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Fiscal consolidation: What factors determine the success of consolidation efforts?

by
Margit Molnar*

The global economic and financial crisis exacerbated the need for fiscal consolidation in many OECD countries. Drawing lessons from past episodes of fiscal consolidation, this study investigates the economic environments, political settings and policy measures conducive to fiscal consolidation and debt stabilisation using probit, duration, truncated regression and bivariate Heckman selection methods. The empirical analysis builds on the earlier literature and extends it to include new aspects that may be of importance for consolidating governments. The empirical analysis confirms previous findings that the presence of fiscal rules – expenditure or budget balance rules – is associated with a greater probability of stabilising debt. Crucial in determining the causal link behind the association, the results also reveal an independent role for such rules over and above the impact of preferences for fiscal prudence. Also, while the analysis confirms that spending-driven adjustments vis-à-vis revenue-driven ones are more likely to stabilise debt, it also reveals that large consolidations need multiple instruments for consolidation to succeed. Sub-national governments, in particular state-level governments can contribute to the success of central government consolidation, if they co-operate. To ensure that state-level governments do co-operate, having the right regulatory framework with the extension of fiscal rules to sub-central government levels is important.

JEL classification: E62; H2; H5; H6; H7

Keywords: Fiscal consolidation; taxation; government spending; fiscal rules; fiscal federalism

* Margit Molnar (Margit.Molnar@oecd.org). At the time of writing the author was a member of the Economics Department of the OECD. This is a background paper for the OECD's project on Fiscal Consolidation (see Sutherland et al., 2012 for the main paper). The author is indebted to the participants of the Working Party meeting, Jürgen von Hagen, Eckhard Wurzel, Hansjörg Blöchliger, Peter Höller and Douglas Sutherland for useful comments and suggestions and to Susan Gascard for excellent editorial support.

In the aftermath of the economic and financial crisis many OECD countries face substantial fiscal consolidation needs. In this context, taking stock of past consolidation episodes can provide insights into what policy and institutional measures were most conducive to successful consolidations. A *consolidation episode* is a period of fiscal adjustment, whose start and end are defined by thresholds in terms of the size of the change in the underlying cyclically-adjusted primary balance. The period between the start and the end is the *length* of the episode expressed in years and the cumulated improvement in the underlying cyclically-adjusted primary balance during the consolidation episode is the *size* of the consolidation, expressed as a share of potential GDP. The *intensity*, in turn, is the average improvement in the underlying cyclically-adjusted primary balance (as a ratio of potential GDP) in a unit time period, which is a year. The intensity of a consolidation episode is obtained by dividing its size by its length. The success of consolidation is defined here as debt stabilisation one, two and three years after the end of the consolidation episode.

The analysis of past consolidation episodes between 1960-2009 builds on and extends earlier OECD work by Ahrend *et al.* (2006) and Guichard *et al.* (2007). It uses probit, duration, truncated regression and bivariate Heckman selection methods to investigate consolidations, highlighting the different ingredients that affect how much consolidation is undertaken and whether it is successful in terms of stabilising debt. The estimations consider five aspects of fiscal consolidations:

- What conditions make governments start fiscal adjustments?
- What determines how long adjustments last?
- What determines the size of adjustments?
- What determines the intensity (the annual average consolidation over the consolidation episode) of the adjustment?
- What makes fiscal retrenchments successful in the sense of stabilising the debt/GDP ratio?

The study, while building on earlier literature, attempts to obtain robust results using a wide sample of definitions and measures of consolidation and its success. Also, it explores most aspects of consolidations seen in the literature and investigates the impact of a large set of conditions including domestic and external economic and political settings, monetary and exchange rate environments and fiscal institutions. The main findings, summarised in Table 1, are the following:

- Fiscal rules are, in general, associated with fiscal consolidation episodes that are successful in stabilising debt, though there is no evidence that they influence the size or the intensity of consolidation. Budget balance rules appear to lengthen the duration of consolidations.
- The composition of consolidation measures seems to be related to its success. Expenditure based consolidations appear to be more effective in stabilising debt. However,

the specific consolidation measures that lead to success seem to differ by the type of consolidation (i.e. small or large, gradual or “cold turkey”) and by the horizon of debt stabilisation (i.e. debt stabilises one, two or three years after the consolidation episode ends). Very large consolidations tend to be achieved by multiple instruments, including both revenue and spending items.

- Strong growth appears to matter for stabilising debt, though less for the size or intensity of consolidations. Low growth rates may lead to protracted consolidation episodes.
- Declining interest rates seem to increase the probability of success and the duration of consolidation, though have no robust impact on the start, size or intensity of the consolidation.
- The political setting also appears to matter for the success of consolidation: non-centrist governments are less likely to stabilise debt than those closer to the centre. The orientation of government does not seem to affect the duration of consolidation. In some specifications, strong governments further from the centre tend to engage in smaller and less intensive consolidation.
- Newly-elected governments seem to be more likely to start a fiscal adjustment programme and have a positive effect on duration.
- Consolidations by state-level governments tend to increase the probability of success of central government retrenchment efforts, but this is not the case for consolidations at the local government level (not reported in Table 1).

The rest of this study is structured as follows: Section 1 summarises the main findings from the empirical literature. This is followed by a short discussion of the methods used, the main definitions of consolidation episodes and data used in the analyses (Section 2). Section 3 presents detailed results for the econometric analysis of different aspects of consolidation and, finally, Section 4 concludes by discussing the implications of the findings for fiscal consolidation.

1. A review of the literature

The literature on fiscal consolidation episodes has identified major determinants of the likelihood of starting fiscal consolidation and its success, as well as several other attributes. The major questions of interest addressed by the fiscal consolidation episode literature are i) in which circumstances are fiscal adjustments likely to start and ii) in which circumstances are they successful. For the start of consolidations, initial conditions including the macroeconomic environment and political economy settings appear to be decisive. For the likelihood of success, a broader set of conditions have been tested. Not surprisingly, given that the channels through which policy effects come through may differ across episodes, the literature is inconclusive on some of the policies. A large part of the literature focuses on the composition of consolidation, primarily whether it should be based on expenditure cuts or revenue increases. While there seems to be consensus on the larger role for expenditure cuts, the results are less homogenous at the more disaggregated level. Tackling politically-sensitive budgetary items, however, seems to be a crucial ingredient of successful consolidations. Fewer studies deal with the role of the policy mix or structural and institutional conditions in determining the success of consolidation. Moreover, the applicability of past consolidation experiences may be limited as policymakers now face additional challenges such as repairing banking sectors and coping with weak global demand. The present consolidation may also be distinct owing to its

Table 1. Summary of the empirical results

Policy variables	Start	Duration	Size	Intensity	Success
Fiscal rules					
Expenditure rule					+++
Budget balance rule					+++
Expenditure and balanced budget rule					+++
Strength of fiscal rules (for the EU)					+++
Composition of consolidation					
Spending cut versus revenue increase share			+++
Housing and community amenities spending cut share		+++++		..
Social protection spending cut share			+.+.+		
Economic environment variables					
GDP growth			+....	+....	+++
Exchange rate (lagged change)	------	..-.	+..
Interest rate (lagged change)		++	---
Interest rate differential (lagged change)+				
Implicit interest on government debt (lagged change)		-----			
Inflation (lagged)-	-----	.+.	++.+	---
Length of consolidation			+++++		
OECD30 budget balance/GDP (lagged change)	+++++				
Initial debt ratio-++	
Initial underlying primary budget balance	-----	------	...-	
Change in the debt ratio (lagged)+	
ERM					
EU 1992-1998		-	+...-	
EU 1999-2009			
Political setting variables					
Elections (lagged)	.+++.	+++++	.-...	
Strong left-leaning government	...--.	..-.	---
Strong right-leaning government--	...-	..-

Notes: The direction of significant effects is indicated by plus and minus signs, a non-significant effect by a dot.

In the columns for the start, duration, size and intensity of consolidation, the results for five thresholds are indicated in the following order: i) very small: continuous improvement in the budget balance (i.e. the episode lasts as long as the budget balance improves), ii) medium-sized: 1 percentage point fall in the budget balance/GDP ratio in a single year or in two years, with at a minimum a 0.5 percentage point fall in the first year, iii) large 1: 1.5 percentage points fall in the budget balance/GDP ratio in a single year or in two years with at a minimum a 1.25 percentage points in each, iv) large 2: 1.5 percentage points fall in the budget balance/GDP ratio in a single year or in three years with less than a 0.5 percentage point deterioration in any year and v) very large: 2 percentage points fall in the budget balance in a single year or in two years with a minimum of 1.5 percentage points in each.

In the column for success, the signs are indicated for three different definitions of success in the following order: i) debt stabilises one year; ii) two years; and iii) three years after the consolidation episode ends. The fiscal rule variables in the success equations are entered sequentially.

The methods used are: probit for the start and survival analysis for the duration of the consolidation, truncated regression for the analysis of the size and intensity of the consolidation and the bivariate Heckman selection model for the success of a consolidation in stabilising debt.

required size and how widespread consolidation needs are. These features may imply the need for a broader set of policy tools to achieve consolidation.

