 (21)	132 (21)

Notes: *** (**) (*) (°) indicates statistical significance at the 1% (5%) (10%) (15%) level. Underlying standard errors are heteroscedasticity-consistent (White)

(a) There are no observations of fiscal expansion when the debt ratio exceeds 130%.

(b) Results are available upon request. Included variables are always the same as for expansion periods.

5.2. The role of institutions

The literature shows a lot of ambiguity on the effects of institutions or institutional reform on the success of fiscal consolidation policies (see Sections 3.6.-3.8.). In this section we study the possible role of institutions during consolidation from two major perspectives. The first perspective takes fiscal policies (in particular, consolidation policies) as given. One important question that we ask here is whether the influence of given consolidation policies on the public debt ratio is different depending on existing institutions. As an example, one may want to know whether the effect of a given consolidation effort on the debt ratio is stronger when labour markets are flexible rather than rigid, or when government efficiency is high rather than low. Also, one may want to know whether it makes a difference when given consolidation policies are embedded in an institutional context of strict and wide fiscal rules, rather than in a context of full discretion. A second question is whether the effects of given consolidation policies are different when they are executed simultaneously with institutional reform. Given growing pressure on governments in many countries, mainly in Europe, to reform labour and product markets, one may want to know for example whether consolidation policies have more or less effect when at the same time employment protection legislation or product market regulation are reduced. The second perspective does not consider fiscal policies as given. Instead, we take into account the possibility that the institutions in a country affect the kind of consolidation policies adopted, for example their size or composition. An obvious example is that the ideology of the government or union power may affect the fraction of tax increases versus spending cuts to reduce the public deficit.

We test the role of institutions for given fiscal policies (first perspective) by adding institutional variables to the regression equation reported in Table 4, column (4). To begin, we extend this equation by $\sum_{R=c,e,n} \sum_{j} \gamma_{jR} INST_{jiT}.DURATION_{iT}$, where $INST_{jiT}$ indicates the level of institution j in country i during fiscal episode T. Included institutions are defined in Table 2. We add several institutional variables to the regression together. So, unlike what is done in the recent literature (e.g. Larch and Turrini, 2011; Alesina and Ardagna, 2012), we study the effect of each institution while controlling for others. We multiply by the length of the episode (*DURATION*) since the total contribution of an institution to the change of the debt ratio in a particular episode may obviously depend on the length of that episode. Later we further extend the regression by also adding changes in institutions ($\Delta INST_{jiT}.DURATION_{iT}$), in particular changes in employment protection legislation and changes in product market regulation[12]. Finally, like in the previous section, we again allow for different effects γ_j across policy regimes R, where R stands for consolidation (c), expansion (e) or neutral (n). The results that we show in Table 6 are the estimated coefficients for consolidation periods (γ_{jc})[13,14].

The effects of institutions or institutional change when we do not control for the characteristics of fiscal policy (second perspective) are reported in Table 7. In this table we do not include revenue or expenditure variables *(AvgNIEXPu, AvgINCu, ONEOFF, ΔTAXB*, *ΔTAXT*, etc.) in the regression. Next to the

[12] As a rule, changes are computed as the level of the institution at the end of the fiscal episode minus the level in the last one or two years before the episode (see Appendix 3).

[13] Estimates for expansion and neutral periods are available upon request.

[14] For an assessment not only of the statistical significance, but also the economic importance of estimated effects, it is good to know the standard deviation of each institution. Computed over all countries and years they are as follows: *EPL* 1.03, *UNION* 21.5, *COOR* 1.45, *PMR* 1.45, *LEFT* 0.44, *PSEAdm* 0.93, *PSEAvg* 0.50 and *FRI* 1.02. Multiplication with the estimated coefficient γ_{jc} indicates the expected effect on the public debt ratio per year of consolidation when the level of the institution concerned is one standard deviation higher.

institutional variables, the regressions underlying these results include only the level of *CAPBu* in the last year before the start of the fiscal episode (*CAPBuINIT*, times *DURATION*), *BURDEN* (times *DURATION*), *DEVAL*, the crisis dummies, and country-specific fixed effects (times *DURATION*). Note that with the exception of columns (9) and (10), the set of included institutions in each column of Table 7 is exactly the same as in Table 6. Differences in estimated coefficients may give an indication of the influence of these institutions on the evolution of the public debt ratio running via their effect on the characteristics of consolidation programmes.

