



WP/14/179

# IMF Working Paper

---

## How Much is A Lot? Historical Evidence on the Size of Fiscal Adjustments

*Julio Escolano, Laura Jaramillo, Carlos Mulas-Granados,  
and Gilbert Terrier*

## **IMF Working Paper**

Fiscal Affairs Department

### **How Much is A Lot? Historical Evidence on the Size of Fiscal Adjustments<sup>1</sup>**

**Prepared by Julio Escolano, Laura Jaramillo, Carlos Mulas-Granados, and Gilbert Terrier**

Authorized for distribution by Gilbert Terrier

September 2014

**This Working Paper should not be reported as representing the views of the IMF.**

The views expressed in this Working Paper are those of the author(s) and do not necessarily represent those of the IMF or IMF policy. Working Papers describe research in progress by the author(s) and are published to elicit comments and to further debate.

#### **Abstract**

The sizeable fiscal consolidation required to stabilize the debt-to-GDP ratios in several countries in the aftermath of the global crisis raises a crucial question on its feasibility. To answer this question, we rely on historical evidence from a sample of 91 adjustment episodes of countries during 1945–2012 that needed and wanted to adjust in order to stabilize debt to GDP. We find that, in at least half the cases, countries improved their cyclically adjusted primary balances by close to 5 percent of GDP. We also observe that, while countries typically make substantial efforts to stabilize debt, once this objective is achieved, they tend to ease their primary balances and do not necessarily get back to their initial lower debt-to-GDP ratio. We find that consolidations tended to be larger when the initial deficit was high and adjustment efforts were sustained over time. Fiscal adjustments also tended to be larger when accompanied by an easing of monetary conditions and, to a lesser extent, by an improvement in credit conditions.

JEL Classification Numbers: H11, H62, H63

Keywords: Deficit, debt, primary balance, size of adjustment, fiscal consolidation, fiscal sustainability

Authors' E-Mail Addresses: [JEscolano@imf.org](mailto:JEscolano@imf.org); [LJaramilloMayor@imf.org](mailto:LJaramilloMayor@imf.org); [CMulasGranados@imf.org](mailto:CMulasGranados@imf.org); [GTerrier@imf.org](mailto:GTerrier@imf.org)

---

<sup>1</sup> We thank Carlo Cottarelli, Martine Guerguil, Benedict Clements, Agustin Roitman, and Serhan Cevik for helpful comments and discussions. We are also grateful to Nathaniel Arnold, Ozgur Demirkol, Daniel Leigh, and Nelson Sobrinho for important feedback; and to participants at the Fiscal Affairs Department seminar for their useful suggestions. Haoyu Wang provided excellent research assistance.

## Contents

Page

Abstract .....	2
I. Introduction.....	3
II. State of the Debate.....	4
III. Selection of Episodes .....	9
A. Criterion 1: A Fiscal Adjustment Need Exists .....	10
B. Criterion 2: There Is the Intention to Implement Discretionary Fiscal Adjustment .....	11
C. Relevant Episodes.....	12
IV. Characteristics of Fiscal Adjustments .....	13
A. What Level of Primary Balance was Achieved? .....	13
B. What was the Total Size of Fiscal Consolidation? .....	16
C. Was Adjustment Enough to Stabilize Debt?.....	17
D. Accompanying Factors .....	18
V. Empirical Model.....	21
A. Model Specification and Data Sources.....	21
B. Results .....	21
VI. How Much Is A Lot?.....	26
VII. Conclusions.....	29
 Tables	
1. Literature Review on Fiscal Consolidation .....	6
2. Sample Coverage.....	12
3. Characteristics of Fiscal Adjustment.....	14
4. Distribution of Levels and Changes in the Actual and Cyclically Adjusted Primary Balances .....	15
5. Level and Changes in CAPB Across Alternative Samples .....	16
6. Determinants of the Size of Fiscal Adjustment.....	24
7. Determinants of the Size of Fiscal Adjustment, Robustness Check.....	26
 Figures	
1. Primary Gaps at t and End of the Episode.....	17
2. Debt and CAPB, Median Across Episodes .....	18
3. Primary Gap and the Interest Rate-Growth Differential .....	19
4. Accompanying Factors.....	20
5. Contribution from Accompanying Factors to Fiscal Adjustment .....	28
 Appendix Table	
List of Episodes.....	30
References .....	31

