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

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WORKING PAPER

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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 1980-2008. We test within a multivariate regression framework seven 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 role of labour and product market institutions and institutional reform, (vi) the ideological orientation of the government, and (vii) 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. Consolidation programmes imply a stronger reduction of the public debt ratio when they mainly rely on spending cuts (except public investment), are large but of short duration, take place when growth in the international economy is high and interest rates are low, 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. Finally, we find no evidence that labour market deregulation contributes to a reduction of the public debt ratio during consolidation periods.

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, 2011; 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; Afonso and Jalles, 2011). 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), still others on the ideological orientation of government or on 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 1980-2008. 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, and (iv) the influence of the international macroeconomic environment, we also test the influence of (v) labour and product market institutions and institutional reform, (vi) the ideological orientation of the government, and (vii) 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 about 130 fiscal episodes in 21 OECD countries since 1980. 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 Section 4 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 5 summarizes our main results and concludes the paper.

2. Fiscal episodes in the OECD, 1980-2008

The fiscal consolidation literature commonly determines consolidation and expansion periods using a criterion based on swings in the cyclically adjusted primary balance (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.

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 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* in percent of potential GDP 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 1980-2008 yields 40 consolidations, 29 expansions and 65 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. The flexible duration approach that we adopt in this paper has also been adopted by e.g. Giavazzi and Pagano (1996) and Guichard *et al.* (2007). Others, however, specify episodes as 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

Table 1. Fiscal consolidation, expansion and neutral periods in the OECD: 1980-2008

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	-0.5
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	-23.7					
UK	uk1	1981-1982	2.72	8.0					
	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	3.02	**Average**			-4.11	5.65

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}).

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

Neutral periods [1]					Neutral periods [1]				
Country	Code	Period $(t_s - t_f)$	$\Delta CAPBu$	ΔGD	**Country**	Code	Period $(t_s - t_f)$	$\Delta CAPBu$	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		ne4n	2006-2008	-1.16	13.5
	ca4n	2004-2005	0.78	-10.1	**New Zealand**	nz1n	1987-1991	-0.14	-6.9
Czech Republic	cz1n	2000-2007	2.49	18.9		nz2n	1995	0.05	-18.9
Denmark	de1n	1981-1982	-1.17	33.4		nz3n	2000-2006	2.70	-14.5
	de2n	1987-1988	-1.05	-5.5	**Norway**	no1n	1981-1986	0.53	-6.8
	de3n	2000-2002	-1.75	-13.0		no2n	1993	0.02	8.5
Finland	fi1n	1981	2.02	4.3		no3n	1996-2000	3.64	-0.2
	fi2n	1984	1.71	1.5	**Poland**	pl1n	1997-2007	-1.25	7.0
	fi3n	1988-1989	2.64	4.8	**Portugal**	pr1n	1985-1988	-1.14	4.5
	fi4n	1997	-0.12	-11.3		pr2n	1992-2005	-1.30	7.0
	fi5n	2005-2007	1.14	1.1	**Spain**	sp1n	1981-1987	1.73	18.6
France	fr1n	1981-1993	-2.36	32.9		sp2n	1998-2007	0.90	-12.6
	fr2n	2000-2006	-1.13	9.1	**Sweden**	sw1n	1985	-0.27	-9.0
Germany	ge1n	1993-2002	0.71	25.4		sw2n	1988-1989	0.11	-6.9
	ge2n	2008	-0.02	14.6		sw3n	1994-1995	-0.08	4.8
Hungary	hu1n	1999-2000	1.67	-4.3		sw4n	2006-2008	0.16	-8.7
	hu2n	2003-2004	0.48	10.1	**UK**	uk1n	1983-1989	-0.76	-18.0
Ireland	ir1n	1981	0.02	24.5		uk2n	2000	0.09	-6.6
	ir2n	1985	-0.59	15.2		uk3n	2005-2006	0.72	13.2
	ir3n	1990-1991	-1.51	-5.2	**USA**	us1n	1981	1.07	7.1
	ir4n	1995-1999	-0.84	-53.1		us2n	1990-1992	-1.10	9.5
	ir5n	2005-2006	0.65	14.7		us3n	1999-2000	0.15	-7.4
						us4n	2004-2006	1.70	10.9
					Average			0.12	3.74

Note: $\Delta CAPBu$: 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}).

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

advantage of our 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 in this paper, 37 are followed by 'neutral' policy. Clearly, this improves 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.

[1] Note that in a few cases $\Delta CAPBu > 2$ 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.

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 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 1980-2008. 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 *ΔCAPBu* are in general (much) closer to the action-based indicator from the IMF than the data obtained when considering *ΔCAPB*.

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, 1986-1989, and Sweden, 1996-2000, 2004-05). 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
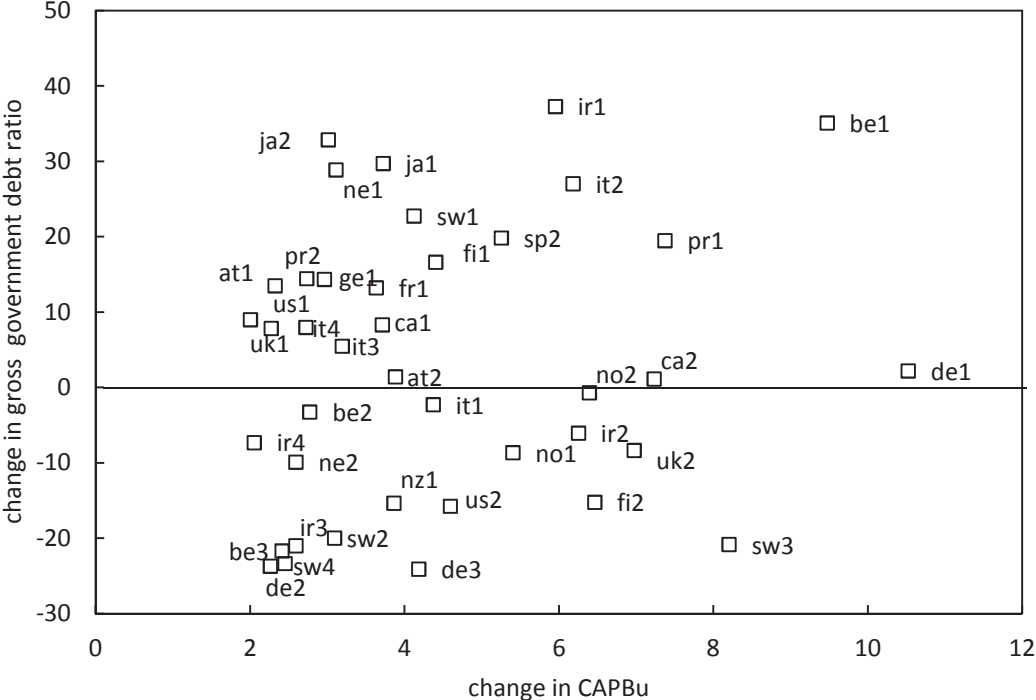
Data and data sources: see Table 1.

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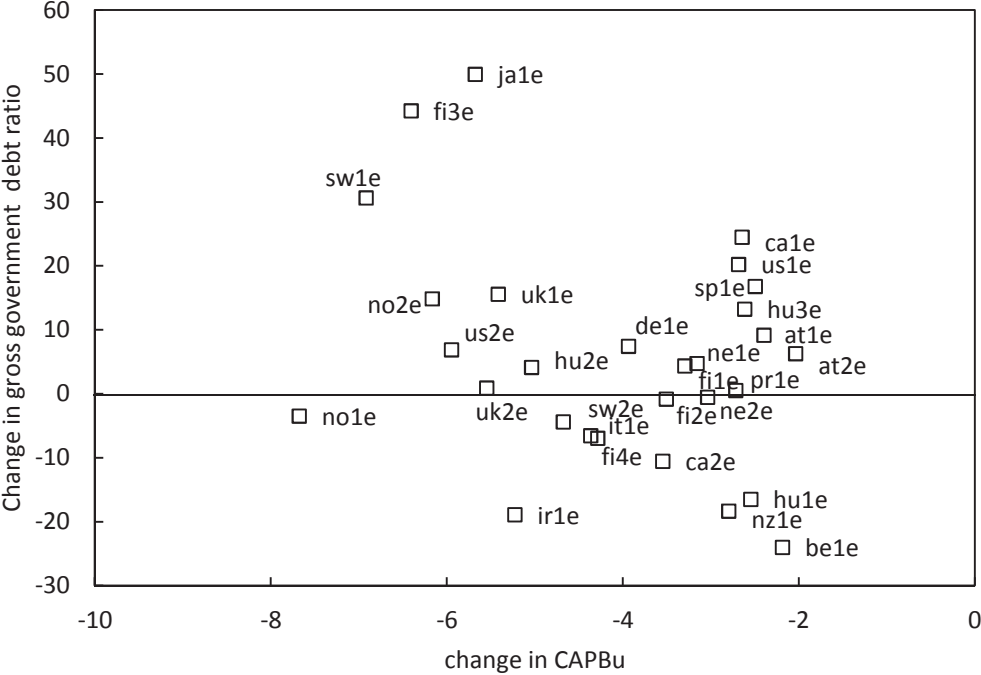

Data and data sources: see Table 1.