Columns (1) to (3) in both tables include only levels of labour and product market institutions and a dummy variable *LEFT* which is 1 when the government is left-wing. In columns (4) and (5) we add government efficiency, in column (6) the strength of fiscal rules, and in columns (7) and (8) institutional change. Columns (9) and (10) include all variables that show at least some significance in earlier columns, except the strength of fiscal rules[15]. Our results demonstrate that institutions and institutional change matter for the evolution of the public debt ratio in consolidation periods. They matter from the two perspectives described above. Both the outcome of given consolidation policies and the kind of consolidation policies adopted, seem to be affected when the institutional environment is different. Not all institutions have an equally strong influence, however. The evidence is the least convincing when it comes to the effects of existing labour and product market institutions. The tendency of our results in Table 6 would be that the evolution of public debt during consolidation is less favourable in unionized and rigid labour markets and in more regulated product markets. *EPL*, *UNION* and *PMR* all get positive coefficients in Table 6. In general, however, they are not statistically significant, or only marginally significant at the 10% or 15% level. Moreover, taking into account the possible endogenous effect on adopted policies in Table 7, estimated coefficients are even less significant. This is the case especially for *EPL*. Its estimated coefficient in Table 7 also falls back to much less than one half of its value in Table 6. It seems that conflicting forces, as one can observe in the literature (see Tagkalakis, 2009), counteract each other. The only labour market institution for which we find a slightly more robust indication of significance in Tables 6 and 7, is the degree of wage bargaining coordination (*COOR*). Considering its negative coefficient, and with most of the effects already occurring in Table 6, we may conclude that a high degree of coordination has a favourable influence, mainly by improving the outcome of given consolidation policies. Internalization by key players of the long-run advantages of these policies (as well as the long-run costs of opposition to these policies) may be one element to explain this result.

In contrast to the level of labour and product market institutions, simultaneous institutional reform may have more effect on the outcome of fiscal consolidation episodes. Our evidence is strongly in favour of the hypothesis that complementary product market deregulation ($\Delta PMR<0$) contributes to the success of fiscal consolidation. Product market deregulation may strengthen the positive effects of given consolidation policies, for example by simultaneously enhancing competition, overall productivity and growth, as in Wölfl *et al.* (2010). Moreover, observing even stronger and more significant effects in Table 7, we conclude that deregulation may also improve the outcome of consolidation episodes by contributing to better adjustment policies, for example by reducing the power of special interest groups. Our results for the effects of labour market reform are interesting from a different point of view. What is striking is the change of sign on ΔEPL from positive in Table 6 to negative in Table 7. Once we no longer control for the characteristics of consolidation policies, it seems that parallel labour market deregulation undermines the success of fiscal consolidation. Adverse consequences for the government's financial

[15] Including *FRI* implies a drastic fall in sample size and degrees of freedom. Estimated standard errors on all variables rise drastically.

balance when firms find it easier to fire workers when (at least in the short run) demand for their product falls, may offer an explanation. So may negative effects on private consumption from rising uncertainty. Our evidence on this issue agrees with Bouis *et al.* (2012) when they find that deregulation of job protection pays off more quickly in good times but can entail short-term losses in depressed economies.

As to the other institutions, our results confirm that - all other things equal - left-wing governments (*LEFT*) may be more successful in bringing down public debt. Although not all estimated coefficients are statistically significant, it would seem from most regressions in Table 6 that these governments raise the effectiveness of given consolidation programmes. In this respect, we match with Ardagna (2004) suggesting that left-wing parties may be better able to convince key players (like unions) to accept the efforts and costs imposed by consolidation policies in return for improved long-run perspectives. Moreover, considering the even more negative and more significant coefficients in Table 7, left-wing governments may also adopt stronger programmes[16].

Furthermore, our regressions reveal strong evidence on the importance for successful fiscal consolidation of public sector efficiency (*PSEAdm*, *PSEAvg*). Table 6 supports the hypothesis that a given consolidation programme is more effective in bringing down public debt when it is adopted by a more efficient government apparatus. One explanation for this favourable effect may be that consolidation policies executed by efficient governments are more credible, and believed to be more durable. Private consumers' and investors' responses may then be more positive[17]. Finally, not only may the effectiveness of given policies rise when government efficiency is higher, the strengthening of effects that we observe in Table 7 adds to this that more efficient governments may also adopt better consolidation programmes.

Last but not least, we find that consolidation programmes are more effective when embedded in a regime of strict fiscal rules (*FRI*). Considering that the whole effect seems to exist already in Table 6, a most likely hypothesis is that fiscal rules raise the credibility of consolidation programmes, as argued by e.g. Guichard *et al.* (2007). We find no additional evidence that regimes of strict fiscal rules would imply better consolidation programmes.