Fiscal consolidation is more likely to be launched when fiscal conditions are weak and the domestic economy is doing well relative to other economies (Table 2). Weak public finance conditions are found to be an important trigger of consolidation (Barrios *et al.*, 2010; Guichard *et al.*, 2007; European Commission, 2007; Von Hagen and Strauch, 2001). In contrast to the intuition that fiscal actions only take place when the authorities are forced by circumstances to embark on a consolidation path, von Hagen and Strauch (2001) and the European Commission (2007) found that positive output gaps increase the probability of

Table 2. A literature review of what determines the start of fiscal consolidation

Dependent variable: Start of a consolidation episode (binary)	Guichard et al. (2007)	EC (2007)	von Hagen and Strauch (2001)	Ahrend et al. (2006)	Barrios et al. (2010) probit	Barrios et al. (2010) Heckman 2-step
Initial budget balance (CAPB)	–	–				
Debt-to-GDP ratio			+		+	–
Increasing debt ratio		+				
Need for adjustment (difference between current CAB& the one needed to bring the debt ratio to zero over 30 years)				+		
Output gap		+	+	0		
Weak international environment			–			
Tight monetary conditions in the previous year (index)			–			
Increase in OECD structural government balance			+			
Fiscal rules		0				
Effective budgetary procedures		+				
Exchange rate depreciation				+		
Elections	+	0				
Size of majority in parliament		0				
Long-term interest rates (domestic-foreign reference)	+					
Pension reform (Rodolfo de Benedetti Foundation), dummy		0				
Employment protection legislation dummy		0				
Unemployment benefits dummy		+				
Labour market reform dummy		+				
Product market reform dummy		0				
Number of countries	24	27	20 (OECD)	24	35	35
Time period	1978-2005	1970-2006	1960-1998	1980-2005	1970-2008	1970-2009
Number of episodes	85	146	65	83	235	235
Method used	Probit	Probit	Probit	Probit	Probit	Heckman 2-step

Note: The negative and positive signs mean negative and positive effect, respectively, while a zero means no significant effect was found.

launching a retrenchment.¹ Von Hagen and Strauch (2001) also found a negative impact for the international environment, which, combined with the positive coefficient on domestic cyclical conditions, implies that governments are more likely to undertake consolidation efforts when the domestic economy is doing well relative to other economies. Von Hagen and Strauch (2001) also found evidence of peer pressure: an increase in the OECD structural government balance has a strong positive effect on the likelihood to start a consolidation

The duration of fiscal consolidations is affected by the composition of the adjustment, initial conditions and consolidation fatigue. Von Hagen *et al.* (2002) found that when output was below potential but improving, a tightening fiscal stance in other countries and an increasing contribution by spending, in particular transfers and wage expenditures, to the total consolidation increase the likelihood that the consolidation episode will continue. Guichard *et al.* (2007) and Ahrend *et al.* (2006) confirmed the importance of a negative output gap to continuing an adjustment programme. On the other hand, Tsibouris *et al.* (2006) found no significant effect. Von Hagen *et al.* (2002) also found evidence of consolidation fatigue by showing that the longer an episode lasts, *ceteris paribus*, the greater the likelihood that the adjustment process will be reversed. This finding was confirmed by Guichard *et al.* (2007) and Ahrend *et al.* (2006).

In general, gradual consolidations tend to be more successful than a cold shower adjustment, but at high and sharply rising debt levels and in a low-growth environment a cold shower may be more effective (Barrios *et al.*, 2010; European Commission, 2007). A gradual retrenchment, however, is not successful in the case of consolidations following sharp debt increases. Moreover, Barrios *et al.* (2010) found that monetary and economic conditions may be playing a role in determining the consolidation strategy. Cold showers may be the right choice if initial debt levels and interest rates are high and GDP growth low, while the opposite conditions would suggest proceeding gradually.

Boltho and Glyn (2006) highlight the differences in consolidation efforts in the 1980s and 1990s: while in the 1980s, inflation and balance-of-payment problems constituted the greatest threat following the oil shocks, in the 1990s, long-term debt sustainability became the major concern. In addition, the run up to the EMU provided an impetus to consolidation efforts. Among the few studies looking at the impact of financial crises on the start or the probability of success of fiscal consolidations, Barrios *et al.* (2010) found that the fall-out from the crises may hinder the necessary retrenchment. Undertaking consolidation once the financial crisis is resolved and choosing a cold shower strategy increases the chance to succeed. This may be related to the use of public funds that the repair of the financial sector often necessitates and as long as the cost of bailouts is unclear, fiscal consolidation programmes may not be credible.

The impact of high debt levels on the probability of successful consolidation hinges upon model specifications. For example, Barrios *et al.* (2010) using two different approaches find either a positive or negative net impact of debt.

Monetary conditions including exchange rate and interest rate movements also have a bearing on fiscal consolidation, though the literature exploring this is scant and inconclusive. Exchange rate depreciation may support the consolidation process by leading to competitiveness gains and export-led growth. This channel is more likely to work for small open economies. The experience of OECD countries shows, however, that depreciation does not necessarily help consolidations succeed. Several studies find no significant impact (Alesina and Perotti, 1997, Guichard *et al.*, 2007 and Barrios *et al.*, 2010) or a significant albeit small positive impact (Lambertini and Tavares, 2005). Lambertini and Tavares (2005) observed that exchange rate depreciation, which boosted competitiveness, often preceded fiscal consolidation episodes in OECD countries over 1970-99. A fall in relative unit labour costs before and during successful consolidations boosted competitiveness (Alesina and Perotti, 1997). While nominal depreciation was observed in both successful and unsuccessful consolidation episodes, it was only in the case of successful ones where nominal depreciations had an impact on competitiveness. This may be related to the composition of fiscal adjustments, in particular the greater weight given to cuts in government wages and employment in successful consolidations, thereby inducing wage moderation. Ahrend *et al.* (2006) found that monetary policy easing at the initial stage of fiscal consolidation contributes to offset the contractionary impact of fiscal consolidation. Von Hagen and Strauch (2001) found that monetary easing may entice governments to start fiscal adjustments, but this does not necessarily lead to successful adjustments.

The composition of fiscal consolidation matters for the probability of success of consolidations: retrenchments based on expenditure cuts are found to be more effective (Alesina and Ardagna, 1998, 2009; von Hagen *et al.*, 2002; Guichard *et al.*, 2007; Barrios *et al.*,

2010). A possible explanation for the higher effectiveness of spending cuts versus tax increases is that the former are often coupled with reforms that enhance the effectiveness of budgetary procedures (European Commission, 2007). Von Hagen and Strauch (2001) examined the probability of a consolidation to be expenditure based and found that a small output gap, both domestically and internationally, a tight fiscal stance in other countries and a high debt-to-GDP ratio increase the probability of a consolidation episode to be expenditure based. Revenue-based consolidations can also be effective, if there is room to increase the revenue-to-GDP ratio, in particular if the revenue types that are less harmful for growth (such as user fees, environmental taxes, property taxes and value-added taxes) are under-exploited (Tsibouris *et al.*, 2006). Surprisingly, Alesina and Perotti (1995) found that the small share of successful adjustments due to increases in tax revenues comes almost exclusively from corporate income taxes and not indirect taxes.

Past empirical work typically finds that cutting current government spending is more conducive to successful consolidation (Alesina and Ardagna; 2009). Guichard *et al.* (2007) found that social spending and transfers are areas where spending cuts should be focused to achieve a successful consolidation. Alesina and Perotti (1995 and 1997) found that fiscal adjustments should focus on cuts in welfare spending and government wages, if they are to be successful. However, European Commission (2007) found, that in the 1990s, the positive impact of cutting primary expenditure on the likelihood of success became weaker. This could be due to past consolidations harvesting the “low hanging fruits”. Interestingly, if the analysis focuses on the European Union (27 members), spending on social protection, health and education continue to increase during consolidation periods, while the bulk of the cuts are done in economic affairs (which comprise subsidies, gross fixed capital formation, capital transfers and intermediate consumption) and housing and community amenities (European Commission, 2007).²

The literature is not conclusive on which types of fiscal rules and institutions affect consolidation programmes. Guichard *et al.* (2007) found a beneficial effect from a combination of expenditure and budget balance rules. The European Commission (2007), on the contrary, found no significant impact of expenditure rules in the European Union, though this study did not verify the combined effect with budget balance rules. However, effective budgetary procedures appear to increase the probability of success (European Commission, 2007). Barrios *et al.* (2010) did not find a significant impact of budget deficit rules on the likelihood of successful consolidation.

Successful consolidations may be accompanied by changes in the distribution of income. Alesina and Perotti (1997) and Alesina and Ardagna (1998) observed that during successful consolidations, the profit share often increases. Alesina and Ardagna (1998) showed that the profit share increases not only during but also in the aftermath of consolidations. Mulas-Granados (2005) found that fiscal consolidations are associated with higher income inequality, though less so for revenue-based adjustments than for expenditure-based ones.

Few studies find convincing evidence on how political factors affect consolidation. Alesina and Perotti (1995) found that coalition governments are mostly unsuccessful in attaining lasting adjustment. The same authors also found that left- and right-wing governments are equally likely to carry out successful adjustments, while centrist governments are less likely to do so. Guichard *et al.* (2007) showed that consolidations are more likely to start after elections in OECD member countries, while the European

Commission (2007) did not find a significant effect for the EU countries over a similar time period. Alesina and Perotti (1995) did not find a significant impact of the closeness of elections on either the likelihood of strong adjustments or their success.