3. Output growth and the outcome of fiscal consolidation

Sections 3 and 4 of this paper investigate the determinants of the change in the public debt to GDP ratio during fiscal adjustment. In Section 3.1. we highlight the crucial role of output growth in the consolidation period. In Section 3.2. we review the theoretical effects of tight fiscal policy on real growth and discuss seven hypotheses that explain why growth may be strong in some consolidation episodes and weak in others. Each of these hypotheses refers to the characteristics of the consolidation programme, or to the circumstances in which it takes place. We also pay attention to the institutional environment which may affect the characteristics of the consolidation programme, or its effects. We consider the role of labour and product market institutions, the political context, and the possible contribution of fiscal rules. We empirically test our hypotheses in Section 4.

Figure 3 represents the structure of our approach and the causal relationships we have in mind. We start the discussion in Section 3.1. at the right hand side of this figure (bold arrows). Section 3.2. focuses on the left hand side (dotted arrows).

Figure 3. Determinants of the change in the public debt to GDP ratio
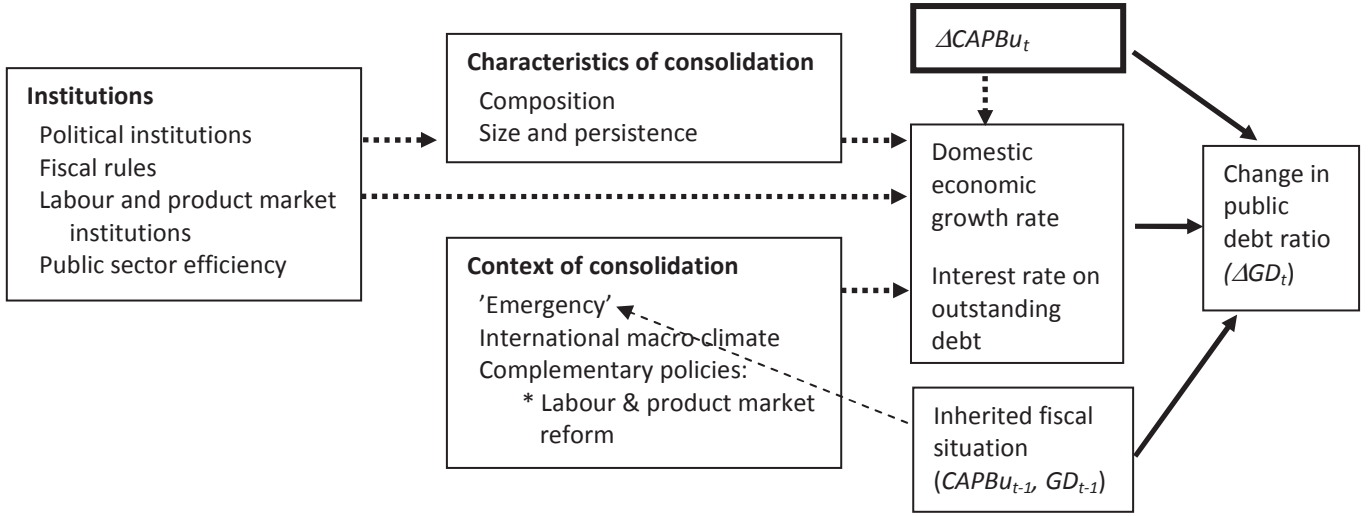
3.1 Dynamics of the public debt ratio and the role of output growth

High GDP growth is of crucial importance for the success of consolidation efforts. Equations (1) and (2) illustrate this. Equation (1) is the well-known equation for the dynamics of the government debt ratio. Equation (2) follows from (1) after some rearrangements.

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

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

$$\text{with: } PB_t = CAPBu_t + CCPB_t + ONEOFF_t$$

In Equation (1), 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. In Equation (2) we split up the primary balance in year t 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.

Equation (2) reveals two channels of influence of real output growth on the ratio of debt to GDP. First, for given inflation, higher real growth reduces the debt burden, $\frac{(r_{n,t} - g_{n,t})}{(1 + g_{n,t})} GD_{t-1}$. Faster GDP growth automatically reduces the weight of a given amount of debt and interest payments, relative to national income. Second, by raising tax receipts and reducing unemployment benefit expenditures, higher real output growth raises the cyclical component of the primary balance, *CCPB*. Both channels contribute to debt reduction (*ΔGD*<0). The other main determinants of the rate of debt reduction are the underlying cyclically adjusted primary balance (*CAPBu_t*) and the interest rate ($r_{n,t}$). Fiscal policy makers have a direct influence on

the former. The latter will depend also on actions from monetary policy makers. Finally, Equations (1) and (2) highlight the influence of the historical fiscal situation as reflected by GD_{t-1}.

Figure 4 demonstrates the crucial role of real growth in actual consolidation episodes. 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. If we compare this result with the absence of a relationship between $\Delta CAPBu$ and the change in the debt ratio in Figure 1, one may conclude that in Equation (2) output growth is a dominating factor. Strong growth really seems to be a necessary condition for consolidation policy to succeed. Only three episodes can be observed in Figure 4 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 4 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.

Looking at the expansion periods in Figure 5, we observe a similar negative relationship between changes in the output gap and the debt ratio, but here it is much weaker. Also for neutral periods a weak negative relationship exists (not shown).

3.2   Consolidation, growth and the public debt ratio: 7 hypotheses

Given the dominant role of the evolution of economic growth, it is not surprising that several authors have concentrated on the determinants of growth during and after consolidation. Major contributions have been made by, among others, Giavazzi and Pagano (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)

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

Figure 4. Consolidation periods, output gap evolution and evolution of the gross debt
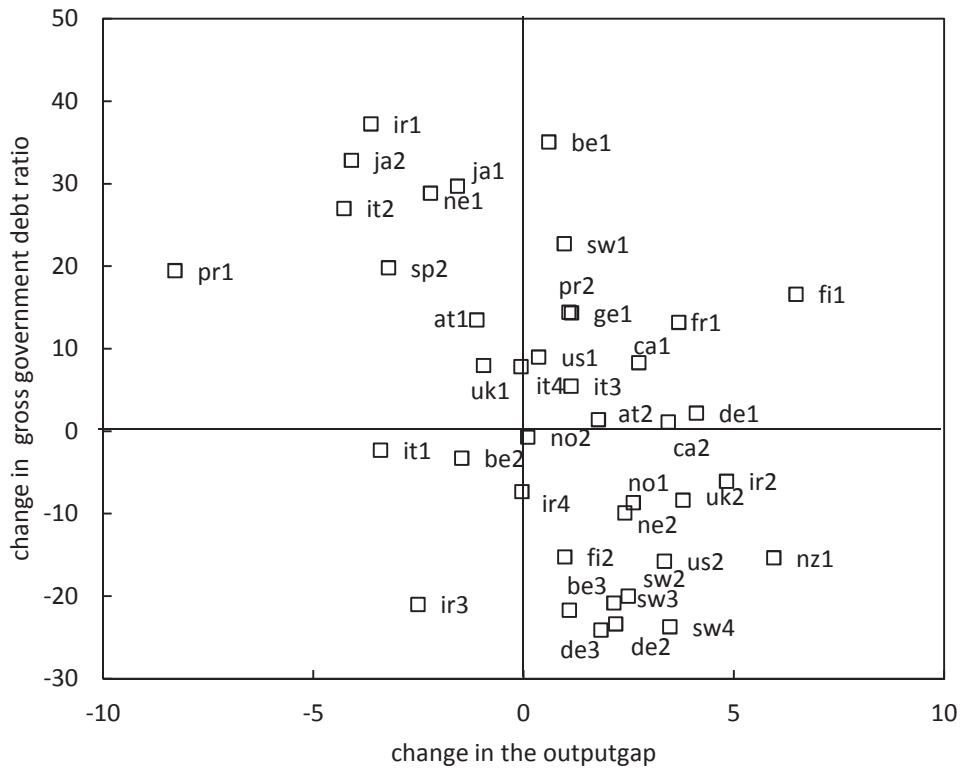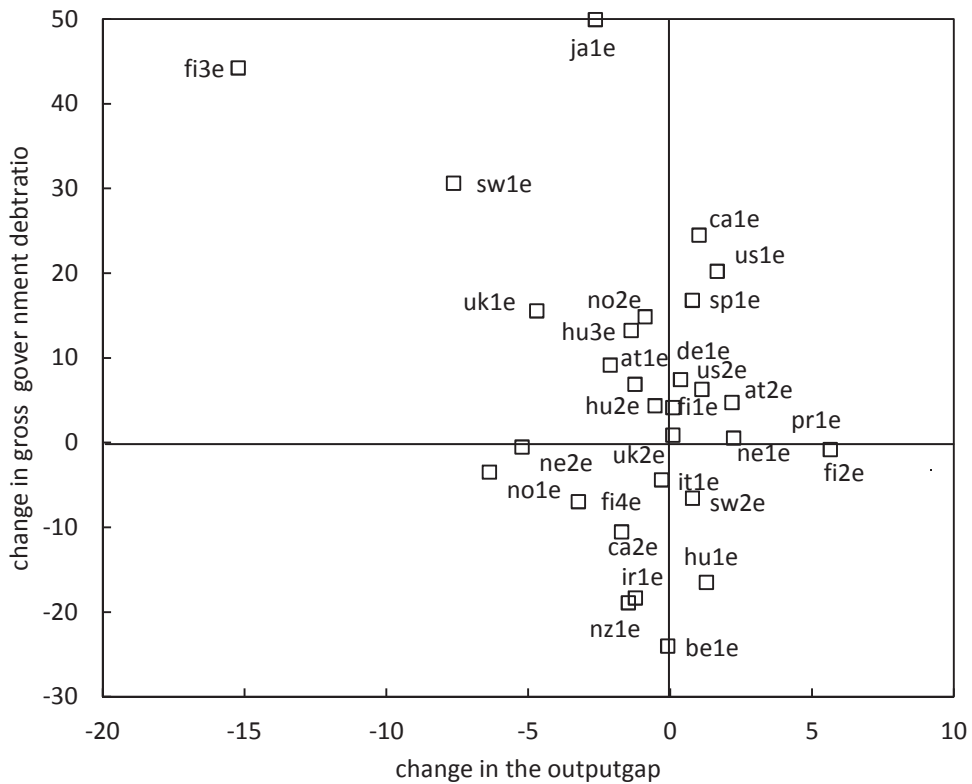