## I. INTRODUCTION

Several countries currently face the challenge of restoring debt sustainability by implementing ambitious fiscal adjustment plans. Average debt-to-GDP ratios for advanced economies jumped by 36 percent of GDP between 2007 and 2012, to a peak of 110 percent of GDP. In 2013, 24 out of 32 advanced economies still faced rising debt-to-GDP ratios (IMF, 2014a)

The credibility of such fiscal adjustment plans hinges on the realism of the path for the primary balance. Public debt can be regarded as sustainable when the primary balance needed to at least stabilize debt is economically and politically feasible, such that the level of debt is consistent with an acceptably low rollover risk and a satisfactory potential GDP growth rate. Conversely, if no realistic adjustment in the primary balance—i.e., one that is both economically and politically feasible—can bring debt to below such a level, public debt would be considered unsustainable (IMF, 2013b).<sup>2</sup> Therefore, the level and trajectory of the debt need to be underpinned by feasible primary balance adjustments.

The sizeable fiscal consolidation needed to stabilize high and rising debt-to-GDP ratios in several countries in the aftermath of the global crisis raises a crucial question on its feasibility. To answer this question, we take stock of past consolidation episodes in order to provide insights into what has been the historical experience in terms of the size of fiscal adjustment, its duration, and the factors that have accompanied such adjustments.

Our approach adds to the existing literature in several ways. First, we draw lessons from a broad set of consolidation episodes by looking at both advanced and developing countries, and including a time period that spans from 1945 to 2012. Second, we make a very careful selection of the relevant episodes by choosing consolidation episodes where countries needed and *wanted* to adjust in order to stabilize debt to GDP. The combination of these two criteria eliminates possible biases from the behavior of primary balances in countries that in the past did not have to make any additional efforts to stabilize debt (for example countries that saw a sharp reduction in interest rates after joining the euro area) or in countries where the authorities did not have any intention of pursuing fiscal adjustment (for example in years of stimulus policies in several countries after the Lehman collapse). Third, we look at all the years of consolidation for each episode as opposed to only the initial years. This allows us to capture the full extent of adjustment that is sustained over several years, even if the deficit improvement is small in a single year. Fourth, we inform our assessment on the feasible size of fiscal adjustment through an analysis of the accompanying factors that are of key concern in today's policy debate, in particular the fiscal policy strategy, the monetary and exchange rate environment, and credit conditions.

---

<sup>2</sup> Cottarelli and Escolano (2014) discuss various practical methodologies to assess the sustainability of fiscal policy, such as gap measures, estimates of fiscal policy reaction functions, and fiscal vulnerability indicators.

We find that in most cases fiscal adjustment is sizeable and the debt-to-GDP ratio stabilizes by the end of the episode, albeit at higher levels. In at least half of the episodes, countries managed to improve their primary balance by 5.4 percent of GDP (4.8 percent of GDP in cyclically adjusted terms). The sample distributions of the levels and changes in the primary balance (actual and cyclically adjusted) show that, while there are significant differences across advanced and developing countries in terms of the levels of primary balances achieved, the changes in primary balances are comparable across the two groups.

The fiscal adjustment implemented was enough to close the primary gap in two-thirds of the episodes. This implies that debt stabilized, and in most cases was put on a downward trend. This does not however imply that debt returned to initial levels. While countries kept primary balances well above those observed before the adjustment episode, they did not sustain primary balances at the highest levels for prolonged periods of time. This suggests that countries make substantial efforts to stabilize debt but, once this is achieved, they see room to ease primary balances and do not necessarily seek to get back to the lower initial debt-to-GDP ratio.

Several factors are found to be significantly associated with the size of fiscal adjustments. Based on a cross-section OLS model, we find that fiscal adjustment was larger the greater the initial deficit, and that a sustained approach to deficit reduction increases the size of total consolidation. The results also show that fiscal adjustment tended to be higher when accompanied by an easing of monetary conditions (as measured through a reduction in short-term interest rates) and, to a lesser extent, an improvement of credit conditions (measured as the change in credit to the private sector as a percent of GDP), especially in advanced economies.

The remainder of the paper is structured as follows. Section II provides an overview of the state of the debate. Section III describes the methodology used to select the relevant episodes, followed in Section IV by a discussion of the characteristics of fiscal adjustment in these episodes. Section V presents the econometric model specification to identify the factors that accompanied sizeable fiscal consolidations, and discusses the empirical results. Section VI attempts to answer the question “how much is too much?” based on the empirical results. Section VII concludes.