2. Empirical approach, definitions and data

Most of the literature applies similar estimation techniques to identify the major determinants of success or failure and various attributes of fiscal consolidations. The main estimation tools include probit, duration models and OLS, and more rarely the Heckman probit two-step estimator. Estimates of the determinants of the start and success of consolidations may be biased if not controlling for the correlation between the decision to consolidate and the likelihood to achieve a successful consolidation (Barrios *et al.*, 2010). In contrast to this standard set (or some subsets of it) of estimation methods applied in the literature to investigate past consolidation episodes, there is considerable variation across the measures of fiscal consolidation, the definitions of the start of consolidation, the size of consolidation and of what constitutes a successful consolidation (Table 3).

Earlier studies such as Alesina and Perotti (1995, 1996) and Alesina and Ardagna (1998) defined a fiscal consolidation episode using the so-called Blanchard index, which calculates a cyclically-adjusted budget balance assuming an unchanged unemployment rate with respect to the previous year. In more recent studies the cyclically-adjusted primary balance is used (Tsibouris *et al.*, 2006). The major shortcoming of the cyclically-adjusted primary balance is that it can also reflect one-offs and accounting distortions (Koen and van den Noord, 2005), revenue fluctuations due to asset prices (Girouard and Price, 2004) and growth surprises (Larch and Salto, 2005). To address these issues, past analyses have typically only used large changes. There is, however, a trade-off in setting thresholds high as it can exclude longer periods of moderate adjustment. To overcome many of these issues, in the analyses below, the cyclically-adjusted underlying primary balance is used. This measure, in addition to correcting for fluctuations in business cycles, also takes into account one-offs. Different definitions of the budget balance were used in the analysis (such as the cyclically-adjusted underlying primary balance, the cyclically-adjusted primary balance, the unadjusted primary balance, adjusted fiscal balance and the unadjusted fiscal balance), though only results for the cyclically-adjusted underlying primary balance are reported in the paper. The results obtained when using the cyclically-adjusted primary balance were similar.

The definition of a consolidation episode is crucial as different thresholds and budget data may lead to different findings. Accordingly, to obtain robust results, five thresholds are used. These thresholds cover several types of consolidation episodes from very small ones defined as any improvement in the budget balance that may occur over a number of years to very large ones of at least 2 percentage points of GDP in a given year. The thresholds applied for consolidation episodes are: i) very small: continuous improvement in the budget balance (*i.e.* the episode lasts as long as the budget balance improves), ii) medium-sized: 1 percentage point fall in the budget balance/GDP ratio in a single year or in two years, with at a minimum a 0.5 percentage point in the first year, iii) large 1: 1.5 percentage point fall in the budget balance/GDP ratio in a single year or in two years with at a minimum a 1.25 percentage point in each, iv) large 2: 1.5 percentage point fall in the budget balance/GDP ratio in a single year or in three years with less than a 0.5 percentage point deterioration in any year and v) very large: 2 percentage point fall in the budget balance in a single year or in two years with a minimum of 1.5 percentage

Table 3. Definitions used to define features of fiscal consolidations

	Start of consolidation		Continuation	Stop	Success
	Definition 1	Definition 2			
Ahrend et al., 2006	At least 1 percentage point of potential GDP in one year	At least 1 percentage point of potential GDP in two years with at least 0.5 percentage point in the first year	Cyclically-adjusted primary balance improves (can decline 0.3 percentage point in a year if in the following year it increases by more than 0.5 percentage point)	Cyclically-adjusted primary balance stops increasing or improves by less than 0.2 percentage point of GDP in one year and then deteriorates	
Alesina and Perotti, 1995	Blanchard fiscal impulse is between – 1.5 and – 0.5% of GDP	Blanchard fiscal impulse is less than 1.5% of GDP			Three years after the debt/GDP ratio is 5 percentage points lower
Alesina and Ardagna, 2009	At least 1.5 percentage points of GDP in one year				Cumulative debt/GDP improvement is greater than 4.5 percentage points
Alesina and Perotti, 1997	At least 1.5 percentage points of GDP in one year	At least 1.5 percentage points of GDP in 2 years with each more than 1.25 percentage points			
Ardagna, 2009	At least 2 percentage points of potential GDP in one year	At least 2 percentage points of potential GDP in two years with each more than 1.5 percentage points			
Barrios et al., 2010	At least 1.5 percentage points of potential GDP in one year	At least 1.5 percentage points of potential GDP in three years, with no annual deterioration larger than 0.5 percentage point			
EC, 2007	At least a 1.5 percentage points of GDP in one year	At least 1.5 percentage points of potential GDP in three years, with no annual deterioration larger than 0.5 percentage point			Three years after the cyclically-adjusted primary balance does not deteriorate by more than 0.75% of GDP in cumulative terms
Guichard et al., 2007	At least 1 percentage point of potential GDP in one year	At least 1 percentage point of potential GDP in two years with each more than 0.5 percentage points	Cyclically-adjusted primary balance improves (can decline 0.3 percentage point in a year if the following year it increases by more than 0.5 percentage point)	Cyclically-adjusted primary balance stops increasing or improves by less than 0.2 percentage point of GDP in one year and then deteriorates	
Tsibouris et al., 2006	Uninterrupted improvement in the primary budget balance			Primary balance deteriorates or debt ratio increases	
von Hagen et al., 2002				Cyclically-adjusted primary balance deteriorates	
von Hagen and Strauch, 2001	Cyclically-adjusted balance at least 1.25 percentage points of potential GDP in 2 years	Cyclically-adjusted balance at least 1.5 percentage points of potential GDP and positive in the preceding and following year			Two years after the government balance is at least 75% of the balance in the first year

points in each. Different thresholds imply different numbers of consolidation episodes and different durations (Table 4).

In the following empirical work several definitions of consolidation have been used. The choice is not always innocuous. To highlight this, the main characteristics of past consolidations using two different approaches to defining the episodes (annual tightening of the underlying primary balance by at least 1.5% of GDP or a gradual but continual tightening of the underlying primary balance over several years) are:

- *Size*: The overall amount of tightening on average does not differ significantly between the two definitions, being around 3% of GDP in both cases. The largest consolidations for episodes based on the annual tightening are almost 9% of GDP whereas they approach 11% of GDP for episodes based on sustained tightening.
- *Pace*: In consolidations greater than 1.5% of GDP tightening of the underlying primary balance in a given year, the average tightening is 2.3% of GDP (reaching over 4% in Hungary in 2007 and Sweden in 1996). If the consolidation is defined as a sustained tightening of the underlying primary balance, the average pace of tightening is slower at just under 1% of GDP annually.
- *Length*: when the consolidation is defined as the underlying primary balance tightening of more than 1.5% of GDP in a single year, the consolidation typically lasts a single year, though around one-third of episodes maintain that pace into a second year. When the consolidation episode is defined as a sustained tightening, the average length is almost four years with the longest reaching 14 years (Greece between 1985 and 1999, when excluding the small reversal in 1995).
- *Composition*: The composition of changes in underlying spending and revenues suggests that revenues contributed more than spending on average to consolidations based on the tightening in a given year (almost 2% of GDP for revenue increases relative to almost 1% of GDP for spending). For sustained consolidations, the contribution is more balanced, with a slightly greater contribution from spending (-2% of GDP) than revenue (1.5% of GDP).
- *Outcome for debt*: For both definitions of consolidation, the level of debt on average changes by a modest amount during the consolidation (rising by around 2% of GDP). However, the ranges are substantial, varying from a reduction of GDP by 12% to an increase of GDP by over 24% for consolidations based on the tightening in a given year. For consolidations based on the sustained tightening definition the variation is even more pronounced, ranging from a reduction of GDP by 25% to an increase of GDP by 40%.

There is a wide variation in the definition of the success of fiscal consolidation, which can be related to its impact on deficits, debt or growth performance. The European Commission (2007) uses a cyclically-adjusted primary balance based criterion, Guichard *et al.* (2007) classify a consolidation episode as successful, if its size is large enough to stabilise the debt-to-GDP ratio. Barrios *et al.* (2010) use the public debt level as a measure of success: a fiscal consolidation is considered as successful if it brings debt down by at least 5 percentage points of GDP in the three years following the episode. In this study, three definitions for the success of consolidation are used: debt stabilises i) the year after, ii) two years after and iii) three years after the episode ends.