At several occasions above we argued that certain institutions, like a left-wing fiscal policy maker and an efficient government apparatus, may contribute to more effective consolidation policies, for example when it comes to size or composition. Table 8 summarizes the results of research into this hypothesis. In the first two equations, we regress the change in the *CAPBu* during a fiscal episode on a number of institutional variables and the fiscal position before the episode. The latter is measured by the underlying primary balance and by the public debt ratio in the last year before the episode (*CAPBuINIT, GDINIT*). The following four equations explain the change in government revenue (*ΔINCu*) and the change in non-interest expenditures (*ΔNIEXPu*) as functions of the same explanatory variables. The last two equations explain the change in public investment (*ΔINV*) during the episode. We regress this variable on the change in the *CAPBu* during the episode, and again a number of institutional variables. We pay separate attention to investment given its particular position as a category of expenditures that should not fall during consolidation. In all eight equations we control for country-specific fixed effects, and include the crisis dummies. When explaining *ΔCAPBu*, *ΔINCu* and *ΔNIEXPu*, we also control for the fact that a preceding devaluation may affect the need or the incentive to improve the *CAPBu*. There is no reason to expect any effect from *DEVAL* on the change in public investment once *ΔCAPBu* is controlled for. (When we test this,

[16] We tested similar effects for right-wing governments but here we found no significant result at all.

[17] Note that a further extension of the estimated regression like in columns (5) and (6) of Table 4 confirms this result, with estimated coefficients on *PSEAdm*DURATION* between -3.15 and -4.04.

Table 6. Effect of institutions / institutional change on the public debt ratio during consolidation periods when we take fiscal policy as given

	Estimated effect of institutions or institutional change on *ΔGD* per year of consolidation (γ_{fc})									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
EPL	1.70*	1.68*	1.51°	1.76°	2.45**	0.54	1.05	1.12	1.45	2.02
UNION	0.04	0.04	-	-	-	-	-0.02	-0.01	-	-
COOR	-0.68	-	-0.89	-1.49**	-1.79**	-0.69	-0.94	-0.78	-1.42*	-1.58*
PMR	0.35	0.13	0.52	0.85°	0.78	-0.57	0.57	0.42	0.65	0.54
LEFT	-2.61**	-2.69***	-2.70***	-1.10	-0.89	-1.63	-	-2.15*	-0.68	-0.62
PSEAdm	-	-	-	-3.30**	-	-	-	-	-2.70°	-
PSEAvg	-	-	-	-	-6.60*	-	-	-	-	-4.84
FRI	-	-	-	-	-	-3.45*	-	-	-	-
ΔEPL	-	-	-	-	-	-	1.87	0.95	1.94	1.92
ΔPMR	-	-	-	-	-	-	3.01**	3.08***	1.53	1.65
Numb. of Obs. (countries)	132 (21)	132 (21)	132 (21)	118 (19)	118 (19)	99 (16)	131 (21)	131 (21)	117 (19)	117 (19)

Notes: *** (**) (*) (°) indicates statistical significance at the 1% (5%) (10%) (15%) level. Underlying standard errors are heteroscedasticity-consistent (White). Each column contains the estimated coefficients on the set of institutional variables (multiplied by *DURATION*) when added to the regression equation reported in Table 4, column (4). We allow different coefficients in consolidation, expansion and neutral periods. We here report coefficients during consolidation. For a definition of all institutional variables, see Table 2.

Table 7. Effect of institutions / institutional change on the public debt ratio during consolidation periods when we do *not* control for fiscal policy

	Estimated effect of institutions or institutional change on *ΔGD* per year of consolidation									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
EPL	0.38	0.46	0.22	0.65	1.51	-0.42	-0.15	-0.55	0.39	0.83
UNION	0.01	0.05	-	-	-	-	0.06	0.09°	0.09°	0.05
COOR	-1.31*	-	-1.57**	-1.13°	-1.26*	-1.47**	-1.04	-1.15°	-0.43	-0.49
PMR	0.76	0.50	0.81	0.85	0.62	-0.14	0.15	0.06	0.09	0.11
LEFT	-3.17***	-3.18***	-3.66***	-2.98***	-1.59	-1.87	-	-3.00**	-1.96	-0.76
PSEAdm	-	-	-	-3.76**	-	-	-	-	-2.48*	-
PSEAvg	-	-	-	-	-12.2***	-	-	-	-	-9.33***
FRI	-	-	-	-	-	-3.10***	-	-	-	-
ΔEPL	-	-	-	-	-	-	-1.62	-2.49°	-1.09	-0.26
ΔPMR	-	-	-	-	-	-	4.82***	4.51***	3.35**	2.29*
Numb. of Obs. (countries)	132 (21)	132 (21)	132 (21)	118 (19)	118 (19)	99 (16)	131 (21)	131 (21)	117 (19)	117 (19)

Notes: *** (**) (*) (°) indicates statistical significance at the 1% (5%) (10%) (15%) level. Underlying standard errors are heteroscedasticity-consistent (White). Each column contains the estimated coefficients for the set of institutional variables (multiplied by *DURATION*) when included in a regression explaining *ΔGD* by means of only *CAPBuINIT* (times *DURATION*), *BURDEN* (times *DURATION*), *DEVAL*, the crisis dummies and country-specific fixed effects (times *DURATION*). We allow different effects for the institutions in consolidation, expansion and neutral periods. We here report effects during consolidation.