## **II. STATE OF THE DEBATE**

Although the literature on fiscal adjustment is extensive, relatively few studies have focused specifically on the size of consolidation episodes and the difficulty of achieving large fiscal adjustments. Most studies have focused on whether fiscal adjustments were successful in significantly reducing debt-to-GDP ratios (Heylen and Everaert, 2000; Lambertini and Tavares, 2007; Alesina and Ardagna, 2009; Barrios and others, 2010) or on whether they were associated with changes in real GDP growth (Alesina and Ardagna, 1998; Giavazzi and

Pagano, 1990; Ardagna, 2009; Perotti, 2012; Baldacci, Gupta and Mulas-Granados, 2013; Guajardo and others, 2014).

Among the few studies that have focused on the size of fiscal adjustment and its determinants, some have looked at the change in the primary balance while others have looked at the level of the primary balance achieved. The selection of fiscal adjustment episodes varies considerably according to the different criteria and thresholds set by each author (Table 1). Guichard and others (2007) find that the median improvement of the cyclically adjusted primary balance (CAPB) across 85 OECD fiscal consolidation episodes was 2.8 percent of GDP. Their results show that large initial deficits and high interest rates were important in boosting the overall size. In a sample of 902 episodes of fiscal adjustment across 165 countries, Tsibouris and others (2006) report that, within five years, primary balances improved by more than 3 percent of GDP in 424 episodes, and by more than 5 percent of GDP in 366 episodes. They find large adjustments to be associated with higher debt ratios and inflation at the outset, as well as more sluggish growth of GDP. Molnar (2012) shows an average fiscal tightening of 3 percent of GDP for OECD countries, but finds that the size of the deficit and debt do not determine the size of consolidation.

Only a handful of papers have focused on the levels of the primary balances achieved. IMF (2013a) looks at the distribution of maximum sustained primary surpluses for 43 countries. Since the 1950s, the distribution shows a median of about  $6\frac{1}{2}$  percent of GDP for advanced economies and  $6\frac{1}{4}$  for emerging market economies. Using five-year averages, the median falls to  $3\frac{1}{2}$ –4 percent of GDP. Zheng (2014) shows that out of the 87 sample countries, only 14 recorded an average primary fiscal surplus higher than 5 percent of GDP over a five-year period. Among the 14, most were facing public debts exceeding 60 percent of GDP at the time when they ran large primary surpluses. Eichengreen and Panizza (2014) work with a sample of 54 emerging and advanced economies and show that in only 8 percent of cases countries managed to maintain an average primary surplus of 4 percent for five years. Based on high debt country experience, IMF (2013b) finds that the average CAPB exceeded 3.5 percent of GDP for any consecutive three-year period in only 25 percent of observations. Similarly, in only 25 percent of observations did the change in the CAPB exceed 3 percent of GDP over a three-year period.

As mentioned above, beyond the debate about the size of fiscal adjustments, the existing literature has mainly focused on the determinants of successful fiscal consolidations, including macroeconomic conditions, the design of fiscal consolidation, institutional changes, and political factors. The overview provided below focuses on the aspects of fiscal consolidation most prominent in the current policy debate, namely the fiscal consolidation strategy (duration, composition), the role of monetary and exchange rate conditions, and the impact of credit conditions. Table 1 provides an overview of the relevant studies in this area, including the different definitions of fiscal consolidation used.