Figure 5. Expansion periods, output gap evolution and evolution of the gross debt ratio

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.

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.

3.2.1 Composition

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 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), 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 wage bill cuts as a starting point, we advance in this paper a new hypothesis emphasizing the role of public sector efficiency. Angelopoulos *et al.* (2008) find that the relationship between the size of the public sector and economic growth depends critically on public sector efficiency. It will be our hypothesis 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.

3.2.2   Size and persistence

Our 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 (2011). Other studies cannot confirm it, e.g. Alesina and Perotti (1996) and Larch and Turrini (2011).

3.2.3   Emergency effects

Our 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.

3.2.4 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.

3.2.5 Labor and product market institutions

The literature reveals various ways in which labor and product market institutions may matter for the effects of fiscal consolidation. Both the existing level of institutions and possible changes in the context of labour or product market reform, may be important, but the exact sign of all possible effects is theoretically often ambiguous. Tagkalakis (2009) discusses most of these effects. 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 (see section 3.2.1). 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 the latter 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 at 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.

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 may significantly 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 (Deroose, 2005; Tagkalakis, 2009). Instead of contributing to the success of consolidation, deregulation and structural reform may then induce failure. The existing empirical evidence is mixed about product market reform. Tagkalakis (2009) finds that product market deregulation does *not* raise the likelihood of successful fiscal consolidation, Larch and Turrini (2011) find that it does. By contrast, both studies agree in finding no positive contribution from a reduction of employment protection legislation.

As a final result, both Tagkalakis (2009) and Larch and Turrini (2011) observe that less generous unemployment benefit systems contribute to the success of fiscal consolidation. This result is clearly in line with the evidence in favour of social transfer cuts as a necessary part of fiscal consolidation programmes (see Section 3.2.1.).

3.2.6   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 here 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.

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.

3.2.7   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. Empirical test

In this section we present the results of an empirical analysis of the evolution of the public debt to GDP ratio in 134 fiscal episodes in 21 OECD countries in 1980-2010. To be explained as our main dependent variable are the data for ΔGD that we report in Table 1. In Section 4.1 we describe our methodology, and the explanatory variables that we use. We report our results in Section 4.2.

4.1 Methodology

We first derive and discuss the basic equations that we will estimate. Then, we motivate our empirical methodology (least squares methodology). We also give insight into the precise data that we shall use.

4.1.1 Basic equations and data

The starting point of our estimations is Equation (2), describing the change of the public debt to GDP ratio in year t. In our regressions, however, we will not include the cyclical component of the primary balance ($CCPB$), nor the domestic interest and growth rates (g_n, r_n). It will be clear from the many hypotheses that we have described in the previous sections that the evolution of these variables is highly endogenous. They will be affected by the precise characteristics of discretionary policy during the year (episode) 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/or context variables to pick up the endogenous effects that they bring about. Policy variables that we include concern the level and change of $CAPBu$ 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 to context variables, we first of all include international growth and interest rates ($GROWTH$, $INTEREST$). Later we also introduce other variables, like institutions, to test other hypotheses that we formulated in Section 3.2. 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 may introduce $CRISIS$ dummies, to be defined in greater detail below.

Taking these arguments into account generates the following straightforward empirical specification for the change in the government debt ratio in country i and year t:

$$\Delta GD_{i,t} = \alpha_i + \beta_1 CAPBu_{i,t} + \beta_3 BURDEN_{i,t} + \beta_4 ONEOFF_{i,t} + \beta_5 CRISIS_t + v_{i,t} \tag{3a}$$

$$\text{with: } BURDEN_{i,t} = \frac{(INTEREST_t/100 - GROWTH_t/100)}{(1 + GROWTH_t/100)} GD_{i,t-1}$$

$$\beta_1, \beta_4 < 0 \text{ and } \beta_3, \beta_5 > 0.$$

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, due to 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 picks up the automatic 'snowball' component of debt dynamics, as well as the effect from (exogenous) international nominal growth and interest rates on their domestic counterparts. We indicate international variables as $GROWTH_t$ and $INTEREST_t$. We define them in greater detail below (Table 2). Finally, α_i is a country-specific fixed effect, and $v_{i,t}$ 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 real interest rates in individual countries during the period under consideration[4].

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

In Equation (3b) we introduce richer dynamics. We allow for different short-run and equilibrium (or longer-run) effects from discretionary policy changes on the change of the debt ratio.

$$\Delta GD_{i,t} = \alpha_i + \beta_1 CAPBu_{i,t-1} + \beta_2 \Delta CAPBu_{i,t} + \beta_3 BURDEN_{i,t} + \beta_4 ONEOFF_{i,t} + \beta_5 CRISIS_t + v_{i,t} \quad \text{(3b)}$$

Fiscal consolidation efforts 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 period. 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 $\beta_2 = \beta_1$. 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, or the size or persistence of policy measures, may play a key role here. Note, however, that even temporary effects on the change in the debt ratio (ΔGD) give rise to permanent effects on the level of *GD*.

Our focus in this paper is not on annual debt dynamics, however, but on the evolution of the public debt ratio during well-defined multi-annual fiscal episodes. Equation (4) establishes the basis of our regressions. This equation 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, and the approximations that we made.

$$\Delta GD_{i,T} = \alpha_i . DURATION_{i,T} + \beta_1 AvgCAPBu_{i,T} . DURATION_{i,T} + \beta_2 \Delta CAPBu_{i,T}$$
$$+ \beta_3 BURDEN_{i,T} . DURATION_{i,T} + \beta_4 ONEOFF_{i,T} + \beta_5 CRISIS_T + v_{i,T} \quad \text{(4)}$$

In this equation, $\Delta GD_{i,T}$ is the change in the public debt to GDP ratio in country i during episode T, $AvgCAPBu_{i,T}$ is the average 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]. The analogy with Equation (3b) is quite clear. Whereas β_1 captures the permanent effects on debt dynamics from changing a country's basic financial position (which can be good or bad, and which is reflected by $AvgCAPBu_{i,T}$), β_2 measures the more temporary effect from deliberate policy actions ($\Delta CAPBu_{i,T}$). 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. The reason to do so, follows from our discussion in Section 3. Given that many of the exogenous determinants of the evolution of the debt ratio operate via all kinds of effects on private agents' behavior and growth (e.g. credibility effects, expectation effects), it may take some time for these effects to materialize.