The analyses used an unbalanced panel data set of 28 OECD member countries³ over 1960-2009. Most macroeconomic and fiscal variables were obtained from the OECD *Economic Outlook Database*. The left-hand side variables are the various conditions of consolidation episodes (their start, length, size and intensity) defined above using the cyclically-adjusted

Table 4. **The number and length of consolidation episodes defined by the five thresholds**

	(1) Very small consolidation threshold		(2) Medium-sized consolidation threshold		(3) Large and sharp consolidation threshold		(4) Large and long consolidation threshold		(5) Very large consolidation threshold	
	No. of episodes	No. of episode years	No. of episodes	No. of episode years	No. of episodes	No. of episode years	No. of episodes	No. of episode years	No. of episodes	No. of episode years
Australia	5	15	4	8	1	1	2	7	1	1
Austria	9	11	5	6	3	4	3	5	3	4
Belgium	6	16	4	8	3	5	3	10	2	4
Canada	6	14	3	8	3	6	4	9	2	3
Czech Republic	4	7	4	6	2	3	2	4	2	3
Denmark	5	13	4	8	2	5	3	6	3	4
Finland	6	13	8	8	6	6	4	10	4	4
France	6	14	2	2			2	4		
Germany	3	11	2	3			2	3		
Great Britain	5	14	3	7	2	4	2	6	1	1
Greece	5	15	5	12	4	8	7	10	4	4
Hungary	3	7	2	4	1	3	1	3	1	3
Iceland	8	16	5	10	2	2	4	7	2	2
Ireland	7	18	4	10	2	4	4	8	2	3
Italy	8	15	5	10	3	4	5	9	2	2
Japan	6	15	3	5	1	1	2	7		
Korea	6	16	2	2	1	1	3	3		
Luxembourg	3	10	3	6	2	3	2	6	2	3
Netherlands	9	14	6	9	3	3	6	10	2	2
New Zealand	5	10	3	5	3	3	3	4		
Norway	6	13	4	9	3	5	3	7	3	4
Poland	4	5								
Portugal	8	11	5	8	4	6	4	8	3	4
Slovak Republic	3	8	3	4	2	3	2	6	1	1
Spain	5	16	5	7	1	1	2	6	1	1
Sweden	6	19	6	10	5	6	4	10	1	2
Switzerland	3	11	4	6	1	1	3	5		
United States	6	15	4	10			3	7		
Total	156	362	108	191	60	88	85	180	42	55

Notes: Thresholds applied for consolidation episodes: i) very small: continuous improvement in the budget balance (i.e. the episode lasts as long as the budget balance improves), ii) medium-sized: 1 percentage point fall in the budget balance/GDP ratio in a single year or in two years, with at a minimum a 0.5 percentage point in the first year, iii) large 1: 1.5 percentage points fall in the budget balance/GDP ratio in a single year or in two years with at a minimum a 1.25 percentage points in each, iv) large 2: 1.5 percentage points fall in the budget balance/GDP ratio in a single year or in three years with less than a 0.5 percentage point deterioration in any year and v) very large: 2 percentage points fall in the budget balance in a single year or in two years with a minimum of 1.5 percentage points in each. Budget balance measure: underlying cyclically-adjusted primary balance.

underlying primary balance (and four alternative measures of budget balance, not reported in this paper) except in the case of analyses examining the conditions of success, which is defined as debt stabilisation, hence it uses the debt ratio. For explanatory variables, data from various aspects of the conditions surrounding fiscal adjustments were used: i) to reflect the fiscal background, the debt-to-GDP ratio, the size of the budget balance, the change in the debt ratio; ii) to capture external conditions, the OECD budget balance; iii) to explore the monetary environment around consolidations, the nominal effective exchange rate, the change in the inflation rate, the change in long-term interest rates, the interest rate differential, a dummy variable saying whether the country is in the Exchange Rate Mechanism (ERM), a euro area dummy capturing whether the country is member of the euro zone, a dummy for euro-area

countries between 1992-98 and a separate one for 1999-2009; iv) to test the importance of political economy settings, the election year dummy, the strength of left-leaning and right-leaning governments; v) to capture the overall economic setting, the GDP growth rate, and vi) to investigate the impact of the composition of consolidation, over 20 revenue and expenditure items were used from the *Government Finance Statistics Database* of the IMF. The budget balance and debt variables are scaled by GDP. As fiscal consolidation itself affects many of the economic environment factors that are included in the analysis, such variables were entered with a lag to reduce the simultaneity problem.

Long-term interest rate differentials are measured relative to German rates for European countries and relative to US rates for other countries. The United States and Germany, as well as Japan and the United Kingdom, are excluded from the sample for the calculation of average responses. Long-term interest rate differentials are a better proxy for the perceived sustainability of fiscal policies than absolute interest rate levels, which also reflect cyclical and other influences on global bond markets.

In the analyses two variables capturing the political orientation and the stability of government are used as in Égert (2010): the strength of right-leaning and left-leaning governments. The value is higher the further left or right the government's political stance (i.e. very left wing or very conservative) of the political spectrum and the stronger its political standing is (the strongest is a single party majority government).

The analysis also considers the role of fiscal rules in consolidations. The impact of the two relatively widely-used fiscal rules, the expenditure rule and budget balance rule is examined. Dummy variables indicate whether i) expenditure rules, ii) budget balance rules or iii) the combination of expenditure and budget balance rules⁴ are in place and iv) an indicator capturing the strength of fiscal rules,⁵ which is only available for the EU countries, is tested.

The sub-national analyses used budget balance data for state-level and local governments obtained from the *OECD National Accounts Database*. The budget balance data were adjusted for cyclical fluctuations applying the Hodrick-Prescott filter.

The inclusion of the above variables in the various regressions was based on earlier literature but with the purpose of having a more comprehensive picture of the different aspects of consolidations. As a result, the number of variables in general tends to be larger than in most of the earlier literature. Variables that had not been applied in earlier literature were introduced in all analyses. These include the strength variables of government orientation, which, intuitively, may have a bearing not only on the start but also on the different attributes and the outcome of a consolidation episode.

3. Empirical results

3.1. The start of consolidations

The first question of interest when exploring the conditions of fiscal consolidations is what triggers them. Intuitively, responsible governments would turn favourable global and/or domestic economic conditions into an opportunity to embark on a consolidation path supported by these conditions to make the process less painful. Alternatively, governments may have no choice but to wait for such conditions owing to, for instance, credibility effects or their commitment to prudent fiscal conduct. Newly-elected governments may also be more willing to undertake reforms to prove to voters that they made the right choice. In addition, there needs to be political unity and a decisive stance on consolidation within the government to start this painful set of reforms.

To examine the determinants of the start of consolidation episodes, more specifically of the probability of the start, probit analysis was used (Table 5). In the table, the results for the

Table 5. **Determinants of the start of fiscal consolidation**

Type of consolidation (see note to the table)	Probit estimation				
	(1) Very small consolidation threshold	(2) Medium-sized consolidation threshold	(3) Large and sharp consolidation threshold	(4) Large and long consolidation threshold	(5) Very large consolidation threshold
Left-hand side variable: binary variable indicating the start of a consolidation					
Explanatory variables					
Debt/GDP (lagged)	0.00	0.00	0.00	0.00	0.00
Budget balance/GDP (lagged)	-0.03***	-0.02***	-0.01***	-0.02***	-0.01***
Change in the debt ratio (lagged)	0.00	0.00	0.00	0.00	0.00
Change in OECD30 budget balance/GDP (lagged)	0.04**	0.08***	0.04**	0.08***	0.02*
Change in nominal effective exchange rate (lagged)	-0.34	-0.07	-0.13	-0.17	0.04
Change in inflation (lagged)	-0.94	-0.34	-0.51	-0.30	-0.53*
Interest rate differential (lagged)	0.00	0.00	0.01	0.00	0.01**
Election year (lagged)	0.05	0.09***	0.04*	0.04*	0.01
Strong left-leaning government	-0.02**	-0.01	-0.01	-0.01	-0.00*
Strong right-leaning government	-0.01	-0.01**	-0.01***	-0.01**	-0.01***
Number of observations	553	553	553	553	553

Notes: Budget balance measure: underlying cyclically-adjusted primary balance. Thresholds applied for consolidation episodes: i) very small: continuous improvement in the budget balance (i.e. the episode lasts as long as the budget balance improves), ii) medium-sized: 1 percentage point fall in the budget balance/GDP ratio in a single year or in two years, with at a minimum a 0.5 percentage point in the first year, iii) large 1: 1.5 percentage points fall in the budget balance/GDP ratio in a single year or in two years with at a minimum a 1.25 percentage points in each, iv) large 2: 1.5 percentage points fall in the budget balance/GDP ratio in a single year or in three years with less than a 0.5 percentage point deterioration in any year and v) very large: 2 percentage points fall in the budget balance in a single year or in two years with a minimum of 1.5 percentage points in each.

Significance levels: * significant at 10%; ** significant at 5%; *** significant at 1%.

Reported coefficients are the marginal effects (i.e. the change in probability of the left-hand side variable if the explanatory variable increases by one unit).

underlying adjusted primary balance are indicated, but replacing this with the adjusted primary balance did not change the results. The reported coefficients are the marginal effects (i.e. the change in probability of the left-hand side variable if the explanatory variable increases by one unit). The main findings concerning the **start** of a consolidation are:

- An important driver to start a consolidation is a country's need to consolidate, which is captured by the initial size of budget deficits. Initial debt levels and increases in debt do not appear to provide incentives to consolidate.
- Monetary conditions can help trigger the start of a consolidation. High interest rate differentials before the consolidation episode appear to matter for the start of very large consolidations.⁶ This is not surprising as large interest differential may, *inter alia*, be a signal of the need to consolidate. However, a depreciating exchange rate does not appear to matter.
- Fiscal consolidation in other countries appears to have an impact on adjustment programmes, indicating a kind of peer pressure.
- Political economy factors can also influence the start of a consolidation. Newly-elected governments are more likely to launch adjustment programmes. Governments that are far from the centre and stronger are less likely to undertake a consolidation programme (this aspect is captured by the variables interacting with the location of the government in the political spectrum on either side, respectively, with the variable reflecting the political standing of the government).