**Table 1. Literature Review on Fiscal Consolidation**  
(continues)

Author(s)	Variable used to Measure Adjustment	Definition of Adjustment Episode	Sample Countries	Sample Years	Number of Episodes	Size of Adjustment (%GDP)
Afonso and Jalles (2011)	Change in CAPB; budget plans	(i) At least 2pp change in the CAPB in one year or at least 1.5 pp change on average over two years; (ii) CAPB change is >1.5 standard deviation in one year; (iii) Fiscal consolidation episodes as defined by Devries and others (2011)	18 countries. ADV/EU	1970-2010	59-79	0.7 to 2.3
Ahrend and others (2006)	Change in CAPB	At least 1pp change in one year; or at least 1pp change in two years with at least 0.5pp in the first year	24 countries OECD	1980-2005	81	> 8
Alesina and Ardagna (1998)	Change in CAPB	At least 2pp change in one year; or at least 1.5pp change in two years	20 countries, OECD	1960-1994	51	NA
Alesina and Ardagna (2009)	Change in CAPB based on Blanchard (1993) methodology	At least 1.5pp change in one year	21 countries, OECD	1970-2007	107	1.85
Alesina and Perotti (1995)	Change in CAPB based on Blanchard (1993) methodology	Blanchard fiscal impulse is less than -1.5 percent of GDP	20 countries, OECD	1960-1992	66	2.6
Alesina and Perotti (1997)	Change in CAPB	At least 1.5pp change in one year; or at least 1.5pp change in two years with each more than 1.25pp	20 countries, OECD	1960-1994	62	2.57
Ardagna (2004)	Change in the CAPB	CAPB improves and, two years after, debt/GDP is at least 3pp lower than in the year of the fiscal tightening	17 countries, OECD	1975-2002		NA
Ardagna (2009)	Change in CAPB	At least 2pp change in one year; or at least 2pp change in two years with each more than 1.5pp	25 countries, OECD	1970-2006	86	2.9
Baldacci and others (2004)	Change in the primary balance	At least 0.5 percent of GDP change per year	25 countries, EME	1980-2001	177	NA
Baldacci and others (2010)	Change in CAPB	Improvement in the CAPB during post-banking crisis years	99 countries, ADV/EME	1980-2008	100	NA
Baldacci and others (2013)	Change in CAPB	At least two consecutive years of reduction in the ratio of public debt to GDP with increases in the CAPB of at least 0.5 percent of GDP per year, sustained for two years or more during the debt reduction episode	107 countries, ADV/EME/LIC	1980-2012	79	3.9
Barrios and others (2010)	Change in CAPB	At least 1.5pp change in one year; or at least a 1.5pp change in three years, with no annual deterioration larger than 0.5pp	23 countries, EU/OECD	1978-2008	235	NA
Devries and others (2011)	"Policy-action" approach	As identified by contemporaneous policy documents	17 countries, OECD	1978-2009	173	Annual of 0.74
Eichengreen and Panizza (2014)	Level of primary balance	Primary surplus episode is large when the average value of the primary surplus during the episode is, alternatively, greater than 3, 4, or 5 percent of GDP. Primary surplus is persistent when the episode lasts at least 5, 8, or 10 years.	54 countries, ADV/EME	1974-2013	36	NA
Giavazzi and Pagano (1990)	Changes in taxes net of transfers and government consumption	All country/years in sample	10 countries, EU; focus on Denmark and Ireland	1973-1989		NA
Guichard and others (2007)	Change in CAPB	At least 1pp change in one year; or at least 1pp change in two years with each more than 0.5pp	24 countries, OECD	1978-2006	85	2.8
Guajardo and others (2011)	"Policy-action" approach	As identified by contemporaneous policy documents	17 countries, OECD	1978-2009	173	0.99
Gupta and others (2005)	Change in the overall deficit	At least 1 percent of GDP improvement in one year	25 countries, EME	1980-2001		NA
Heylen and Everaert (2000)	Change in CAPB	At least two consecutive years when the CAPB improved by at least 2pp (at least 0.25pp in the first year)	18 countries, OECD	1975-1995	39	3.2