The other variables in Equation (4) have been specified as follows. $ONEOFF_{i,T}$ is the sum of all annual one-off measures over the fiscal episode. *CRISIS* is a dummy capturing stock-flow adjustments during banking crises. A first crisis dummy that we introduce (*CRISIS08*) is 1 for all episodes which include 2008 in the computation of $\Delta GD_{i,T}$. A second dummy (*CRISIS91sf*) is 1 in Sweden and Finland during their banking crisis in the early 1990s[6]. Finally, $BURDEN_{i,T}$ has been computed from average international

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[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 average computed over all years from t_{s-1} to t_{f-1}.
[6] We tested for banking crisis effects in other countries (Norway early 1990s, Japan end of 1990s), but there we did not observe any significant effect on the public debt ratio.

nominal interest and growth rates during the episode T and from the level of the government debt ratio in the year before the start of the episode T. The latter we indicate as $GDINIT$. Algebraically,

$$BURDEN_{i,T} = \left(Avg\left(\frac{INTEREST_T/100 - GROWTH_T/100}{1 + GROWTH_T/100} \right)_T \right) . GDINIT_{i,T}$$

In our empirical analysis we extend Equation (4) in various 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 3.2.1). We introduce this idea in our Equation (4) by substituting one of the following two decompositions for $\Delta CAPBu_{i,T}$:

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

$$\begin{aligned} \Delta CAPBu_{i,T} = &\Delta TAXB_{i,T} + \Delta TAXH_{i,T} + \Delta INTAX_{i,T} + \Delta SOC_{i,T} \\ &- \Delta WAGE_{i,T} - \Delta NONWAGE_{i,T} - \Delta SOCEXP_{i,T} \\ &- \Delta SUBS_{i,T} - \Delta INV_{i,T} + \Delta OTHERu2_{i,T} \end{aligned} \tag{6}$$

The same decompositions can be made for the level of $AvgCAPBu_{i,T}$. In (5) we make use of a rather general decomposition of the change in the underlying cyclically adjusted primary balance. 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 over all countries and years in our dataset of the absolute value of $\Delta OTHERu$ 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 ($TAXB$), direct taxes on households ($TAXH$), social security contributions paid by workers and firms (SOC), and indirect taxes ($INTAX$). 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 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 behavior 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) introduces different coefficients on the composition variables according to the fiscal episode to which they belong. This means that we allow for different coefficients on for example $\Delta INCu$ or $\Delta WAGE$ in years of neutral fiscal policy, years of consolidation, and years of expansion. Such a flexible specification may be particularly useful for example if we want to provide room for the many nonlinearities in the effects of fiscal policy in non-Keynesian theories to show up. The same absolute change in an expenditure or revenue variable may bring about different effects on expectations of households or firms when this change belongs to an expansion period rather than a consolidation period. As a result, household or firm behaviour may be different, and so may the change in the ratio of debt to GDP. In our discussion below, we will mainly focus on effects during consolidation.

An important 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 3.2. More precisely, these variables relate to the size and persistence (or duration) of a particular fiscal episode, the possible situation of fiscal 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.

4.1.2 Estimation method

In regression equations like Equation (3), which use annual data, the least squares estimation methodology would seem a most reasonable choice. If it can be assumed that fiscal policy makers do not react to shocks in the public debt ratio within the same year, all variables at the RHS of the equation would seem uncorrelated to the error term. A key element is that policy plans are usually determined before the start of a new year. Beetsma *et al.* (2008) test this assumption for public spending in the European Union, and find it to be justified. The use of the least squares estimator may be less obvious, however, in a multi-annual setting like the one in Equation (4). The probability of correlation between the error term and some of the explanatory variables, in particular $\Delta CAPBu_{i,T}$ or $ONEOFF_{i,T}$, may indeed be higher in periods lasting several years, rather than only one. If, for example, consolidating governments are hit by an adverse shock to the debt ratio (e.g. caused by an unexpected domestic growth slowdown), they may respond by adjusting their policies in order to reach the goals for the debt ratio that they may have set earlier. Even if responding is not possible within the same year, it may be possible in periods lasting longer. The endogeneity that then occurs would impose the use of IV methods. Considering this possibility, it was 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). As our main result, we could never reject the null that there is no correlation with the error term, i.e. that our regressors are exogenous and OLS estimates are consistent[7].

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[7] Our procedure was as follows. (i) We defined five instruments: $CAPB_u$ in the last year and in the one but last year *before* the start of the fiscal episode, *ONEOFF* in these two years, and the recent change in the debt ratio *before* the start of the episode. We specified the latter as ΔGD between the third and the last year before the start of the episode. Standard Wald tests show high explanatory power in these instruments for $\Delta CAPBu_{i,T}$ and $AvgCAPBu_{i,T}$ (F values above 20), but much less so for $ONEOFF_{i,T}$ (F value below 2.5). Given the highly ad hoc nature of one-off policy measures, the latter result should not be surprising. (ii) Augmenting our basic specification (Equation 4) with the residual series from the first stage regressions of $\Delta CAPBu_{i,T}$, $AvgCAPBu_{i,T}$ and $ONEOFF_{i,T}$ on all exogenous variables and the instruments, and re-estimating with the least squares method, never resulted in significant coefficients for these residual series. All three individual *p*-values were above 0.25. A Wald test of their joint significance implied a *p*-value of more than 0.60. The null hypothesis that our regressors are exogenous can therefore not be rejected. (iii) We obtain the same conclusion in complementary tests for overidentifying restrictions. Estimating Equation (4) by the IV-method, while assuming one or two of $\Delta CAPBu_{i,T}$, $AvgCAPBu_{i,T}$ and $ONEOFF_{i,T}$ to be exogenous, always yields *p*-values for the *J*-statistic above 0.20.

Table 2. Description of variables

Fiscal policy	
GD	Gross public debt in % of GDP.
GDINIT	Gross public debt in % of GDP in the year before the start of a fiscal episode.
CAPBu	Underlying cyclicallyadjusted primary balance, in % of potential GDP.
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.
INTAX	Cyclically adjusted indirect taxes on production and imports, in % of potential GDP.
TAXB	Cyclically adjusted direct taxes on business, in % of potential GDP (corporate tax).
TAXH	Cyclically adjusted direct taxes on households, in % of potential GDP.
SOC	Cyclically adjusted 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).
BRR1	Unemployment benefit (gross replacement rate during the first year of unemployment, %).
BRR45	Unemployment benefit (gross replacement rate during the fourth and fifth year of unemployment, %).
UNION	Trade union density, in %.
COORD	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).
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).
LEFT	Dummy variable taking the value 1 if the government is left-wing and 0 otherwise.
RIGHT	Dummy variable taking the value 1 if the government is right-wing and 0 otherwise.
FRAG	Index for the degree of political fragmentation in government (higher for coalition governments than for one-party governments).
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.
Other variables	
SIZE/PERSIST	Several indicators (see discussion in Section 4.2.1. - size and persistence).
EMERGENCY	Several indicators (see discussion in Section 4.2.1. - emergency).

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.

4.2 Regression results

In this section we present our estimation results. Section 4.2.1. concentrates on the effects of fiscal policies as obtained from estimating Equation (4), or extended versions of Equation (4). Extensions allow us to test for composition effects, size and persistence effects, or emergency effects. The former are tested by introducing Equations (5) or (6). The other effects can be tested by entering a number of other fiscal policy variables, like the duration of a fiscal episode or the inherited level of public debt. In Section 4.2.2. we focus on the role of institutions and institutional change.

4.2.1 Basic results

Table 3, column (1), 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. For $\Delta CAPBu$ the outcome is as one would expect if over the fiscal episode the effect of discretionary policy on output and growth is about neutral[8]. 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 4.1.1., 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. The *CRISIS* dummies capture direct stock-flow effects 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. Finally, for *ONEOFF* we find no significant effect. One can easily imagine that negative credibility or expectation effects on private sector behaviour and/or financial markets may explain (part of) this result.

In column (2) we allow the coefficient on $\Delta CAPBu$ to differ during fiscal consolidation episodes, fiscal 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 clear explanation for this finding. One hypothesis is 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 behavior. 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. One way to explain such a pattern may involve the combination of forward-looking consumers with borrowing constraints. Another hypothesis may relate to nonlinear domestic interest rate responses. It will be more likely to get the effects that we observe in Table 3 if the interest rate (risk premium) rises more in times of expansion and increasing debt, than it falls in times of consolidation. These results notwithstanding, it should be clear that permanent consolidation efforts imply a better future *CAPBu* level. The effect of consolidation efforts may be limited during the consolidation episode (as revealed by the coefficient on $\Delta CAPBu$). By permanently improving

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[8] In complementary work we have run the regression in column (1) using annual data as in Equation (3b). We then obtain an estimated coefficient on $\Delta CAPBu$ of about -0.7. This result is in line with findings by e.g. IMF (2010a) and OECD (2010b) that short run output effects from contractionary (expansionary) fiscal policies are negative (positive).

(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 $\Delta CAPBu$.

Table 3. Estimation results – 1

Explanatory variables	ΔGD			
	(1)	se	(2)	se
Constant	3.47*	2.05	2.81	2.07
AvgCAPBu*DURATION	-1.35***	0.14	-1.34***	0.14
BURDEN*DURATION	1.12***	0.30	1.16***	0.30
ONEOFF	-1.06	0.96	-1.17	0.95
CRISIS08	11.3***	2.97	12.0***	2.97
CRISIS91sf	27.3***	8.15	22.9***	8.32
$\Delta CAPBu$	-1.01***	0.30	-	
Consolidation				
$\Delta CAPBu$			-0.49	0.45
Expansion				
$\Delta CAPBu$			-2.04***	0.58
Neutral				
$\Delta CAPBu$			0.23	1.13
R-squared	0.75		0.76	
Adjusted R-squared	0.68		0.69	
Controlling for country fixed effects (times duration)	yes		yes	
Number of obs. (countries)	134(21)		134(21)	

Notes: 'se' indicates the estimated standard error;
*** (**) (*) 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

Tables 4 and 5 allow for different effects from the various (cyclically adjusted) revenue and expenditure components behind the government balance. Column (3) in Table 4 introduces the basic decomposition of $\Delta CAPBu$ in changes in underlying non-interest expenditures ($\Delta NIEXPu$) and changes in underlying current receipts ($\Delta INCu$) that we put forward in Equation (5). Column (4) additionally decomposes *AvgCAPBu*DURATION*, and therefore allows for possibly different permanent effects of taxes and government expenditures on debt dynamics, i.e. effects on ΔGD which persist even after the end of a consolidation or expansion episode. Column (5) also splits up *BURDEN*. We allow for different effects from international interest rate changes and growth rate changes. Moreover, these interest and growth rate effects are free to differ according to the fiscal policy regime.