Table 8. Effect of institutions on the size and composition of consolidation policies

	Dependent variable							
Explanatory variables	ΔCAPBu	ΔCAPBu	ΔINCu	ΔINCu	ΔNIEXPu	ΔNIEXPu	ΔINV	ΔINV
CRISIS08	0.12	0.35	1.50**	1.57**	0.75	0.67	0.49**	0.28°
CRISIS91sf	-2.18***	-2.69***	1.56	1.50	2.75	2.66	-0.39	-0.52
DEVAL	-0.19	-0.19	0.24	0.25	0.45***	0.45***	-	-
Consolidation								
Constant	-1.12	0.42	2.44	2.11	3.04	2.79	-	-
CAPBuINIT	-0.58***	-0.64***	0.28**	0.29**	0.72***	0.72***	-	-
GDINIT	0.043*	0.043***	-0.060***	-0.058***	-0.092***	-0.089***	-	-
ΔCAPBu	-		-	-	-	-	-0.11*	-0.13***
PSEAvg	2.55	2.98°	-3.11	-3.04	-5.88**	-5.98**	0.29	-
LEFT	-1.29*	-0.85	0.20	0.12	1.92**	1.81**	0.20	0.72**
EPL	0.80	0.66	0.22	-	-0.43	-	0.23	0.36*
UNION	0.01	-	-0.10*	-0.11**	-0.08	-0.08	0.03	0.03*
COOR	-0.27	-	-1.11***	-1.16***	-0.56	-0.65°	0.04	-
LEFT * UNION	-	-	-	-	-	-	-	-0.01°
PMR	-0.02	-	0.48	0.56**	0.18	-	-0.23**	-0.27***
Expansion								
…	-	-	-	-	-	-	-	-
Neutral								
…	-	-	-	-	-	-	-	-
Adjusted R-squared	0.83	0.84	0.47	0.48	0.52	0.55	0.29	0.37
Country fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
Number of obs. (countries)	118 (19)	118 (19)	118 (19)	118 (19)	118 (19)	118 (19)	118 (19)	132 (21)

Notes: *** (**) (*)(°) indicates statistical significance at the 1% (5%) (10%)(15%) level. Underlying standard errors are heteroscedasticity-consistent (White).

the data also confirm it). We report all estimated coefficients for the consolidation episodes[18]. As a rule, when institutions show up highly insignificant for a dependent variable (*p*-value >0.50), we drop them in the second regression for that variable. Note also that we do not include *FRI* to save degrees of freedom. (When we include it in Table 8, we never find any significant effect during consolidation times. Estimated *p*-values are always above 0.20. This finding is in line with our earlier conclusions from Tables 6 and 7).

The results confirm that public sector efficiency matters for the characteristics of the consolidation programmes that governments adopt. More efficient governments succeed in cutting non-interest expenditures significantly more than other governments. This contributes to larger consolidation programmes, although the effect on *ΔCAPBu* is not very significant. The lack of a significant effect here may be related to the negative sign on *PSEAvg* that we see in the equations for *ΔINCu.* Successful consolidation by efficient governments is not due to the choice of higher taxes. If there is an effect on taxes, it is rather the opposite. As a final observation, we see no significant effect from public sector efficiency on the share of investment in consolidation packages. On the impact of ideology, our results in Table 8 reveal that left-wing policy makers tend to adopt smaller consolidation packages. Mainly, this seems to be due to difficulty or hesitation among left-wing policy makers to cut expenditures. On government revenue we see no significant effect. An important element here, however, is that left-wing policy makers pay significantly more attention to safeguarding public investment, which may also explain

[18] Estimated coefficients for the other episodes are available from the authors upon request.

part of their success during consolidation. We observe this effect on investment in the utter right column, at least when union density is not extreme (not above 60 to 70%)[19].

Table 8 reveals or confirms a number of other interesting regularities. We confirm that worse initial fiscal conditions (lower *CAPBuINIT*, higher *GDINIT*) typically trigger significantly larger consolidation programmes (see also Mierau *et al.*, 2007). We also confirm that (larger) consolidation programmes generally include (larger) cuts of public investment (see e.g. de Haan *et al.*, 1996). Public investment seems to suffer more also when product markets are highly regulated. If we can use *PMR* as a proxy for the power of special interest groups, an explanation may be that investment is the first victim when these interest groups all try to protect their share of government expenditures. Finally, we find that devaluations tend to be followed by more expansionary fiscal policies, increased expenditures in particular.