**Table 1. Literature Review on Fiscal Consolidation**  
(continued)

Author(s)	Variable used to Measure Adjustment	Definition of Adjustment Episode	Sample Countries	Sample Years	Number of Episodes	Size of Adjustment (%GDP)
Hjelm (2002)	Change in CAPB	At least 3 pp in one year; or at least 3 pp over 2 years; or at least 4 pp over 3 years; or at least 5 pp over 4 years	19 countries, OECD	1970-1997	19	NA
IMF (2013a)	Level of primary balance	Maximum five-year moving-average primary balance	43 countries, ADV/EME	1950-2012		3½-4
IMF (2013b)	Level of CAPB, change in CAPB	Average CAPB for any consecutive 3-year period; change in the CAPB over 3 years	54 countries, ADV/EME	1990-2011		CAPB level of 3.5; CAPB change of 3
Kumar and others (2007)	Change in CAPB	At least 1pp improvement in one year	24 countries, OECD	1972-2006	81	1.7
Lambertini and Tavares (2007)	Change in the primary balance	At least 1.5pp improvement in one year	20 countries, OECD	1970-1999	99	NA
Mati and Thornton (2008)	Change in the primary balance	At least 0.75pp improvement in one year; at least 1.5pp improvement in one year and no deterioration in the following two years	23 countries, EME	1970-2004	198; 132	NA
McDermott and Wescott (1996)	Change in CAPB	At least 1.5pp improvement over 2 years and does not decrease in either of the two years	20 countries, OECD	1970-1995	74	NA
Molnar (2012)	Change in CAPB	At least 1.5pp improvement per year; gradual but continual tightening over several years		1960-2009		3
Perotti (2012)	"Policy-action" approach	As identified by contemporaneous policy documents	Denmark, Finland, Ireland, Sweden	1982-1998	4	6.2
Tsibouris and others (2006)	Change in primary Balance	Uninterrupted improvement in the primary budget balance	165 countries, ADV/EME/LIC	1971-2001	366	>5
Von Hagen and others (2002)	Change in CAB	At least 1.25pp improvement for two years; or at least 1.5pp improvement in one year and positive in the preceding and following year	20 countries, OECD	1960-1998	65	2.29
Von Hagen and Strauch (2001)	Change in CAB	At least 1.25pp improvement for two years; or at least 1.5pp improvement in one year and positive in the preceding and following year	20 countries, OECD	1960-1998	65	2.29
Zheng (2014)	Level of primary balance	Average primary fiscal surplus over a five-year period	87 countries, ADV/EME	1956-2009		NA

Note: CAPB: cyclically adjusted primary balance as a percent of potential GDP; CAB: cyclically adjusted balance as a percent of potential GDP; pp: percentage point of potential GDP; ADV: advanced countries; EME: emerging market economies; LICs: low income countries; EU: European Union

A frequent finding of the literature is that the composition and duration of fiscal consolidations affect the likelihood of success. Alesina and Perotti (1995, 1997), Alesina and Ardagna (1998, 2009), Tsibouris and others (2006), Kumar and others (2007), Afonso and Tovar Jalles (2011), and Molnar (2012) have found that expenditure reductions are more likely to be successful in reducing deficits and debt than tax increases, as spending cuts would have a smaller negative impact on output. However, for countries with large adjustment needs after a banking crisis, Baldacci and others (2010) report that revenue-raising measures increased the likelihood of successful consolidation, reflecting the fall in effectiveness of spending cuts when deficit reduction needs are sizeable. The duration of fiscal consolidation has also been found to contribute positively to the probability of success of a fiscal consolidation episode (Von Hagen and others, 2002; Baldacci and others, 2004; Guichard and others, 2007; Barrios and others, 2010).



Fewer studies have attempted to control for the effects of changes in monetary stance during the consolidation episodes. Fiscal consolidation can be assisted by shifts in monetary stance insofar as lower interest rates contribute to offset the contractionary short-term effects of fiscal tightening on demand. However, monetary expansion can also ease the government's task by stimulating short-term revenue growth and lowering interest payments on public debt, which decreases the size of consolidation needed to achieve a given debt reduction. Ahrend and others (2006) find evidence that consolidation efforts are more likely to be pursued and to succeed if the monetary policy stance is eased in the initial stages of the episode. Molnar (2012) finds that an easing of monetary conditions increases the probability for a consolidation to stabilize debt. Baldacci and others (2010) also report that successful debt reductions have been accompanied by supportive monetary policy stance. Nonetheless, Von Hagen and Strauch (2001) show that, while easier initial monetary conditions increase the likelihood that a fiscal consolidation is undertaken, they have no impact on the probability of success. Also, Von Hagen and others (2002) and Ardagna (2004) find no evidence that episodes accompanied by monetary easing were more likely to be successful.

The effect of exchange rate depreciation on fiscal consolidation efforts is unclear. Exchange rate depreciation can support fiscal adjustment to the extent that it improves competitiveness, thereby boosting net exports and output. This would make the consolidation more acceptable politically and thus easier to sustain. However, competitiveness does not depend solely on the exchange rate but also hinges on structural policies that increase productivity and the export market structure. In addition, for countries with foreign currency-denominated public debt, exchange rate depreciation could complicate the fiscal consolidation effort through the adverse impact on debt and debt servicing costs. Also, depreciation could be showing a sharp deterioration in confidence in the economy.