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 (2). All our regressions reveal 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, in general this effect is small and not significantly different from zero. Things are even worse at the expenditure side. Estimated coefficients on $\Delta NIEXPu$ are close to zero, and even obtain an unexpected negative sign. As a group, expenditure cuts seem ineffective in bringing down the debt ratio, at least during the consolidation period which lasts about 3.5 years on average. 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) [9]. 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 columns (4) and (5). 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 totally ineffective.

Table 4. Estimation results – 2 – composition I

	ΔGD					
Explanatory variables	(3)	se	(4)	se	(5)	se
Constant	3.43*	2.06	3.85*	2.00	3.48*	2.05
AvgCAPBu*DURATION	-1.32***	0.15	-		-	
AvgINCu*DURATION	-		-1.10***	0.17	-1.13***	0.18
AvgNIEXPu*DURATION	-		1.42***	0.15	1.40***	0.15
AvgOTHERu*DURATION	-		-0.34	0.56	-0.29	0.59
BURDEN*DURATION	1.16***	0.29	1.41***	0.32	-	
ONEOFF	-1.64*	0.94	-2.36**	0.95	-2.43**	1.02
CRISIS	10.2***	2.93	9.64***	2.84	9.86***	2.99
CRISIS91sf	12.6	9.77	6.42	9.73	8.96	10.61
Consolidation						
INTEREST*GDINIT*DURATION	-		-		1.60***	0.45
GROWTH*GDINIT*DURATION	-		-		-1.34**	0.58
ΔINCU	-1.07	0.77	-0.82	0.75	-0.75	1.13
ΔNIEXPU	-0.49	0.62	-0.25	0.60	-0.33	0.91
ΔOTHERU	-10.5***	3.24	-10.7***	3.17	-10.0***	3.31
Expansion						
INTEREST*GDINIT*DURATION	-		-		1.01	0.74
GROWTH*GDINIT*DURATION	-		-		-0.64	1.03
ΔINCU	-2.58***	1.03	-2.28**	1.00	-2.46**	1.15
ΔNIEXPU	2.09***	0.69	2.76***	0.72	2.99***	1.08
ΔOTHERU	-12.9*	7.29	-13.9*	7.07	-13.2*	7.25
Neutral						
INTEREST*GDINIT*DURATION	-		-		1.00**	0.44
GROWTH*GDINIT*DURATION	-		-		-0.62	0.62
ΔINCU	0.68	1.13	1.03	1.12	1.35	1.23
ΔNIEXPU	0.24	1.20	0.41	1.17	0.39	1.21
ΔOTHERU	-1.57	2.85	-1.27	2.93	-0.10	3.17
R-squared	0.79		0.81		0.81	
Adjusted R-squared	0.72		0.74		0.73	
Controlling for country fixed effects (times duration)	yes		yes		yes	
Number of obs. (countries)	134(21)		134(21)		134(21)	

Notes: see Table 3. For a definition of all variables, see Table 2.

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[9] We do not discuss the effects from *ΔOTHERu*. As we have mentioned before, this variable is so small, that it is not really important economically.

In expansionary episodes, all policy effects have the expected sign, and are highly significant. Note also (and again) that these policy effects are larger than during consolidations. Again this may support the hypothesis that domestic output responds much less to policy in expansion than in consolidation.

As to the other variables in Table 4, 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.

Table 5 investigates the composition hypothesis in greater detail. It introduces 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 is still decomposed in its two major categories (and *OTHERu*) as in Table 4. 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 Table 5 confirms that permanent improvements of the *CAPBu*, realized either by expenditure cuts or by tax increases, do have favourable effects on future debt dynamics. The effects from permanent expenditure cuts are again stronger. During the consolidation period, however, it is difficult to observe strong effects, at least at first inspection. At the revenue side in column (6), raising direct taxes on business (*$\Delta TAXB$*) or households (*$\Delta TAXH$*) seems to contribute immediately to a reduction of the debt ratio, but both effects are only marginally significant. For indirect taxes (*$\Delta INTAX$*), we observe the opposite, but here the effect is even less significant. Moreover, some of these results are not very stable, as one can see in columns (7) and (7'). At the expenditure side, column (6) suggests that spending cuts may only contribute to a reduction of the debt ratio during the consolidation period when they affect social security benefits (*$\Delta SOCEXP$*). But, again, this is not a robust result in other columns. For all other expenditure subcategories, we observe the opposite, although none of these effects is statistically significant. The estimated negative effects on *$\Delta WAGE$* and *$\Delta NONWAGE$* in column (6) raise doubts about the composition hypothesis. If anything, these results suggest that cutting government consumption during consolidation may rather push up the debt ratio, at least during the consolidation period. The estimated negative effect on *ΔINV* is more in line with the composition hypothesis.

Columns (7) and (7') investigate the effect of public wage and non-wage consumption changes (*$\Delta WAGE$*, *$\Delta NONWAGE$*) in greater detail. They bring a much more nuanced picture. In these columns we control for the level of public sector efficiency in administration (*PSEadm*)[10]. We come back to this result in Section 4.2.2., but our main finding is that cutting the public sector wage bill will contribute directly and strongly to debt reduction 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 (7') a clear positive coefficient on *$\Delta WAGE$*. The lower the level of *PSEadm*, the higher this positive coefficient. When public sector efficiency is high, however, reducing the public sector may not be an effective way to bring down public debt, quite on the contrary. Extending the regression as in column (7') also yields (much) more significant estimates for most of the other expenditure categories. We now observe significant negative coefficients on changes in public investment (*ΔINV*) and changes in nonwage consumption (*$\Delta NONWAGE$*). The latter effect holds at median or lower than median levels of public sector efficiency and median duration of consolidation periods. Finally, we observe a

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[10] The difference between both columns is the included sample. Column (7') 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 *$\Delta WAGE<0$* is not an option.

Table 5. Estimation results – 3 – composition II

Explanatory variables	(6)	se	(7)	se	(7')	se
			ΔGD			
CONSTANT	1.50	2.20	4.51*	2.48	4.81*	2.82
AvgINCu*DURATION	-0.92***	0.22	-0.91***	0.29	-0.88***	0.32
AvgNIEXPu*DURATION	1.13***	0.20	1.13***	0.24	1.10***	0.26
AvgOTHERu*DURATION	0.05	0.59	-0.08	0.80	-0.23	1.14
BURDEN*DURATION	1.27***	0.32	1.19***	0.42	1.11**	0.48
ONEOFF	-2.13**	1.02	-1.82*	1.10	-2.72*	1.37
CRISIS08	14.4***	3.08	18.1***	4.02	15.8***	4.79
CRISIS91sf	12.5	11.4	12.0	11.9	13.8	13.6
Consolidation						
ΔTAXB	-4.72 °	3.04	-4.28	3.35	-3.73	3.75
ΔTAXH	-4.20 °	2.58	0.25	2.93	2.61	3.33
ΔSOC	-0.02	2.35	1.30	2.85	3.42	3.35
ΔINTAX	3.15	2.66	3.03	2.91	2.07	3.54
ΔSOCEXP	3.94*	2.34	0.73	2.55	-1.01	3.06
ΔSUBS	-3.56	4.43	5.60	4.87	10.8 °	6.54
ΔINV	-3.24	3.04	-7.16**	3.57	-11.7**	4.55
ΔWAGE	-3.21	2.97	7.79	6.72	16.5 *	9.04
ΔNONWAGE	-3.77	3.57	-23.0**	9.52	-27.3 *	16.2
ΔOTHERu2	3.02	3.35	4.86	3.71	6.17 °	4.18
PSEadm*DURATION	-		-2.94**	1.34	-4.51***	1.66
PSEadm*DURATION*ΔWAGE	-		-2.21**	0.89	-2.88**	1.14
PSEadm*DURATION*ΔNONWAGE	-		3.81***	1.44	4.27*	2.56
Expansion						
ΔTAXB	-5.50*	3.30	-5.84°	3.64	-5.59	4.08
ΔTAXH	0.36	2.03	0.05	2.27	-1.64	3.06
ΔSOC	1.85	1.92	0.96	2.02	0.77	2.10
ΔINTAX	0.57	3.12	-1.21	3.92	-3.09	4.38
ΔSOCEXP	3.79*	2.02	3.05	2.50	1.76	2.69
ΔSUBS	13.7*	7.69	16.9**	8.18	17.6**	8.55
ΔINV	2.03	4.01	-2.26	5.83	-4.96	6.67
ΔWAGE	3.07	3.18	10.1*	5.64	7.48	6.31
ΔNONWAGE	4.06	3.51	-6.05	5.06	2.85	9.96
ΔOTHERu2	-4.04	4.38	-2.20	5.21	2.11	6.32
PSEadm*DURATION	-		-1.66	1.60	-2.61 °	1.74
PSEadm*DURATION*ΔWAGE	-		-1.01	1.09	-0.36	1.30
PSEadm*DURATION*ΔNONWAGE	-		1.62*	0.86	-0.75	2.34
Neutral [a]						
...						
R-squared	0.87		0.92		0.91	
Adjusted R-squared	0.77		0.82		0.77	
Controlling for country fixed effects (times duration)	yes		yes		yes	
Number of obs. (countries)	134 (21)		118 (19)		107 (17) [b]	

Notes: *** (**) (*)(°) indicates statistical significance at the 1% (5%) (10%) (15%) level.