6. Conclusions

The sharp increase in public debt ratios since 2008 and growing concern about the sustainability of public finances, impose the need for a significant fiscal adjustment, and credible debt reduction strategies in almost all OECD countries.

Many countries have gained experience with fiscal consolidation programmes in the past two or three decades. In this paper we focus on 21 OECD countries in 1981-2008. We define 132 fiscal episodes, including 40 consolidation periods. The latter are periods of at least two years in which the government's underlying cyclically-adjusted primary balance in percent of potential GDP (*CAPBu*) improves year after year. Over the whole period the total improvement of the *CAPBu* should exceed 2 percentage points. We contribute to the literature by studying directly the evolution of the ratio of public debt to GDP during, and up to two years after, these fiscal consolidation periods. The data reveal a wide range of outcomes, with the change in the public debt ratio varying between about -25 and +35 percentage points. Our aim is to explain these outcomes, and the enormous differences that one can observe. In our empirical analysis we test eight hypotheses put forward in the literature on the success or failure of fiscal consolidation. These hypotheses concern the characteristics of the consolidation programme, the context within which it takes place, and the role of institutions and institutional reform. Moreover, we add a new hypothesis on the role of public sector efficiency.

Our main findings are as follows: (i) The effect of fiscal adjustment programmes on the public debt to GDP ratio depends strongly on economic growth during (and after) the consolidation episode. (ii) During consolidation periods, growth may suffer, which implies short-run difficulties to bring down the debt to GDP ratio. Our results suggest that this will be the case in particular for expenditure based consolidations. (iii) Permanent expenditure cuts and permanent tax increases contribute both significantly to debt reduction in the longer run. The effects of the former are stronger though. Moreover, for the longer run effects on the debt ratio, the precise composition of expenditure cuts is very important. Our results prefer cuts in subsidies and (conditionally) the public sector wage bill. Cutting public employment and public sector wages may contribute strongly to debt ratio reduction, but only when public sector efficiency in

[19] When we do not include the interaction term *LEFT x UNION*, we also obtain a positive effect from *LEFT* on investment, but then this is not significant (see the first regression for *ΔINV*). On the other hand, if we neither include *UNION* in that first regression, the estimated coefficient on *LEFT* becomes significant (and equal to about 0.4). Positive correlation between *LEFT* and *UNION* may play a role here. All in all, our results favour the hypothesis that more (political or social) power from the left may be beneficial to public investment during fiscal consolidation. We tested for a role of this *LEFT x UNION* interaction term in our other regressions in Tables 6-8. It was never relevant.

administration is low. According to our results, downsizing an efficient public sector will not 'work'. Social benefit cuts matter in the longer run, but they may not have much effect during the consolidation period. Finally, reducing expenditures by means of public investment cuts is highly counterproductive when the aim is to bring down the public debt ratio. Overall, our evidence is broadly in line with Alesina and Perotti's composition hypothesis, except when it comes to the effect of changes in the government wage bill. (iv) As to other aspects of policy design, we find no evidence that large or long lasting adjustment programmes are *relatively* more effective. Larger adjustment programmes will obviously affect borrowing requirements and - consequently - the public debt ratio more, but this beneficial effect seems to be vulnerable to decreasing returns.

(v) Next to policy design, our results demonstrate the importance of the context within which consolidation takes place. First of all, the international macroeconomic climate is very important, most so for high debt countries. We find that consolidation is significantly more effective in bringing down the debt ratio when international economic growth is high, and interest rates are low. Consolidation may therefore be much harder when all countries undertake simultaneous consolidation efforts. Complementary (international) monetary accommodation, keeping interest rates low and supporting growth, is then of crucial importance. Second, our results confirm the hypothesis that fiscal consolidation is more effective when accompanied by a preceding devaluation. Third, we obtain mixed evidence on the hypothesis that consolidation programmes are more likely to succeed when the initial fiscal situation is in a state of emergency. On the one hand, our results suggest that very high debt countries may reap much stronger and immediate benefits when they show willingness to consolidate, for example thanks to falling risk premia. On the other hand, however, our evidence is consisent with the hypothesis that consolidation programmes in these countries hit growth much harder. Fiscal multipliers may be stronger in very high debt countries, for example due to rigged financial markets and tighter credit conditions for private borrowers.

(vi) Our results on the role of institutions and institutional reform for the effects of consolidation, are more diverse. We find that consolidation policies are significantly more successful when they are complemented by product market deregulation. One explanation is that deregulation and competition contribute to overall productivity and growth, as recently shown for example in Wölfl *et al.* (2010). By contrast, we find little evidence for favourable effects from flexible labour markets, or complementary labour market reform. Parallel labour market deregulation may even raise the chances that consolidation policies fail when firms find it easier to fire workers when demand for their product falls. Furthermore, we find that consolidation policies are more effective in bringing down the public debt ratio when they are embedded in a regime of strict and wide fiscal rules, and when they are adopted by efficient public administrations. Increased credibility, and belief among private consumers and investors that consolidation is durable, may be a possible explanation for these findings. Next to this effect, our results also show that more efficient governments may realize better and (maybe) larger consolidation programmes. Efficient governments succeed in cutting expenditures significantly more than other governments.