Findings in the empirical literature are mixed with respect to the effect of exchange rate depreciation on fiscal consolidation. Based on statistical association and case study analyses, Alesina and Perotti (1997), Alesina and Ardagna (1998), and Giavazzi and Pagano (1990) demonstrate that successful fiscal consolidations were sometimes preceded by, or coincided with, a sizeable devaluation. Hjelm (2002) finds that fiscal contractions associated with favorable macroeconomic outcomes have been preceded by significantly larger real depreciations. Lambertini and Tavares (2007) report a small increase in the probability of success if fiscal adjustment is preceded by exchange rate depreciation, while Molnar (2012) finds a positive effect of exchange rate depreciation only for very large consolidations. Heylen and Everaert (2000) find a preceding devaluation to have had a positive impact only when the adjustment comprised cuts in transfers and taxes and increased public investment. However, Ahrend and others (2006) show that the real exchange rate depreciation favors the start and continuation of fiscal consolidation but does not favor debt reduction significantly. McDermott and Wescott (1996) and Barrios and others (2010) do not find any conclusive evidence regarding the effect of the exchange rate devaluation in facilitating successful fiscal consolidations. In the case of emerging economies, Mati and Thornton (2008) suggest that exchange rate depreciation increases the probability of success of consolidation. In contrast,

Gupta and others (2005) find that exchange rate depreciation in emerging economies is associated with a higher probability of ending a spell of fiscal adjustment.

The literature on the interplay between credit conditions and fiscal consolidations remains very limited. As outlined by Bénétrix and Lane (2011), credit growth would affect fiscal revenues through several channels, over and above their influence on output. First, the positive impact of credit growth on domestic asset and property prices improves revenues through direct and indirect channels. Second, credit growth may fuel a greater volume of asset market turnover, which raises revenues from transactions. Third, credit growth could shift the composition of production towards more tax-rich activities. In addition, if credit to the private sector supports an increase in consumption good imports, this could improve revenue collection even though it would not contribute to real GDP growth. Thus far, only Barrios and others (2010) have explored the issue of fiscal consolidation where the credit channel is hampered. They argue that in the presence of a systemic financial crisis, the repair of the banking sector is a pre-condition for a fiscal consolidation to succeed in reducing debt levels.

### III. SELECTION OF EPISODES

To serve as an adequate benchmark for proposed fiscal adjustments, relevant historical episodes must be carefully selected. The distribution of primary balances in a sample that includes all countries and all years as separate observations could be biased downward as it would include a large amount of countries that did not make at the time any efforts to adjust, either because they did not need to do so or because they did not have the intention to do so. For example, between 1998 and 2002, in euro area countries debt declined on average by 3½ percent of GDP, even as primary balances worsened by over 1½ percent of GDP as they benefitted from positive debt dynamics due to falling interest rates. Similarly, G20 advanced economies pursued expansionary policies in the aftermath of the Lehman collapse even though debt ratios were on the rise, and introduced about 6.4 percent of GDP in stimulus measures between 2008 and 2010 (IMF, 2011).

Therefore, in order to avoid this potential bias, relevant episodes are selected based on the combination of two criteria: (i) the country faces a fiscal adjustment need; and (ii) the country is willing to address this imbalance through discretionary policy.<sup>3</sup> These criteria are applied to a group of 90 countries (30 advanced and 60 developing countries) between 1945

---

<sup>3</sup> The paper that comes closest to this one in terms of selecting relevant episodes is Lavigne (2011), who chooses country episodes based on the existence of an adjustment need (defined as whenever the cumulative central government deficits over the past five years is greater than or equal to 20 percent of GDP) matched by a fiscal adjustment in the same year or the following year (defined as a continuous positive change in the primary balance amounting to at least 1.5 percent of GDP over a five-year period).

and 2012, for which data are available.<sup>4</sup> Data on fiscal variables and real GDP growth are from the WEO where available, and IFS and Mauro and others (2013) for the historical series.

### A. Criterion 1: A Fiscal Adjustment Need Exists

Debt sustainability hinges on the stability of the debt-to-GDP ratio. Therefore, a country with fiscal adjustment needs is one whose debt-to-GDP ratio is on a rising path and consequently is facing a positive primary gap. This primary gap approach has been widely used in the literature (Blanchard, 1993, and Cottarelli and Escolano, 2014).<sup>5</sup> The primary gap (equation 1) is the difference between the country's debt stabilizing primary balance (equation 2) and its present primary balance.<sup>6</sup>

$$gap = p^* - p \quad (1)$$

$$p^* = \frac{(r-g)}{(1+g)} d \quad (2)$$

Where  $d$  is a constant debt-to-GDP ratio (here, we use as the constant debt ratio the debt-to-GDP ratio of the current year);  $p$  is the actual primary balance ratio to GDP;  $p^*$  is the debt-stabilizing primary balance ratio to GDP,  $r$  is the effective interest rate;  $g$  is the GDP growth rate (with the latter two rates expressed either both in nominal terms or both in real terms); and  $gap$  is the primary gap.