    (a) The results for the neutral periods are available upon request. In column (6) none of the estimated 'neutral' coefficients are statistically significant at 10% or better.

    (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).

(marginally) significant positive coefficient on changes in subsidies (*ΔSUBS*). As we have mentioned before, the coefficient on changes in social expenditures is now insignificant and negative.

We conclude from Tables 4 and 5 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. A different composition of expenditures may strongly affect the outcome of fiscal adjustment during the consolidation period. Our results argue in favour of cuts in subsidies and (when government efficiency is low or median) 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 emphasizing the role of public sector efficiency, may provide a way out of the existing ambiguity in the literature (see Section 3.2.1.).

International macroeconomic context

Our results in Tables 3-5 also shed light on the possible role of the international macroeconomic context during consolidation (see section 3.2.4.). All in all, our results confirm that low international interest rates and strong growth contribute to bring down the debt ratio during consolidation periods. We derive this conclusion first from the significant positive coefficient on *BURDEN* in all regressions. Moreover, when we decompose *BURDEN*, we also observe significant positive coefficients on *INTEREST*, and negative coefficients on *GROWTH*, at least during consolidation (see column 5 in Table 4). We then find for example for a consolidating country with an initial debt to GDP ratio of 75% that a one percentage point rise (fall) in the international growth rate would bring down (raise) the debt ratio by about 1 percentage point (1.34 x 0.75). Note that countries with higher initial debt ratios are more sensitive to fluctuations in international growth and interest rates. A 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.

In column (5) we also observe negative (positive) effects from international growth rate (interest rate) changes on the debt to GDP ratio during expansion periods, but these effects are much less precisely estimated than during consolidations.

Size and persistence / emergency

Our results in Table 6 test the size and persistence hypothesis and the emergency hypothesis (see Sections 3.2.2. and 3.2.3.). 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 6, columns (8) to (10). In columns (11)-(12') we extend these regressions with emergency variables. Column (13) re-estimates (12') including only those fiscal episodes lasting more than one year. This more limited sample contains all consolidation and expansion episodes, but drops 18 very short neutral episodes. The main messages of our results are the following. First, as to the size hypothesis, column (8) 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 (8) that $\frac{\partial(\Delta GD)}{\partial(\Delta CAPBu)} = -2.56 + 0.28\Delta CAPBu$. The effect is therefore negative (for reasonable values of *ΔCAPBu*), but it becomes weaker the higher *ΔCAPBu*. From columns (10) and (11), however, we can derive that this decreasing returns result is not robust. The estimated coefficient on *ΔCAPBu*ΔCAPBu* is no longer statistically significant. Measuring size by dummies, which are 1 when *ΔCAPBu* exceeds a certain threshold and 0 otherwise, implies the same conclusion (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 our regressions is always positive, implying that $\frac{\partial(\Delta GD)}{\partial(\Delta CAPBu)}$ becomes smaller (in absolute value) the higher *DURATION*. In column (13) this effect is statistically significant at the 10% level. In most other columns its *p*-value varies between 10 and 15%. 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. All in all, the tendency of our results is in favour of sizeable, short programmes.

Columns (11)-(13) in Table 6 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 to 4% per year of consolidation for an initial debt ratio between 60% and 130%. This bonus is estimated to be about 5 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 3.2.3.). Interestingly, however, despite this bonus, our results in columns (12) and (13) also demonstrate that fiscal consolidation at high debt remains a battle that is very difficult to win. Given the positive coefficient on *GDINIT*ΔCAPBu* (conditional on *DUM60*=1), 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 (see Section 3.2.4). 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 6.

Table 6. Estimaton results – 4 – size and persistence / emergency

Explanatory variables	(8)	(9)	(10)	ΔGD (11)	(12)	(12')	(13)
CONSTANT	4.26*	3.43°	4.09*	2.84	2.87	4.38**	6.93**
AvgCAPBu*DURATION	-1.33***	-1.29***	-1.28***	-1.28***	-1.24***	-1.30***	-1.27***
BURDEN*DURATION	1.22***	1.21***	1.23***	1.13***	1.15***	1.13***	1.18***
ONEOFF	-1.32	-1.27	-1.40°	-1.28	-1.47°	-1.26	-1.18
CRISIS08	11.8***	12.4***	12.3***	12.9***	13.6***	12.9***	13.9***
CRISIS91sf	24.2***	23.5***	24.5**	24.8*	25.8**	24.3***	24.7***
Consolidation							
ΔCAPBu	-2.56**	-2.18*	-2.98**	-1.89	-2.14°	-2.38*	-3.11**
ΔCAPBu*ΔCAPBu	0.28*	-	0.20	0.18	-	-	-
DURATION*ΔCAPBu	-	0.44°	0.28	-	0.43°	0.45°	0.58*
(DUM60-DUM130)*DURATION	-	-	-	-2.81	-3.99**	-3.72**	-4.06**
DUM130*DURATION	-	-	-	-5.17°	-6.35**	-6.35**	-7.13***
DUM60*GDINIT*ΔCAPBu	-	-	-	0.02	0.034**	0.031*	0.036**
Expansion							
ΔCAPBu	-1.83	-2.18	-2.10	-0.57	-2.55°	-1.90***	-1.66***
ΔCAPBu*ΔCAPBu	0.04	-	-0.06	0.15	-	-	-
DURATION*ΔCAPBu	-	0.05	-0.00	-	0.23	-	-
(DUM60-DUM130)*DURATION	-	-	-	2.47	2.98	-	-
DUM130*DURATION	-	-	-	-[a]	-[a]	-	-
DUM60* GDINIT*ΔCAPBu	-	-	-	0.02	0.025	-	-
Neutral [b]							
…							
R-squared	0.77	0.77	0.78	0.79	0.80	0.78	0.81
Adjusted R-squared	0.70	0.70	0.70	0.70	0.70	0.70	0.74
Controlling for country fixed effects (times duration)	yes	yes	yes	yes	yes	yes	yes
Number of obs. (countries)	134 (21)	134 (21)	134 (21)	134 (21)	134 (21)	134 (21)	116 (21)
Sample	complete	complete	complete	complete	complete	complete	DURATION>1

Notes: *** (**) (*) (°) indicates statistical significance at the 1% (5%) (10%) (15%) level.
(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.

4.2.2 The role of institutions

We have studied the possible role of institutions for the evolution of the public debt to GDP ratio during consolidation along three dimensions. First, we investigate whether given fiscal policies (in particular, consolidation policies) affect the debt ratio differently depending on *existing institutions*. As an example, one may want to know whether the same consolidation effort has stronger effects on the debt ratio when unions are strong rather than weak, or when labour markets are flexible rather than rigid. 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. Second, we investigate 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 whether consolidation

policies have more or less effect when combined with simultaneous labour market reform, say a reduction of employment protection legislation, or product market liberalization. A third question is whether institutions or institutional change have an influence on the outcome of fiscal consolidation by *affecting fiscal policies*, for example by pushing the composition of consolidation efforts in the right or wrong direction.

Empirically, we test the role of given institutions along the first dimension by adding *INST*DURATION* to the regression equation reported in Table 5, column (6), where *INST* is a single institutional variable in levels. For a definition of all included institutions, we refer to Table 2. We multiply by the length of the fiscal episode (*DURATION*) since the total effect of an institution on the change of the debt ratio in a particular episode may obviously depend on the length of that episode. Each institutional variable is initially added separately. We again allow for different effects in consolidation periods, expansionary periods and neutral periods. The upper left corner of Table 7 shows the estimated coefficients on *INST*DURATION* for consolidation periods, as well as the expected effect on the debt ratio per year of consolidation when the level of the institution concerned is one standard deviation higher[11]. The bottom left corner of the Table shows the results of simultaneous institutional *change*, at least for those variables where policy makers can have an influence (second dimension)[12]. Here we extend the regression reported in Table 5, column (6), by adding *ΔINST*DURATION* to the explanatory variables. Finally, the columns at the right hand side of Table 7 show the effects of institutions or institutional change when we do not control for the characteristics of fiscal policy, i.e. when we do not include revenue or expenditure variables *(AvgNIEXPu, AvgINCu, ONEOFF, ΔTAXB, ΔINTAX, etc.)* in the regression (third dimension). Next to the institutional variable, the regressions underlying these results include only the level of *CAPBu* in the year before the start of the fiscal episode (times duration), *BURDEN* (times duration), the crisis dummies, and country-specific fixed effects (times duration).