A final result in this paper concerns the ideological orientation of the government. All other institutions equal, we find left-wing governments to be more successful in fiscal consolidation. It may be less difficult for them to convince key players (like unions) to accept the efforts and costs imposed by consolidation policies in return for improved long-run perspectives. Another explanation is that left-wing governments pay more attention to safeguarding public investment during consolidation.

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Appendix 1:

Classification of fiscal policy in specific countries and years (1981-2008) according to the traditional approach using the *CAPB*, the IMF action-based narrative approach, and the *CAPBu* approach that we use in this paper

Tabel A1. Size of fiscal consolidation policy according to alternative measurement

Country/year	*ΔCAPB*	narrative approach IMF (2010a)	*ΔCAPBu*	Would we change our conclusion on the stance of policy (consolidation/ neutral/ expansion) if we used the IMF data instead of our *ΔCAPBu* for the particular country and year ?
Belgium 1984	+4.13	+0.88	+2.15	No
Germany 1996	+6.63	+0.20	+0.13	No
Japan 1999	+4.20	+0.00	-1.30	No
Finland 2000	+4.35	+0.90	+4.00	No
Japan 2006	+4.52	+0.67	+1.35	No
Ireland 1982	+0.98	+3.80	+1.03	No
Finland 1992	-1.96	+1.80	-2.15	Yes
Finland 1993	-0.41	+3.80	+0.61	No
Italy 1993	+1.84	+4.30	+3.20	No

In eight out of these nine cases, the data that one obtains to evaluate policy using *ΔCAPBu* are much closer to the action-based indicator from the IMF than the data obtained from considering *ΔCAPB*. The only exception is Finland 1992. In this case the difference between *ΔCAPBu* and *ΔCAPB* is very small, however.

In eight out of these nine cases, we would not change our conclusion on the stance of fiscal policy in a particular year if we used IMF data. For example, we concluded that fiscal policy in Belgium in 1984 was contractionary, and part of a consolidation programme (see Table 1). If we used IMF data for 1984, we would draw the same conclusion. Using IMF data would make us change our conclusion only for Finland in 1992 (change from expansion to consolidation).

Appendix 2: Derivation of Equation (4)

We assume a fiscal episode which lasts for two years, *t* and *t+1*. Derivation for longer periods is totally analogous. Dropping the *CRISIS* dummy and *DEVAL*, Equation (3b) for these two years is:

$$GD_{i,t+1} - GD_{i,t} = \alpha_i + \beta_1 CAPBu_{i,t} + \beta_2 (CAPBu_{i,t+1} - CAPBu_{i,t}) + \beta_3 BURDEN_{i,t+1} + \beta_4 ONEOFF_{i,t+1} + \upsilon_{i,t+1}$$

$$GD_{i,t} - GD_{i,t-1} = \alpha_i + \beta_1 CAPBu_{i,t-1} + \beta_2 (CAPBu_{i,t} - CAPBu_{i,t-1}) + \beta_3 BURDEN_{i,t} + \beta_4 ONEOFF_{i,t} + \upsilon_{i,t}$$

To simplify further notation, we will specify $BURDEN_{i,t}$ as :

$$BURDEN_{i,t} = X_t . GD_{i,t-1}, \qquad \text{with: } X_t = \frac{(INTEREST_t - GROWTH_t)}{(1 + GROWTH_t)}$$

Summing both equations then implies:

$$\begin{aligned} GD_{i,t+1} - GD_{i,t-1} = {} & 2\alpha_i + \beta_1 (CAPBu_{i,t} + CAPBu_{i,t-1}) + \beta_2 (CAPBu_{i,t+1} - CAPBu_{i,t-1}) \\ & + \beta_3 (X_{t+1} GD_{i,t} + X_t GD_{i,t-1}) + \beta_4 (ONEOFF_{i,t+1} + ONEOFF_{i,t}) + \upsilon_{i,t+1} + \upsilon_{i,t} \end{aligned}$$

Using $GD_{i,t-1}$ as a proxy for $GD_{i,t}$ at the RHS of this equation, we can rewrite this result as the two period specification for Equation (4):

$$\begin{aligned} \Delta GD_{i,T} = {} & 2\alpha_i + 2\beta_1 (AvgCAPBu_{i,T}) + \beta_2 \Delta CAPBu_{i,T} + 2\beta_3 AvgX_T . GD_{i,t-1} \\ & + \beta_4 ONEOFF_{i,T} + \upsilon_{i,T} \end{aligned}$$