A country is considered to have a sizeable fiscal need if it exceeds a certain threshold within the distribution of countries with a positive primary gap. We define this threshold as the cut-off for the 50<sup>th</sup> percentile among all observations with a positive primary gap. Based on this methodology, thresholds are defined for advanced economies at 2 percent of GDP and for developing countries at 1.8 percent of GDP. In order for an observation to be included as a relevant episode, the primary gap has to remain above the threshold for at least two consecutive years. The relatively high threshold attempts to filter out the cases of countries with very low initial levels of debt, but does not do so fully. Removing such cases from our sample does not significantly alter our findings, as discussed in the robustness checks below.

---

<sup>4</sup> The number of developing countries with available data is considerably smaller before the mid-1990s.

<sup>5</sup> By construction, this criterion excludes fiscal consolidations that start when debt is high but stable (when the primary gap is closed).

<sup>6</sup> For a derivation of the formulas, see Escolano (2010).

## **B. Criterion 2: There Is the Intention to Implement Discretionary Fiscal Adjustment**

A country that has the intention to implement discretionary fiscal adjustment is defined as one that shows an improvement in its CAPB in two consecutive years.<sup>7</sup> By adjusting for the economic cycle, the CAPB strips out the effect of automatic stabilizers from actual balances.<sup>8</sup> To avoid biasing the sample toward large successful adjustments (but still requiring some demonstrable determination to adjust), the episodes selected are those that show at least a minimal positive annual change in the CAPB of 0.1 percent of GDP for two consecutive years. This approach, less stringent than that in several of the papers listed in Table 1, allows us to keep those episodes that are small in each year but sustained over several years.

In the literature, fiscal adjustment has typically been measured using two methodologies. The “quantitative” approach identifies discretionary fiscal policy as changes in the CAPB, while the “policy-action” approach relies on fiscal plans as announced in budgets, as well as other official documents (Romer and Romer, 2010; and Devries and others, 2011). The main drawbacks of using the change in the CAPB are that: (i) it attributes all residual changes in the CAPB to fiscal policy instruments, hence possibly overestimating discretionary fiscal policy changes if other non-discretionary factors are at play, for example due to a commodity boom or a real estate bubble (Riera-Crichton and others, 2012); (ii) the estimation of potential output, crucial for the cyclical adjustment, varies considerably depending on the statistical technique used; and (iii) revenue and expenditure elasticities are usually assumed to be time invariant. An additional shortcoming is that the “quantitative” approach only signals adjustment when there is an improvement with respect to the previous year, and therefore misses those cases in which an adjustment is implemented to avoid a further deterioration of the fiscal position under a no-policy change baseline.

Despite its shortcomings, the approach of using changes in the CAPB to identify fiscal adjustment provides several important advantages for the analysis in this paper. First, it provides a uniform methodology across countries that measures changes with respect to the previous year instead of a baseline put forward by the authorities and for which there is limited information. Second, it captures the fiscal adjustment that was actually implemented, rather than announced measures which may not have been fully executed, or the impact of which may not have been accurately measured. Third, it provides broad coverage across countries and time in a consistent manner, as combining different sources of data based on the “policy-action” approach may pool information based on methodologies not entirely compatible. Lastly, possible mismeasurement problems could also easily arise in the “policy-

---

<sup>7</sup> CAPB has traditionally been used as an indicator of discretionary fiscal policy. For a seminal discussion on fiscal indicators, see Blanchard (1993).

<sup>8</sup> CAPB calculations are based on data from WEO, IFS, and Mauro and others (2013), assuming elasticities of 1 and 0 for revenue and expenditure, respectively. When potential GDP is not available, it is calculated using a Hodrick-Prescott filter.

action” approach if not all official announcements and plans (i.e., supplementary budgets) are taken into account (Perotti, 2012).