3.2. The duration of consolidations

Once consolidation started, the next concern is how long it will last, how big and how intense it will be or in other words whether it will be a “cold shower”, bringing about large reductions in the budget deficit in a relatively short time or a more gradual process. The length of consolidation episodes is intuitively influenced by economic conditions during consolidation, both external and domestic, but political economy considerations may also play a role. For instance, reform fatigue may reduce incentives to produce quick results in the consolidation process or new governments may be for or against consolidation depending on their political agenda. More importantly, countries lacking credibility or in times of reduced global risk appetite may need to produce quick and visible results to regain confidence of international investors.

To investigate the shape of consolidation episodes, in particular their length, duration analysis was applied. To estimate what determines the length of consolidation episodes, parametric methods were used that assume a continuous parametric distribution for the probability of failure, in this case the stopping of consolidation, over time. The shape of this probability of experiencing the failure event at time t conditional on having survived to this time (called hazard rate) needs to be decided to estimate the model. Theory can provide little guidance as the shape of time dependency is conditional on the covariates in the model.⁷ The variation in terms of duration of episodes in the dataset suggests that the exponential parametric model is unlikely to be the right choice. Also, there is no reason to assume that the conditional probability of experiencing the event of stopping the episode is monotonic. Therefore, model selection methods were applied to determine the type of distribution. The generalised gamma model was estimated, which is flexible with two shape parameters and nests the exponential, the Weibull and the log-normal model as special cases. Wald tests were then used to test the values of the shape parameters that resulted in rejecting the exponential and Weibull models while the log-normal distribution could not be rejected. Estimation results assuming log-logistic distribution appeared similar and the Akaike-information criterion (AIC) also suggested the same choice. The estimated model is therefore the log-normal with the survival function of:

$$S(t) = 1 - \Phi\left\{\frac{\ln(t) - \mu}{\delta}\right\}$$

where $S(t)$ denotes the survival function, t is time, Φ is the standard normal cumulative distribution function, δ is a shape parameter and $\mu = X\beta$, where X is the set of explanatory variables. All covariates are time-varying and lagged to reduce the simultaneity problem.

The accelerated failure time specification was used for the model, as the duration model with a log-normal distribution can only be interpreted in this format. Actually, the interpretation of the results is straightforward in this specification as the sign of the coefficient indicates how a covariate affects the logged survival times.⁸ Thus, a positive coefficient increases the logged survival time and hence the expected duration of the consolidation episode. By the same token, a negative coefficient decreases the logged survival time and hence the expected duration of an episode. The budget balance measure used for the analyses is the underlying adjusted primary balance, but the use of the adjusted primary balance leads to similar results. The main findings concerning the **duration** of a consolidation are (Table 6):

- A major determinant of the length of a consolidation appears to be the size of the budget deficit.

- Monetary conditions can have an effect on the duration of a consolidation. A depreciating exchange rate provides a favourable environment for competitiveness gains and lengthens the duration of the consolidation episode. Falling inflation, similarly, tends to increase the duration of the episode. A decrease in the implicit interest paid on debt also appears to lengthen the episode. Replacing this variable by long-term interest rates (not reported) leads to the same result.
- Newly-elected governments tend to continue consolidations. The orientation of the government does not seem to matter for the length of the episode.
- The composition of fiscal consolidation does not appear to have a bearing on its length. This holds for over 20 spending and revenue items examined at both the aggregate and disaggregated level. These findings are not reported in the table.
- The duration of a consolidation episode appears to be largely uninfluenced by the level of debt.
- Adding fiscal rules (sequentially) results in insignificant coefficients on the exchange rate and interest rate variables, while showing no significant effect for fiscal rules either (not reported). This could be due to the interaction between fiscal rules and macroeconomic variables that may work through the disciplining effect of fiscal rules or may be related to an omitted variable reflecting the government's commitment to prudent macroeconomic policies.

Table 6. **Determinants of the length of fiscal consolidation**

Survival data analysis

Explanatory variables	Type of consolidation (see note to the table)				
	(1) Very small consolidation threshold	(2) Medium-sized consolidation threshold	(3) Large and sharp consolidation threshold	(4) Large and long consolidation threshold	(5) Very large consolidation threshold
Left-hand side variable: survival time (logged)					
Debt/GDP (lagged)	0.00	0.00	0.00	-0.00*	0.00
Budget balance/GDP (lagged)	-0.02***	-0.04***	-0.04***	-0.04***	-0.04***
Change in implicit interest on government debt	-0.09***	-0.11***	-0.11**	-0.13***	-0.12**
Change in inflation	-4.10***	-4.79***	-5.64***	-4.38***	-5.63***
Change in exchange rate, NEER, lagged	-0.52*	-0.81**	-1.09**	-0.93**	-0.32
Election year dummy, lagged	0.11***	0.10**	0.25***	0.15***	0.21**
Strong left-leaning government	0.01	0.00	0.00	0.00	0.00
Strong right-leaning government	0.00	0.00	0.00	0.00	0.02
Constant	8.68***	9.83***	11.15***	9.55***	10.42***
Observations	572	572	572	572	572

Notes: Budget balance measure: underlying cyclically-adjusted primary balance. Thresholds applied for consolidation episodes: i) very small: continuous improvement in the budget balance (i.e. the episode lasts as long as the budget balance improves), ii) medium-sized: 1 percentage point fall in the budget balance/GDP ratio in a single year or in two years, with at a minimum a 0.5 percentage point in the first year, iii) large 1: 1.5 percentage points fall in the budget balance/GDP ratio in a single year or in two years with at a minimum a 1.25 percentage points in each, iv) large 2: 1.5 percentage points fall in the budget balance/GDP ratio in a single year or in three years with less than a 0.5 percentage point deterioration in any year and v) very large: 2 percentage points fall in the budget balance in a single year or in two years with a minimum of 1.5 percentage points in each.

Significance level: * significant at 10%; ** significant at 5%; *** significant at 1%.

The log-normal distribution was assumed for the parametrisation of the conditional probability of experiencing a failure at time t conditional on surviving until time t , as both the AIC model-selection criterion and the nested Wald-test supported the log-normal (and log-logistic) forms versus the often used Weibull, Gompertz or exponential distributions. As the log-normal distribution assumes an accelerated failure time form, the interpretation of the coefficients is straightforward: a unit increase in the explanatory variable is associated with an increase equivalent to the size of the respective coefficient in the logged survival time.

3.3. The size of consolidations

Another important attribute relating to the shape of fiscal consolidations is their size. Governments in need of producing quick results to regain credibility are likely to aim at larger squeezes. Institutional commitments may also act as a force to increase the size of the adjustment. In some cases, however, the consolidation need may be too large to produce fast results and thus may need longer time. The size of consolidation is the cumulated improvement in the underlying cyclically-adjusted primary balance during the consolidation episode, expressed as a share of potential GDP.

The determinants of the size of consolidations were investigated using the truncated regression model, as the size, by definition, is truncated. While changes in the underlying cyclically-adjusted primary balance may take negative values, consolidation is defined as an improvement in that balance; hence the lower part of the distribution of the size variable (which is the dependent variable) is truncated. Defining consolidation by the least restrictive threshold, *i.e.* any improvement in the underlying cyclically-adjusted primary balance, implies that consolidation is related to self selection. In the case of the other four thresholds, however, the choice of those thresholds introduces additional bias. The underlying cyclically-adjusted primary budget balance was used, but adjusted primary budget balance measures lead to similar results. The main findings concerning the **size** of a consolidation are (Table 7):

- The length of the consolidation episode appears to be a major determinant of its size, perhaps reflecting that it takes longer to achieve larger consolidations.
- Countries in the ERM tended to undertake larger consolidations compared with other countries.
- How the consolidation is achieved appears to matter for the size of the consolidation. Cuts focused on social protection and housing and community amenities spending seem to boost the size of consolidations.⁹ The robustness of these findings could not be fully checked, however, owing to small sample size for some specifications. A larger share of spending cuts relative to tax increases does not appear to affect the size of the consolidation (not reported).¹⁰
- There is weak evidence that newly-elected governments pursue less consolidation and that left-leaning governments pursue smaller consolidations.
- Monetary conditions do not seem to play an important role in determining the size of a consolidation. Exchange-rate depreciation boosts the size of only very large consolidations, while interest rates and inflation do not seem to matter much.
- The size of the deficit and the debt burden do not seem to be particularly important in determining the size of the consolidation.
- Fiscal rules do not appear to affect the size of consolidation (not reported).

Another potential issue that may arise in the estimation of the determinants of the size of consolidations is selection bias. Selection bias may stem from the possibility that the conditions that make governments decide to consolidate also influence the size of consolidation. To correct for such potential selection bias, the Heckman selection model was also applied and the results broadly correspond to those of the truncated regression model (not reported).