Our main findings are as follows. First, the institutional context is of only limited influence when it comes to the effects on the debt ratio of a *given* consolidation programme (first dimension, upper left corner of Table 7). Most variables, in particular those relating to labour market institutions (*EPL*, *BRR1*, *UNION*, *COORD*), product market institutions (*PMR*) and political institutions (*RIGHT*, *FRAG*) show up highly insignificant. Only for *LEFT*, *FRI* and the level of government efficiency (*PSEAdm*, *PSEAvg*) the evidence may be stronger. Given consolidation programmes may have larger negative effects on the debt to GDP ratio if they are adopted by left-wing governments, and embedded in a system of strict fiscal rules. High public sector efficiency would also seem to improve their overall effects.

Extending the estimated regression like we did in columns (7) and (7') of Table 5 reinforces the evidence in favour of the hypothesis that public sector efficiency affects the outcome of given consolidation policies. In column (7') we first observe a significant negative estimated coefficient on *PSEAdm*DURATION* (-4.51) which is stronger than the one reported in Table 7. Moreover, it can be derived from the estimation result in Table 5, column (7'), that $\frac{\partial(\Delta GD)}{\partial(\Delta WAGE)} = 16.5 - 2.88\, PSEAdm * DURATION$. Evaluated at the median duration of 3 years, for example, cutting the government wage bill will bring down the public debt ratio in those countries where *PSEAdm* is below 1.91[13]. When public administration is more efficient, cutting the wage bill may not be an effective way to reduce the public debt ratio. To the

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[11] We compute standard deviations over all countries and years. They are as follows: *EPL* 1.03, *BRR1* 19.8, *BRR45* 13.7, *UNION* 21.5, *COORD* 1.45, *FRI* 1.02, *PMR* 1.45, *FRAG* 0.26, *LEFT* 0.44, *RIGHT* 0.44, *PSEAdm* 0.93, *PSEAvg* 0.50.

[12] As a rule, changes are computed as the level of *INST* at the end of the fiscal episode minus the level in the last one or two years before the episode. Data limitations along the time dimension explain why we have not included *ΔPSE* in the lower part of Table 7.

[13] Note that the median *PSEAdm* over all countries and periods in our dataset is 1.69.

best of our knowledge, this is a new result, which may provide one explanation for the sometimes conflicting evidence on public wage bill cuts as a way to assure successful consolidation (see Section 3.2.1.)[14].

Table 7. Effect of institutions / institutional change on the results of consolidation policy

	Estimated effect of institutions on ΔGD, per year of consolidation (a)		Estimated effect of institutions on ΔGD, after dropping all fiscal policy variables, except initial *CAPBu* (b)	
	estimated coefficient	effect from a one st. dev. change in the institution	estimated coefficient	effect from a one st. dev. change in the institution
EPL	1.41	1.45	1.20	1.24
BRR1 (c, d)	-0.04	-0.79	0.00	0.01
BRR45 (c, d)	-0.14*	-1.92*	-0.08	-1.10
UNION	-0.01	-0.06	0.02	0.43
COOR	-0.73	-1.06	-1.57**	-2.28**
PMR	0.66	0.96	0.53	0.77
FRI (e)	-2.80**	-2.80**	-3.18***	-3.18***
LEFT	-2.57**	-1.13**	-5.40***	-2.38***
RIGHT	1.17	0.51	-0.09	-0.04
FRAG	3.02	0.79	-1.87	-0.49
PSEAdm (f)	-2.07°	-1.86°	-3.60**	-3.24**
PSEAvg (f)	-5.63*	-2.82*	-13.2***	-6.58***
	Estimated effect of institutional *change* on ΔGD, per year of consolidation (a)		Estimated effect of institutional *change* after dropping all composition variables (a)	
	estimated coefficient	effect from a one st. dev. change in the institution	estimated coefficient	effect from a one st. dev. change in the institution
ΔEPL	3.68**	3.81**	3.00°	3.10°
ΔBRR1 (c, d)	0.09	1.78	0.19°	3.76°
ΔBRR45 (c, d)	-0.02	-0.27	0.02	0.27
ΔPMR (d)	2.14*	3.10*	4.73***	6.86***
ΔCOOR	-1.82**	-2.64**	-1.77*	-2.57*
ΔFRI (e)	0.16	0.16	-1.60***	-1.60***

Notes: *** (**) (*) (°) indicates statistical significance at the 1% (5%) (10%) (15%) level.

(a) Each institutional variable (multiplied by *DURATION*) is added separately to the regression result reported in column (6), Table 5. We allow for different effects during consolidation, expansion and neutral periods. In the table here we only report results for consolidation periods. Other results are available upon request.

(b) Each institutional variable (multiplied by *DURATION*) is added separately to a regression explaining ΔGD by means of only initial *CAPBu* (times *DURATION*), *BURDEN* (times *DURATION*), the crisis dummies and country-specific fixed effects (times *DURATION*).

(c) *BRR1* and *BRR45* (both multiplied by *DURATION*) are added together.

(d), (e), (f) based on regressions with only 133 / only 100 / only 118 observations.

For a definition of all institutional variables, see Table 2.

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[14] For a proper interpretation of this result, and its policy implications, it may be interesting to mention that there is no clear relationship between *PSEAdm* and the size of the government wage bill in percent of GDP (*WAGE*). The Nordic countries for example combine the highest *WAGE* with above average efficiency.

Along the second dimension (bottom left corner of Table 7), we find that given consolidation programmes may be more effective when they are combined with labour market deregulation (i.e. $\Delta EPL<0$), product market deregulation (i.e. $\Delta PMR<0$), or with an increase of wage bargaining coordination (i.e. $\Delta COORD>0$). Changes in the unemployment benefit system (i.e. ΔBRR) or a simultaneous strengthening of fiscal rules ($\Delta FRI>0$) does not make given consolidation programmes more effective.

Last but not least, we observe the strongest effects from institutions and institutional reform along the third dimension, i.e. when we do not keep fiscal policy variables constant in the regression. If institutions matter, it is not only by determining the outcome of given policies, but also (and sometimes even more) by affecting policy itself, in good or bad directions. The results at the right hand side of Table 7 confirm the favourable effect of strict and wide fiscal rules, and of overall public sector efficiency, during consolidation episodes. They also confirm the contribution of complementary product market reform. A favourable one standard deviation improvement of these variables may imply a direct and significant reduction of the debt ratio by about 3 (*FRI*), 6.5 (*PSEAvg*) or almost 7 *(ΔPMR*) percentage points per year of consolidation. Labour market institutions or reform matter much less. We find no significant role for the level or change of employment protection legislation and unemployment benefit generosity, nor for the level of union density. We do obtain some evidence, however, that a higher initial level as well as an increase of wage bargaining coordination may help to bring down the debt ratio during consolidation. As to political institutions, we observe that in consolidation periods left-wing governments may be more successful in bringing down debt.

Summarizing, our results confirm most of the literature on the positive effects of fiscal rules (Section 3.2.8). They also shed new light on the conflicting hypotheses regarding the effects of product market deregulation (Section 3.2.6). Our evidence is strongly in favour of the hypothesis that complementary product market reform is important for the success of fiscal consolidation. Product market deregulation seems both to strengthen the positive effects of given consolidation policies (e.g. by simultaneously enhancing competition, overall productivity and growth, as in Wölfl *et al.* (2010)), and to imply better consolidation policies (e.g. by reducing the power of interest groups to block off necessary changes). In contrast to product market characteristics, labour market institutions do not seem to affect the outcome of consolidation initiatives in any clear way. It seems that conflicting forces, as one can observe in the literature (see Tagkalakis, 2009), counteract each other. The only conclusion that one might draw is that consolidation policies are more effective when wage bargaining is highly coordinated. The increased possibility to internalize the long-run advantages of fiscal consolidation may explain this result.

Our evidence on the contribution of public sector efficiency to debt reduction is new. Higher efficiency also seems to operate along both the channel of better consolidation policies, and the channel of better outcomes of given policies. As we have mentioned above, the latter may for example be due to higher credibility and resulting positive effects on private sector behaviour. Another very interesting result is that public sector efficiency determines the possible contribution to debt reduction of public sector wage bill cuts. These may only 'work' in countries where public efficiency is low. Finally, our result on government ideology and the outcome of consolidation may be somewhat surprising considering most of the literature (see Section 3.2.6). We find a better evolution of the government debt ratio during consolidation when government is dominated by left-wing parties. Here, our results match with those of 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. Consolidation is more likely to succeed when it can take place in a context of consensus. An alternative explanation for the success of left-wing governments during consolidation may be that they

pay more attention to safeguarding government investment. When we regress $\Delta INV_{i,T}$ on *LEFT* and *RIGHT* (and country and crisis dummies) and allow different effects in consolidation, expansion and neutral periods, we find a positive effect on *LEFT* during consolidation which is significant at the 10% level.