With:

$$\begin{aligned} & \Delta GD_{i,T} = GD_{i,t+1} - GD_{i,t-1} \\ & 2(AvgCAPBu_{i,T}) = CAPBu_{i,t-1} + CAPBu_{i,t} \\ & \Delta CAPBu_{i,T} = CAPBu_{i,t+1} - CAPBu_{i,t-1} \\ & 2AvgX_T = X_t + X_{t+1} \\ & ONEOFF_{i,T} = ONEOFF_{i,t} + ONEOFF_{i,t+1} \\ & \upsilon_{i,T} = \upsilon_{i,t} + \upsilon_{i,t+1} \end{aligned}$$

We approximate $GD_{i,t}$ at the RHS by $GD_{i,t-1}$ for econometric reasons, which is to avoid the correlation that one has between $(X_{t+1} GD_{i,t} + X_t GD_{i,t-1})$ and the error term $\upsilon_{i,t}$. Basically, this approximation comes down to instrumenting $GD_{i,t}$ by $GD_{i,t-1}$.

A more general specification for longer fiscal episodes will have *DURATION* instead of 2 in the equation. We use the same proxy $GD_{i,t-1}$ for each $GD_{i,t+z}$ at the RHS where $z \geq 0$.

The equation that we finally estimate will also include *CRISIS* dummies and the devaluation variable (*DEVAL*). Moreover, as we mention in the main text, to allow for possible lags in behavioural responses, we have extended in our regressions the period over which we compute the dependent variable $\Delta GD_{i,T}$ by two years.

Appendix 3: Data and data sources

Almost all data that we use in this paper are publicly available from OECD sources and from the Database Political institutions (DPI). Most OECD data have been taken from the *Statistical Compendium, Economic Outlook, N° 88*. We downloaded these data in January 2011. For the political variables we use the DPI version of December 2010. Details are described below. For a number of countries (e.g. Czech Republic, Germany, Hungary) data may not be available for the whole period 1980-2008.

Fiscal Policy

Gross government debt in percent of GDP (GD):
Source: OECD (series GGFLQ and GDP). Data for the Czech Republic, Hungary, Ireland and Portugal have been taken from AMECO. Data for the first two countries are available since 1995 only.

Underlying cyclically adjusted government primary balance in percent of potential GDP (CAPBu)
Source: OECD (series NLGXQU). Data for the Czech Republic are available since 1999 only, for Hungary and Poland since 1996, for Germany since 1992 and for Portugal since 1981.

Cyclically adjusted government primary balance in percent of potential GDP (CAPB)
Source: OECD (series NLGXQA). Data for the Czech Republic are available since 1999 only, for Hungary and Poland since 1996, for Germany since 1992 and for Portugal since 1981.

One-off measures in percent potential GDP (ONEOFF)
Calculation: CAPB-CAPBu.

Underlying cyclically adjusted current government revenues in percent of potential GDP (INCu)
Source: OECD (series YRGTQU). Data for the Czech Republic are available since 1999 only, for Hungary and Poland since 1996, for Germany since 1992 and for Portugal since 1981.

Underlying cyclically adjusted government non-interest expenditures in percent of potential GDP (NIEXPu).
Source: OECD (series YPGTXQ). Data for the Czech Republic are available since 1999 only, for Hungary and Poland since 1995 and for Germany since 1991.

Cyclically adjusted taxes on business in percent of potential GDP (TAXB)
Source: OECD (series TYBA and GDPTR). Data for the Czech Republic are available since 1999 only, for Hungary and Poland since 1996, for New-Zealand since 1986 and for Portugal since 1981.

Cyclically adjusted indirect taxes in percent of potential GDP (component of TAXT)
Source: OECD (series TINDA and GDPTR). Data for the Czech republic are available since 1999 only and for Hungary and Poland since 1995.

Cyclically adjusted direct taxes on households in percent of potential GDP (component of TAXT)
Source: OECD (series TYHA and GDPTR). Data for the Czech Republic are available since 1999 only, for Hungary and Poland since 1996, for New-Zealand since 1986 and for Portugal since 1981.

Cyclically adjusted social security contribution received by general government in percent of potential GDP (component of TAXT)
Source: OECD (series SSRG and GDPTR). Data for the Czech Republic are available since 1999 only since 1995, for New-Zealand since 1986 and for Poland since 1996.

Public sector wage consumption in percent potential GDP (WAGE)
Source: OECD (series CGW and GDPTR). Data for the Czech Republic, Hungary and Poland are available since 1995 only, for New-Zealand since 1986.