Table 7. **Determinants of the size of fiscal consolidation**

Truncated regression model

Explanatory variables	Type of consolidation (see note to the table)				
	(1) Very small consolidation threshold	(2) Medium-sized consolidation threshold	(3) Large and sharp consolidation threshold	(4) Large and long consolidation threshold	(5) Very large consolidation threshold
Left-hand side variable: cumulated size of consolidation during the episode					
Explanatory variables					
Debt level (lagged)	0.00	0.00	0.00	0.00	0.01*
Budget balance (lagged)	-0.09	-0.10	-0.06	-0.12	-0.08*
Debt level (lagged change)	-0.04	0.01	0.02	-0.02	0.06
Length	1.53***	1.77***	2.56***	1.52***	2.24***
GDP growth rate (lagged)	15.05*	2.59	-0.39	5.39	-1.42
Nominal effective exchange rate (lagged change)	0.01	-0.01	-0.04	-0.01	-0.08***
Core CPI (lagged change)	0.32	0.37**	0.05	0.50*	0.17
Long-term interest rate (lagged change)	-0.28	-0.06	0.03	-0.10	0.06**
Elections in previous year	-0.93	-0.85**	-0.10	-0.44	0.29
ERM	0.67	1.03**	0.13	2.24***	0.34
Euro area 1992-98 dummy	1.04	-0.50	0.05	-1.26	-1.12***
Euro area 1999-2009 dummy	-0.64	-0.07	0.37	-0.62	0.15
Strong left-leaning government	-0.04	0.01	-0.15***	0.04	-0.09**
Strong right-leaning government	-0.06	-0.02	-0.07**	-0.08	-0.04
Constant	-18.63**	-3.69	0.28	-6.76	1.46
Observations	115	80	44	61	27

Notes: Budget balance measure: underlying cyclically-adjusted primary balance. Thresholds applied for consolidation episodes: i) very small: continuous improvement in the budget balance (i.e. the episode lasts as long as the budget balance improves), ii) medium-sized: 1 percentage point fall in the budget balance/GDP ratio in a single year or in two years, with at a minimum a 0.5 percentage point in the first year, iii) large 1: 1.5 percentage points fall in the budget balance/GDP ratio in a single year or in two years with at a minimum a 1.25 percentage points in each, iv) large 2: 1.5 percentage points fall in the budget balance/GDP ratio in a single year or in three years with less than a 0.5 percentage point deterioration in any year and v) very large: 2 percentage points fall in the budget balance in a single year or in two years with a minimum of 1.5 percentage points in each. The size of consolidation is the cumulated improvement in the underlying cyclically-adjusted primary balance during the consolidation episode, expressed as a share of potential GDP.

Significance level: * significant at 10%; ** significant at 5%; *** significant at 1%.

3.4. The intensity of consolidations

Determined jointly by the duration and the size of consolidation, intensity is the third attribute often used to characterise the shape of consolidation episodes. Intensity of a consolidation episode is defined as the annual average size of the reduction of the underlying cyclically-adjusted budget balance. The intensity of a retrenchment defines whether it is a “cold shower”, achieving large improvements in the budget balance in a short time or a gradual process phasing in expenditure cuts and revenue increases over a longer time span.

The determinants of the intensity of consolidations were investigated using the truncated regression model, as the intensity, by definition, is truncated. As intensity is defined as the ratio of the size to the length of the consolidation episode and given that the lower part of the distribution of the size variable is truncated, as discussed above, the same applies for the intensity variable. The underlying cyclically-adjusted primary budget balance was used, but

adjusted primary budget balance measures led to similar results. The determinants of the **intensity** (annual average consolidation over the episode) of consolidation episodes are very similar to those of their size. The main findings are (Table 8):

- The intensity of large, but not smaller consolidation episodes appears to depend on the size of the deficit in the previous year. The debt burden or an increase in debt levels only appears to matter for very large consolidations.
- Economic growth appears to be only relevant for the intensity of very small consolidations.
- Inflation seems to have a positive effect on the intensity of the consolidation episode. This may be because governments may have a certain consolidation target and, notwithstanding the reduction of the debt ratio in the short term as a result of the pick-up in inflation, inflation makes it easier to control expenditures that are set in nominal terms, and hence to reach such targets, they had better intensify their consolidation efforts. Exchange rate depreciation and rising long-term interest rates are associated with more intense, very large consolidations.
- Elections do not seem to matter for the intensity of consolidations. There is some evidence suggesting that both left- and right-leaning governments undertake less intense consolidations, though this is found for only a few consolidation thresholds.
- Fiscal rules do not seem to matter for the intensity of fiscal consolidation (not reported).

Table 8. **Determinants of the intensity of fiscal consolidation**

Truncated regression model

Explanatory variables	Type of consolidation (see note to the table)				
	(1) Very small consolidation threshold	(2) Medium-sized consolidation threshold	(3) Large and sharp consolidation threshold	(4) Large and long consolidation threshold	(5) Very large consolidation threshold
Left-hand side variable: intensity (annual average size of consolidation measures)					
Explanatory variables					
Debt/GDP (lagged)	0.00	0.00	0.00	0.00	0.01**
Budget balance/GDP (lagged)	-0.04	-0.05	-0.03	-0.08**	-0.05*
Change in the debt ratio (lagged)	-0.03	0.01	-0.01	0.00	0.07***
Growth rate (lagged)	6.34*	0.93	-1.00	3.72	-1.86
Change in exchange rate, NEER, lagged	0.01	-0.01	-0.03*	-0.01	-0.06***
Inflation (lagged change)	0.20*	0.23***	0.04	0.20**	0.35**
Long-term interest rates (lagged change)	-0.11	-0.02	0.00	-0.01	0.05**
Election year dummy (lagged)	-0.40	-0.22	0.04	-0.26	0.19
ERM	0.07	0.24	0.02	0.73***	0.36
euro_9298	0.96**	0.01	0.17	-0.32	-0.91***
euro_9909	-0.16	0.02	0.37	-0.25	0.06
Strong left-leaning government	0.00	-0.01	-0.07**	-0.01	-0.07***
Strong right-leaning government	-0.02	-0.02	-0.03	-0.05**	-0.03
Constant	-6.05	0.35	3.35	-2.46	4.05*
Observations	115	80	44	61	27

Notes: Budget balance measure: underlying cyclically-adjusted primary balance. Thresholds applied for consolidation episodes: i) very small: continuous improvement in the budget balance (i.e. the episode lasts as long as the budget balance improves), ii) medium-sized: 1 percentage point fall in the budget balance/GDP ratio in a single year or in two years, with at a minimum a 0.5 percentage point in the first year, iii) large 1: 1.5 percentage points fall in the budget balance/GDP ratio in a single year or in two years with at a minimum a 1.25 percentage points in each, iv) large 2: 1.5 percentage points fall in the budget balance/GDP ratio in a single year or in three years with less than a 0.5 percentage point deterioration in any year and v) very large: 2 percentage points fall in the budget balance in a single year or in two years with a minimum of 1.5 percentage points in each.

Significance level: * significant at 10%; ** significant at 5%; *** significant at 1%.

Another potential issue that may arise in the estimation of the determinants of the intensity of consolidations is selection bias. Selection bias may stem from the possibility that the conditions that make governments decide to consolidate also influence the intensity of consolidation. To correct for such potential selection bias, the Heckman selection model was also applied and the results broadly correspond to those of the truncated regression model (not reported).

3.5. The success of consolidations

The major issue of interest when investigating the various attributes and conditions of consolidations is what makes them successful. As discussed in a previous section, success is defined in different ways in the literature, but its objective should be to stabilise and ultimately to reduce debt. It is not sufficient to embark on a fiscal adjustment programme, but the circumstances surrounding the carrying out of the programme such as the global and the domestic economic environment as well as the domestic political climate and institutional setting may determine the outcome of the efforts.

The determinants of the success of a consolidation were examined using the Heckman bivariate selection model, which corrects for the selection bias stemming from the fact that the conditions that make governments decide to consolidate also influence the outcome of consolidation. This method was applied in Barrios *et al.* (2010) that also examines the factors determining the success of fiscal consolidations. To account for episodes of different durations, the probit model was also applied. The definition of success is debt stabilisation following the consolidation episode, with a couple of thresholds for the number of years after which debt stabilises following a consolidation. The major findings concerning the probability of **success** in stabilising debt are (Table 9):

- Economic growth appears to help debt stabilisation. This may come partly through the denominator effect.
- An easing of monetary conditions captured by the change in the long-term interest rate seems to increase the probability for a consolidation to stabilise debt. Moderating inflation similarly appears to increase the probability of success of a consolidation. This is somewhat surprising as inflation normally reduces the real debt burden. A possible explanation is that once consolidation has started, rising inflation may increase incentives to consolidate as it becomes easier to control expenditures that are set in nominal terms. This bodes well with the finding that moderating inflation also increases the intensity of consolidation. Alternatively, moderating inflation may represent positive confidence effects that increase the probability of stabilising debt. A depreciating exchange rate may help as well, but the evidence is not strong.
- The further governments are away from the centre, the less likely they seem to stabilise debt. This finding is more robust for strong left-leaning governments than strong right-leaning ones.
- Fiscal rules appear to be associated with successful consolidations, regardless whether an expenditure rule, a budget balance rule or a combination of the two is in place. In addition, stronger rules seem to be more effective.
- Fiscal adjustment programmes during or immediately following banking crises¹¹ appear to be less likely to result in stabilising debt (not reported).