Table 8 reports the results of a series of additional regressions testing the effect of institutions or institutional reform. We build on the regressions reported at the right hand side of Table 7, but rather than introducing all *INST*DURATION* variables separately, we now include some of the more important ones together. Basically, these additional results confirm the above mentioned effects for *ΔPMR*, *LEFT*, *FRI* and *PSE*. Only in column (6) statistical significance is weaker, but this seems mainly due to the serious drop in the number of countries and observations (and therefore in the cross-country variation in institutions). The labour market variables by contrast lose statistical significance in column (1) already, with *ΔEPL* even experiencing a change of sign. Also *ΔFRI* becomes insignificant. Having tight fiscal rules (*FRI*) may contribute to successful consolidation. A further tightening of the rules during the consolidation process, however, may be less effective. In some final regressions, we further extended the set of institutions by re-introducing other labour market variables (*EPL*, *UNION*, *BRR*, *ΔBRR*). Again, these were never significant.

Table 8. Effect of institutions when introduced simultaneously

	Estimated effect of institutional variables on *ΔGD*, per year of consolidation, when included together and after dropping all fiscal policy variables except initial *CAPBu* (b)					
	estimated coefficients (1)	estimated coefficients (2)	estimated coefficients (3)	estimated coefficients (4)	estimated coefficients (5)	estimated coefficients (6)
ΔPMR	3.76***	3.96***	2.50**	2.11*	2.54*	2.28
LEFT	-3.63***	-2.49**	-1.50	-2.26°	-3.23**	-1.71
ΔCOOR	-1.07	-	-	-	-	-
ΔEPL	-1.83	-	-	-	-	-1.41
PSEAdm	-	-3.11**	-	-	-	-3.88*
PSEAvg	-	-	-10.0***	-	-	-
FRI	-	-	-	-1.77**	-	-1.43°
ΔFRI	-	-	-	-	-0.37	-
Numb. of Obs. (countries)	133 (21)	117 (19)	117 (19)	100 (16)	100 (16)	85 (14)

Notes: *** (**) (*) (°) indicates statistical significance at the 1% (5%) (10%) (15%) level.
        (b) see Table 7.

5. 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 three decades. In this paper we focus on 21 OECD countries in 1980-2008. We define 134 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 seven 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 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 evolution of 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 administration is low. According to our results, downsizing an efficient public sector will not 'work'. Social benefit cuts may not have much effect during the consolidation period, but only matter in the longer run. Finally, 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 Alesina and Perotti's composition hypothesis, except when it comes to the effect of changes in government consumption and the government wage bill. (iv) As to other aspects of policy design, we find that larger adjustment programmes will have more effect on the ratio of debt to GDP. Within the group of large programmes, our results prefer sizeable adjustment programmes of short duration above moderate programmes of long duration.

(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, 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 deregulation. Clearly, this does not imply that the labour market situation itself is unimportant. Following Ohanian *et al.* (2008) and Berger and Heylen (2011), progress in the area of employment may however depend more on the level and structure of taxes and government expenditures than on labour market institutions. 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. A final result 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. An alternative 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 (1980-2008) according to the traditional approach using the *CAPB*, the IMF action-based narrative approach, and the *CAPB$_u$* approach that we use in this paper

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

Country/year	$\Delta CAPB$	narrative approach IMF (2010a)	$\Delta CAPBu$	Would we change our conclusion on the stance of policy (consolidation/ neutral/ expansion) if we used the IMF data instead of our $\Delta CAPBu$ 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 $\Delta CAPB_u$ are much closer to the action-based indicator from the IMF than the data obtained from considering $\Delta CAPB$. The only exception is Finland 1992. In this case the difference between $\Delta CAPB_u$ and $\Delta CAPB$ 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, Equation (3b) for these two years is:

$$GD_{i,t+1} - GD_{i,t} = \alpha_i + \beta_1 CAPBu_{i,t} + \beta_2(CAPBu_{i,t+1} - CAPBu_{i,t}) + \beta_3 BURDEN_{i,t+1} + \beta_5 ONEOFF_{i,t+1} + \upsilon_{i,t+1}$$

$$GD_{i,t} - GD_{i,t-1} = \alpha_i + \beta_1 CAPBu_{i,t-1} + \beta_2(CAPBu_{i,t} - CAPBu_{i,t-1}) + \beta_3 BURDEN_{i,t} + \beta_5 ONEOFF_{i,t} + \upsilon_{i,t}$$

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

$$BURDEN_{i,t} = X_t.GD_{i,t-1}, \quad \text{with: } X_t = \frac{(INTEREST_t/100 - GROWTH_t/100)}{(1 + GROWTH_t/100)}$$

Summing both equations then implies:

$$GD_{i,t+1} - GD_{i,t-1} = 2\alpha_i + \beta_1(CAPBu_{i,t} + CAPBu_{i,t-1}) + \beta_2(CAPBu_{i,t+1} - CAPBu_{i,t-1})$$
$$+ \beta_3(X_{t+1}GD_{i,t} + X_t GD_{i,t-1}) + \beta_5(ONEOFF_{i,t+1} + ONEOFF_{i,t}) + \upsilon_{i,t+1} + \upsilon_{i,t}$$

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):

$$\Delta GD_{i,T} = 2\alpha_i + 2\beta_1(AvgCAPBu_{i,T}) + \beta_2 \Delta CAPBu_{i,T} + 2\beta_3 AvgX_T.GD_{i,t-1}$$
$$+ \beta_5 ONEOFF_{i,T} + \upsilon_{i,T}$$

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

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. 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). We downloaded OECD data in January 2011. For the political variables we use the DPI version of December 2010. The fiscal rule index has been taken from the European Commission. Details are described below.

Fiscal Policy

Gross government debt in percent of GDP (GD):
Source: OECD, Statistical Compendium, Economic Outlook, N° 88 (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.

Cyclically adjusted *underlying* government primary balance in percent of potential GDP (CAPBu)
Source: OECD, Statistical Compendium, Economic Outlook, N° 88 (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, Statistical Compendium, Economic Outlook, N° 88 (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

Cyclically adjusted *underlying* government revenues in percent of potential GDP (INCu)
Source: OECD, Statistical Compendium, Economic Outlook, N° 88 (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.

Cyclically adjusted *underlying* government non-interest expenditures in percent of potential GDP (NIEXPu).
Source: OECD, Statistical Compendium, Economic Outlook, N° 88 (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 indirect taxes in percent of potential GDP (INTAX)
Source: OECD, Statistical Compendium, Economic Outlook, N° 88 (series TINDA and GDPTR). Data for the Czech republic are available since 1999 only and for Hungary and Poland since 1995.

Cyclically adjusted taxes on business in percent of potential GDP (TAXB)
Source: OECD, Statistical Compendium, Economic Outlook, N° 88 (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 direct taxes on households in percent of potential GDP (TAXH)
Source: OECD, Statistical Compendium, Economic Outlook, N° 88 (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 (SOC)
Source: OECD, Statistical Compendium, Economic Outlook, N° 88 (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, Statistical Compendium, Economic Outlook, N° 88 (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, Statistical Compendium, Economic Outlook, N° 88 (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, Statistical Compendium, Economic Outlook, N° 88 (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, Statistical Compendium, Economic Outlook, N° 88 (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.

International macroeconomic context

International nominal short term interest rate in percent (INTEREST)
Definition: see our note to Table 2.
Source: OECD, Statistical Compendium, Economic Outlook, N° 88 (series IRS)

International nomial GDP growth rate in percent (GROWTH)
Definition: see our note to Table 2.
Source: OECD, Statistical Compendium, Economic Outlook, N° 88 (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.

Gross benefit replacement rate (BRR1, BRR45)
Definition: gross unemployment benefit replacement rate across two income situations (100% and 67% of APW earnings) and three family situations (single, with dependent spouse, with spouse in work). BRR1 is the replacement rate during the first year of unemployment, BRR45 the replacement rate during the fourth and fifth years of unemployment.
Source: OECD, Benefits and Wages Database.

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 (COORD)
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, P., D. De Rosa, G. Nicoletti, and F. Steiner (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.

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.

Party orientation with respect to economic Policy (LEFT/ RIGHT)

Definition: Right: for parties that are defined as conservative, Christian democratic, or right-wing. Left: for parties that are defined as communist, socialist, social democratic, or left-wing.

Source: Database political institutions, 2010 (series EXECRLC)

Government fragmentation (FRAG)

Definition: Probability that two randomly selected government members belong to different parties.

Source: Database political institutions, 2010 (series GOVFRAC)

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.

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