Government non-wage consumption in percent potential GDP (NONWAGE)
Source: OECD (series CGNW and GDPTR). Data for the Czech Republic, Hungary and Poland are available since 1995 only, for New-Zealand since 1986

Government fixed capital formation in percent of potential GDP (INV)
Source: OECD (series IGAA and GDPTR). Data for the Czech Republic, Hungary and Poland are only available since 1995.

Subsidies in percent potential GDP (SUBS)
Source: OECD (series TSUB and GDPTR). Data for the Czech Republic, Hungary and Poland are only available since 1995.

Cyclically adjusted social expenditures in percent of potential GDP (SOCEXP)
OECD provides no direct series for this variable. Following Heylen and Everaert (2000), we computed it as SOCEXP = NIEXP – WAGE – NONWAGE – SUBS - other current transfers - property income paid (except interest payments), where NIEXP is cyclically adjusted current primary disbursements. Underlying this approach is a double assumption. First, we assume that one-off current disbursements are negligible. Second, we assume that the variables at the right hand side of this equation are not affected by the cycle.

Devaluation
Definition: percentage of official nominal exchange rate devaluation in the year before the fiscal episode (t_{s-1})
Sources: Bofinger (2000, Table 2); Bank for International Settlements; national sources (e.g. Riksbank, Norges Bank). Data available upon request.

International macroeconomic context

International nominal short term interest rate in percent (INTEREST)
Definition: see our note to Table 2.
Source: OECD (series IRS).

International nominal GDP growth rate in percent (GROWTH)
Definition: see our note to Table 2.
Source: OECD (series GDP).

Institutions

Employment protection legislation (EPL)
Definition: OECD summary indicator of the stringency of Employment Protection Legislation. We use the overall EPL strictness indicator (time series, version 1).
Source: OECD, Employment Outlook 2004; see also Online OECD Employment Database.
Data shortages and adjustments: see Berger and Heylen (2011) who also use and extended this dataset.
As indicator of institutional reform we compute the change in *EPL* (*ΔEPL*) as its level at the end of a fiscal episode minus its level two years before the episode.

Trade union density rate (UNION)
Definition: the share of workers affiliated to a trade union, in %.
Source: OECD, Employment Outlook 2004; see also Online OECD Employment Database. Data for the Czech Republic and Hungary are only available since 1996, for Germany since 1992, for Poland since 1990, for New-Zealand since 1986 and for Portugal since 1981.

Coordination of Wage Bargaining (COOR)
Definition: Index from 1 to 5 for the degree of intentional harmonization in the wage setting process, for the degree to which "minor players" deliberately follow along with what the "major players" decide. The coding for the index is based on structural characteristics of the wage bargaining process.
Source: Kenworthy (2001).
Data shortages and adjustments: see Berger and Heylen (2011) who also use (and extended) this dataset.

Product market regulation (PMR)
Definition: OECD summary indicator of regulatory impediments to product market competition in seven non-manufacturing industries (telecoms, electricity, gas, post, rail, air passenger transport, and road freight).
Source: Conway *et al.* (2006); see also OECD.Stat, Public Sector, Taxation and Market Regulation (REGREF dataset).
The data from Conway et al. are available only until 2003. We extrapolated them relying on more recent product market regulation data from OECD.stat for 2003 and 2008. Data for the Czech Republic and Hungary is only available since 1998.
As indicator of institutional reform we compute the change in *PMR* (*ΔPMR*) as its level at the end of a fiscal episode minus its level in the last year before the episode.

Party orientation with respect to economic Policy (LEFT)
Definition: Dummy variable for parties that are defined as communist, socialist, social democratic, or left-wing.
Source: Database political institutions, 2010 (series EXECRLC).

Public sector efficiency (PSEAdm, PSEAvg)

Source: Angelopoulos *et al.* (2008). The authors provide period averages for *PSEAdm* and *PSEAvg* (among other variables) for 1980-85, 1985-90, 1990-95 and 1995-2000. For most countries observations are available for three or four of these periods. For a few countries (Czech Republic, Italy, Poland, Spain) data availability is more limited. When a fiscal episode falls nicely within one of these periods (e.g. a consolidation episode in 1982-84), we take the *PSE* values relating to that period (1980-85). When a fiscal episode overlaps two periods, but the overlap in the second period is less than three years (e.g. 1983-87) we take the *PSE* values relating to first of these periods (1980-85). When the overlap is at least three years (e.g. 1983-88) we take the average of the *PSE* data for both periods. In case *PSE* data for the period concerned are missing, we take the available data for the adjacent period as a proxy. We never take *PSE* data where the gap with the fiscal episode is more than five years.

Fiscal rule index (FRI)

Source: The construction of the fiscal rule index is explained in European Commission (2006). The dataset is available at: http://ec.europa.eu/economy_finance/db_indicators/fiscal_governance/fiscal_rules/index_en.htm
Data for Canada, Japan New-Zealand, Norway and the United States are not available.