Table 9. **Determinants of the success of fiscal consolidation**

Bivariate Heckman selection model

Explanatory variables	Debt stabilises at t + 1			Fiscal rules index	Debt stabilises at t + 2			Fiscal rules index	Debt stabilises at t + 3			Fiscal rules index
	Expenditure rules	Balanced budget rules	Expenditure and balanced budget rules		Expenditure rules	Balanced budget rules	Expenditure and balanced budget rules		Expenditure rules	Balanced budget rules	Expenditure and balanced budget rules	
Left-hand side variable: binary variable indicating the success of a consolidation												
Growth rate	12.07***	12.87***	12.01***	17.73***	8.1***	8.85***	8.28***	14.44***	7.21***	8.33***	7.47***	15.71***
Long-term interest rate (change)	-0.10**	-0.09**	-0.10**	-0.13*	-0.18***	-0.17***	-0.18***	-0.39***	-0.23***	-0.22***	-0.23***	-0.56***
NEER depreciation dummy	0.21*	0.22*	0.19	0.56***	0.14	0.16	0.13	0.25	-0.06	-0.07	-0.10	0.01
Inflation (change)	-0.29***	-0.25***	-0.28***	-0.42***	-0.28***	-0.26***	-0.28***	-0.47***	-0.24***	-0.22***	-0.24***	-0.38***
Strong left-leaning government	-0.04*	-0.06***	-0.04*	-0.06*	-0.08***	-0.10***	-0.08***	-0.14***	-0.07***	-0.08***	-0.06***	-0.21***
Strong right-leaning government	-0.03*	-0.02	-0.02	0.02	-0.04**	-0.03*	-0.03**	0.00	-0.05***	-0.04***	-0.04***	-0.05
Expenditure rules dummy	0.44***				0.32**				0.42***			
Balanced budget rules dummy		0.59***				0.50***				0.60***		
Expenditure and balanced budget rules dummy			0.55***				0.51***				0.67***	
Fiscal rules index for the EU countries				0.16*				0.32***				0.51***
Constant	-12.36***	-13.51***	-12.33***	-17.87***	-8.05***	-9.12***	-8.27***	-14.10***	-7.21***	-8.65***	-7.49***	-15.46***
Observations	542	542	542	282	545	545	545	293	548	548	548	304

Notes: Budget balance measure: underlying cyclically-adjusted primary balance. t denotes the last year of the consolidation episode.

Significance levels: * significant at 10%; ** significant at 5%; *** significant at 1%.

Reported coefficients are the marginal effects (i.e. the change in probability of the left-hand side variable if the explanatory variable increases by one unit). The coefficients of the selection equation variables are not shown in the table but tests confirmed the selection bias in most cases.

- Consolidations based on spending cuts are more likely to stabilise debt. In some results, debt is stabilised a year after the consolidation episode is over, but soars again two or three years after the end of consolidation. This suggests that such stabilisations may have been only temporarily successful, i.e. unable to reverse the debt accumulation process effectively. Very large consolidations only stabilise debt temporarily if they are spending driven. A reduction in social security spending and government wages likewise only stabilises debt temporarily if the consolidation is large (not reported).

Although the direction of causality between fiscal discipline and fiscal rules is difficult to establish in a cross-country analysis, findings in the literature based on Canadian, Swiss and US data tend to support a role for fiscal rules in underpinning prudent fiscal behaviour even when voters' preferences (based on observed preferences from micro-level data) are taken into account.¹² Assessing whether fiscal rules themselves contribute to fiscal consolidation creates difficulties. Empirical work often finds that the presence of fiscal rules increases the probability of stabilising debt. However, the causality of the relationship is often not assessed. For example, the finding may reflect underlying government or population attitudes towards indebtedness, which leads governments concerned about debt stabilisation (and reduction) to adopt fiscal rules as part of their fiscal consolidation programmes. In cross-country studies, assessing governments' attitudes to fiscal restraint presents considerable difficulties as comparable measures of preferences are missing.¹³

So-called regression discontinuity design (RDD) offers one way to identify whether the fiscal rules as distinct from underlying preferences affect fiscal outcomes. The hypothesis was that if fiscal rules have a distinct effect on the outcome of consolidation, then such an effect will be statistically significant even after controlling for all time- and country-specific aspects – which should *inter alia* capture voters' preferences – that potentially influence the outcomes. RDD – by controlling for country-specific trends – can pinpoint whether the introduction of a fiscal rule has an impact over and above the impact of unchanged or smoother changes in preferences for fiscal probity.¹⁴ As in addition to year and country dummies, the country-specific trends together with their second and third order terms can be assumed to capture country- and time-specific variation in the sample, no other variables capturing the consolidation environment were introduced except fiscal rules, which were the major point of interest. Four model specifications were applied: a model i) with only year and country dummies, ii) with also country-specific time trends, iii) with country-specific time trends and their second-order terms in addition to the year and country dummies and iv) year and country dummies and country-specific time trends and their second and third-order terms. All four specifications were applied to three right-hand side variables: debt stabilising i) one ii) two and iii) three years after the consolidation episode, resulting in twelve models to estimate. Then the two fiscal rules (expenditure and balanced budget rules) doubled the number of estimations to total 24. The results in all the 24 model specifications support the independent role of spending or budget balance rules in explaining debt stabilisation, after controlling for the other potential country- and time-specific influences. That is the coefficient on the fiscal rule variable was significant after controlling for the time- and country-specific circumstances in all 24 cases, albeit in four cases only at the 10% threshold of significance.¹⁵

3.6. The impact of sub-central fiscal behaviour on central consolidation

Central governments that tend to assume a large share in the burden of fiscal consolidation may need to count on the support of sub-central governments. Although in

some cases sub-central fiscal behaviour is kept under control by fiscal rules, central governments may be forced to cover deficits and assume debt created by sub-central levels of government, which may frustrate efforts to consolidate.

For the analysis, fiscal balances were cyclically adjusted using the Hodrick-Prescott filter and their impact on the start, size, length and success of central government consolidation efforts was examined. In order to assure comparability, consolidation was defined as an improvement in the cyclically-adjusted central government and social security budget balance (using only cyclically-adjusted central government balances does not alter the results). In this section therefore, the notion of the central government refers to the combined central government and social security system accounts.

For most consolidation aspects, the actions of sub-central levels of government do not appear to make much difference. The start of fiscal consolidation, defined as any improvement in the budget balance does not seem to be influenced by sub-central fiscal behaviour.¹⁶ Sub-central government behaviour does not appear to affect the length, size and intensity of consolidation episodes consistently.

The contribution of sub-central governments to the success of a consolidation programme initiated by a central government does seem to matter in some cases.¹⁷ Success was defined as stabilisation of government debt one, two and three years following the consolidation episode. Similarly to the earlier analyses of the determinants of the probability of success, the bivariate Heckman selection method was used to correct for the potential selection bias stemming from the fact that circumstances that make a government start consolidation, may also affect the outcome of consolidation. The results for these regressions (Table 10) suggest that consolidations by state-level governments tend to increase the probability of success of central government retrenchment efforts.¹⁸ This finding holds when consolidation is defined as stabilisation of government debt two or three years following the start of the consolidation. Consolidations at the local government level do not appear to have a consistent effect on the success of consolidation.

Table 10. **Sub-central governments and success in stabilising debt**

	Debt stabilises at t + 1	Debt stabilises at t + 2	Debt stabilises at t + 3	Debt stabilises at t + 1	Debt stabilises at t + 2	Debt stabilises at t + 3
Left-hand side variable: binary variable indicating the success of a consolidation						
Explanatory variables						
Growth rate	8.80***	3.80	2.30	7.77***	5.13***	4.65***
Long-term interest rates (change)	-0.14***	-0.20***	-0.13***	-0.06***	-0.09***	-0.11***
NEER depreciation dummy	0.04	0.06	0.07	0.15***	0.1**	0.02
Inflation (change)	-0.11	-0.08**	-0.02	-0.06***	-0.07***	-0.07***
Strong left-leaning government	-0.01	-0.04**	-0.03*	-0.02**	-0.03***	-0.03***
Strong right-leaning government	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01*
State-level government budget balance (change)	0.34	0.71***	0.73***			
Local government budget balance (change)				-0.41**	-0.32*	-0.19
Observations	145	164	183	472	473	474
LR-test of independent equations	7.35***	7.39***	12.75***	4.35**	1.8	1.43

Notes: The budget balance measures are cyclically-adjusted using the Hodrick-Prescott filter.

Significance levels: * significant at 10%; ** significant at 5%; *** significant at 1%.

The regressions use the bivariate Heckman selection model. Reported coefficients are the marginal effects (i.e. the change in probability of the left-hand side variable if the explanatory variable increases by one unit). The coefficients of the selection equation variables are not shown in the table but tests confirmed the selection bias in most cases.

However, some evidence suggests that they reduce the probability of a successful central government consolidation effort. This finding is statistically significant when debt stabilises in the following year, but less so when debt stabilises in subsequent years. In part, the differences in the findings may be due to the differences in the samples with all countries having local governments, but only a sub-set with state-level governments.¹⁹ Alternatively, the finding may either reflect that, given the services local governments typically provide, a sharp tightening may be unsustainable without central government providing additional support or, alternatively, that an overall consolidation effort requiring significant tightening at the local level is more serious and will take longer for debt to stabilise.

4. Conclusions

The analysis of past consolidation episodes suggests that there are certain policies that may be conducive to debt stabilisation. This section provides a brief discussion of the policy measures and economic environment factors as well as the political settings that appear to support debt stabilisation, encourage governments to start to consolidate, boost the size and the intensity of consolidation episodes, and prompt governments to continue the adjustment once started.

Fiscal rules are one of the policy measures found to be associated with a higher probability of stabilising debt. The rationale for fiscal rules is related to the reluctance of governments to commit to fiscal discipline and the room governments have to abandon their announced plans before implementation. To counteract these problems, explicit targets and fiscal rules can play an important role, though they are difficult to design (Box 1). Fiscal rules can constrain government spending, spending of revenue windfalls, the budget balance or debt, or a combination of them. The empirical work in this paper

Box 1. Fiscal rules: Design, implementation and creative accounting issues

Given the multiple targets fiscal policy needs to take into account, optimal fiscal rules can be derived theoretically, but they are too complex to implement. In addition, fiscal rules should allow for some flexibility over the cycle, but too much flexibility may undermine them (Wyplosz, 2008). Striking a balance between stringency and flexibility also involves an additional implementation issue: the exact cyclical position of the economy may be hard to determine, so that it is also difficult to judge at any point in time whether the government is complying with the fiscal rules. Owing to these implementation and design issues, Wyplosz (2005 and 2008) proposed that a fiscal council should serve as a surrogate for a fiscal policy rule. He argues that fiscal councils could be a powerful watchdog. There could be an intermediate way, with a fiscal council monitoring compliance with fiscal rules as well as taking up other functions, such as providing independent forecasts and analysis of and recommendations for fiscal policy.

Fiscal rules may, in some circumstances, encourage creative accounting. This is more likely when complying with the rules results in credibility gains for the government and the risk of being caught is low (for instance, owing to a low level of fiscal transparency) or when the social cost of being caught is low (if, for instance, the electorate is accustomed to creative accounting by the government). Creative accounting is less likely when the social cost of missing fiscal targets is high or when the probability of being discovered is high. A high probability of being discovered fosters genuine fiscal consolidation (Koen and van den Noord, 2005 and Milesi-Ferretti, 2000).

indicates that countries that have either expenditure or budget-balance rules or a combination of the two are more likely to stabilise debt. The causality could also run the other way, as governments that are more committed to debt stabilisation are more likely to adopt fiscal rules. However, an independent role of spending or budget balance rules in explaining debt stabilisation was also found. In addition, more comprehensive fiscal rules – that is the larger part of government activity and the larger number of government levels they cover *inter alia* – are more likely to help stabilise debt. However, in this case, owing to lack of data, the direction of causality could not be established and therefore it can well be the case that governments that commit to debt stabilisation adopt more comprehensive fiscal rules.

The composition of the fiscal adjustment can also matter for the probability of its success. Very large consolidations, that need to be pursued now by many countries, have a higher probability of success, if achieved by multiple instruments. Past evidence suggests that a mix of reducing various spending items – including subsidies, government wages and social protection – and of increasing several revenue items helps.

- The empirical evidence shows that if the adjustment is spending rather than tax driven, debt is more likely to stabilise and this stabilisation is lasting. However, very large consolidations stabilise debt only temporarily if they are exclusively spending driven. Similarly, cutting government wages only helps stabilise debt temporarily if the consolidation is large. A reduction in social security spending can increase the probability of consolidations of any size to succeed. But in the case of very large consolidations, the debt ratio will only stabilise temporarily, suggesting that large cuts in social security spending may not be sustainable. There is some evidence that cutting subsidies may help stabilise debt, though it only applies for very large consolidations. Relying on cuts of social protection spending and on housing and community amenities may boost the size of the consolidation, though they do not seem to matter for its probability to succeed. Finally, the composition appears to have little bearing on the duration of the consolidation.
- Revenue-based consolidations are often considered to be less effective due to the ratchet effect on spending and to the adverse impact on growth compared with expenditure-based ones. A focus on indirect taxes reduces the probability for immediate debt stabilisation, though this impact fades away after a year. There is some weak evidence that relying on business taxes for fiscal adjustment may help achieve debt stabilisation temporarily, but for very large programmes it hampers debt stabilisation over the medium term.

The economic environment in which consolidation takes place can affect the probability of its success. In the empirical analyses, economic growth and falling interest rates appear to help stabilise debt. Growth reduces debt partly through the denominator effect, while declining interest rates help stabilising debt through reducing debt servicing costs and cushioning the contractionary impact of consolidation. Growth appears to matter less for the size or intensity of adjustment. Falling interest rates similarly do not seem to have an impact on the start, size or intensity of the adjustment. The depreciation of the nominal effective exchange rate seems to be conducive to reducing debt, which may work through competitiveness gains boosting exports, though this effect is short lived. It also appears to lengthen the consolidation episode, but has no bearing on the size or the intensity of the episode. Moderating inflation also seems to help debt stabilisation, though favours a less intense and more protracted process.

The political setting also seems to matter for the success of consolidation: some evidence suggests that centrist governments appear more likely to stabilise debt. Newly-elected governments seem to be more likely to start a consolidation and also to continue it. However, as in the case of the policy variables, the findings related to the political environment are also susceptible to omitted variable problems and reverse causality. For instance, if the electorate cares about fiscal discipline, it elects governments that are more likely to provide such discipline.

The attitude of sub-central governments towards central government consolidation appears to affect its probability of success. In particular, state-level governments can increase the probability of success and the stabilisation of national debt if they consolidate during central government consolidation episodes. To ensure that state-level governments do co-operate, the right regulatory framework with the extension of fiscal rules to sub-central government levels may be effective.

Notes

1. European Commission (2007) noted that the *ex post* output gaps used in the analyses may not necessarily reflect the assessment of the cycle at the time.
2. The study by the European Commission (2007) is the first one to look at cuts in expenditure at the 2-digit COFOG (classification of functions of government) level. Categories at this level include general public services; defence; public order and safety; economic affairs; environmental protection; housing and community amenities; health; recreation, culture and religion; education; and social protection.
3. The 28 countries are: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Great Britain, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Netherlands, New Zealand, Norway, Poland, Portugal, Slovakia, Spain, Sweden, Switzerland and the United States. New OECD member countries such as Chile, Estonia, Israel and Slovenia and old member states without comparable fiscal accounts i.e. Mexico and Turkey are not included.
4. Fiscal rules dummy variables are based on Sutherland *et al.* (2005) and are extended until 2009.
5. The EU fiscal rule index is available for all EU member states for the years 1990-2008. It summarises five aspects of fiscal rules: i) statutory base of the rule, ii) room for setting or revising objectives, iii) nature of the body in charge of monitoring and enforcing fiscal rules, iv) enforcement mechanisms of the rule and v) media visibility of the rule. These five aspects make up the fiscal rules strength index. In the following step, these indices are multiplied by the coverage of general government finances by the respective rule and these products are added up into the fiscal rule index. If two or more rules are applied to the same government sector, the one with the higher strength score gets a weight of 1 and the second and additional rules get a 0.5 weight. The rationale behind this weighting is that more fiscal rules applied to the same government sector have a larger impact than a single one, but the marginal benefit from the second rule is smaller than that of the first, strongest rule.
6. Long-term interest rate differentials are measured relative to German rates for European countries and relative to US rates for other countries. The United States and Germany, as well as Japan and the United Kingdom, are excluded from the sample for the calculation of average responses.
7. In fact, time dependency indicates how the probability of experiencing an event at time t (conditional on surviving till time t) changes with time after conditioning on covariates.
8. Just the other way around in proportional hazard models where the sign of the coefficient indicates how a covariate affects the hazard rate. In those models, a positive coefficient increases the hazard rate and therefore reduces the expected duration of an episode.
9. While cutting spending on social protection may boost incentives to work, to return to work or to work longer, the finding that cuts for housing and community amenities matter is more of a surprise (though not unprecedented in the literature: EC, 2007 has a similar finding for the EU27 countries).
10. The spending and revenue items were introduced into the regressions sequentially.

11. Banking crises are captured by dummy variables with a value of 1 indicating a crisis year and 0 otherwise. The dummy variables are based on Laeven and Valencia (2008) and are extended until 2009.
12. Krogstrup and Wälti (2008) and Dafflon and Pujol (2001) are examples of the literature finding a causality between fiscal rules and fiscal discipline.
13. Within countries such as Canada, Switzerland and the United States, voters' preferences are used to control for the incentives sub-central governments face in pursuing fiscal prudence.
14. Country-specific time trends and their second and third-order terms were inserted in the regressions.
15. The results are available from the author upon request.
16. Although higher balances at the local or the joint local and state level in the year before the consolidation seemed to increase the probability of the central government starting fiscal retrenchment, these results are driven by three countries: Austria, Spain and Switzerland.
17. Sub-central governments do not appear to affect the length, size and intensity of consolidation episodes.
18. The ability of state-level governments to consolidate may be affected by central government transfers, as pointed out by a referee. To correct for potential endogeneity bias, while also taking into account potential selection bias, the following steps were taken: i) the selection equation of the Heckman model was estimated and the inverse Mills-ratio obtained, then ii) another probit model was used to estimate the probability of success (i.e. stabilisation of debt) with the obtained inverse Mills ratio as explanatory variable; this probit was an IV model with transfers instrumenting sub-central behaviour. The standard errors were corrected by clustering. The results show that even after controlling for endogeneity (the Wald test that the correlation parameter ρ is equal to zero was rejected) the coefficient on the change of the cyclically-adjusted budget balance at the state level is highly significant and positive when success is defined as debt stabilising one or two years after consolidation. With the definition of debt stabilising three years after the consolidation episode, however, the coefficient was not significant. For cyclically-adjusted budget balance changes at the local level no significant coefficients were obtained.
19. Sensitivity tests that restrict the sample to those countries with state level governments or only those countries without state level governments suggests that some of the results are sensitive to the inclusion of Canada and Korea.

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