### C. Relevant Episodes

The combination of the two selection criteria mentioned above yields 91 relevant episodes. These episodes span across 49 advanced and developing economies, and across several decades. (see Table 2). An episode is deemed to continue for as long as the CAPB continues to increase. As in Ahrend and others (2006) and Guichard and others (2007), the episode continues if a decline of less than 0.3 percentage points of GDP in one year is followed by an increase of more than 0.5 percentage points of GDP in the following year. Most fiscal adjustment episodes had a duration of 3–4 years, and tended to be longer for advanced economies than developing countries. Consolidations that were still ongoing in 2012 are assumed to end in 2013, though these are dropped later on, as part of robustness tests of the econometric analysis. The appendix provides a list of the selected episodes.<sup>9</sup>

Table 2. Sample Coverage

	Number of episodes	Number of countries
<b>Total</b>	91	49
Advanced	48	19
Developing	43	30
<b>Decades</b>		
1940s	1	1
1950s	5	4
1960s	4	3
1970s	6	5
1980s	19	17
1990s	23	21
2000s	25	25
2010s	8	8

In this sample, fiscal positions deteriorated notably ahead of the adjustment effort. Within the five years prior to the consolidation episode, the median CAPB deteriorated by 3.1 percent of GDP both for advanced and developing countries. Also within the five years prior to the consolidation episode, the median debt-to-GDP ratio jumped by 16½ percent of GDP in advanced economies and 9½ percent of GDP in developing countries.

The results of the selection process using the “quantitative” and “policy-action” approaches, in combination with the criterion on the existence of a fiscal need to stabilize debt-to-GDP, are comparable. Comparing our results with a “policy-action” approach dataset for advanced

<sup>9</sup> The list of episodes identified will not correspond exactly with those identified in other studies if they do not meet one of the two criteria used in this paper. Episodes may not qualify to be selected in our sample if they occurred when the countries *did not need* a fiscal adjustment to stabilize debt-to-GDP, where the initial primary gap was not sufficiently large according to the threshold set above for two consecutive years (for example Denmark in 1986 and Turkey in 2000) or when countries *did not want* to adjust as evidenced by a minimal improvement of the CAPB over two consecutive years (for example Ireland in 1982 and Japan in 1997).

economies compiled from different sources for 1980–2010,<sup>10</sup> there is considerable overlap in the selected episodes: 22 of the episodes coincide out of 29 episodes identified using the “quantitative” approach and 25 identified using the “policy-action” approach. Furthermore, for those 22 coinciding episodes, at the median, the “policy-action” approach estimates that 4 percent of GDP in measures were implemented, compared with an estimated change in the CAPB of 4.7 percent of GDP using our methodology.

#### **IV. CHARACTERISTICS OF FISCAL ADJUSTMENTS**

Based on these selected episodes, we find that both advanced and developing countries were able to implement sizeable fiscal consolidation. This is assessed by looking at the level of the primary balance (actual and cyclically adjusted) achieved at the end of the episode, the change in the primary balance during the episode, and whether the adjustment was enough to stabilize debt by the end of the episode.

##### **A. What Level of Primary Balance Was Achieved?**

By the end of the episode, most countries achieved primary surpluses, significantly higher for advanced economies than for developing countries. Table 3 shows that in half of advanced economy episodes, countries were able to achieve a primary balance of at least 1.6 percent of GDP (CAPB of 2.2 percent of GDP) by the end of the episode, and a quarter achieved 4.5 percent of GDP (CAPB of 5.3 percent of GDP). For developing country episodes, half reached at least primary balance (CAPB of 0.8 percent of GDP), and a quarter 2.1 percent of GDP (CAPB of 2.8 percent of GDP). See Table 1 to compare these results with the findings from other studies in the literature.

Table 4 maps the sample distribution of the actual and cyclically adjusted primary balances. For example, the table shows that a CAPB of 1.1 percent of GDP—which corresponds to the estimated CAPB needed to stabilize debt to GDP at 2013 levels in advanced economies, based on data in IMF (2014a)—is at the 40<sup>th</sup> percentile of the sample distribution for advanced economies. This means, that countries were able to achieve this CAPB or more in 60 percent of advanced economy episodes.

---

<sup>10</sup> For advanced economies, discretionary fiscal adjustment is as identified by Devries and others (2011), Mauro and others (2011), and Perotti (2012).

Table 3. Characteristics of Fiscal Adjustment

	Percentile cut-off <sup>1</sup>			Min	Max
	25	50	75		
<b>Full sample</b>					
Actual primary balance at end of episode (percent of GDP)	-1.0	0.3	3.4	-3.8	10.9
Change in actual primary balance at end of episode (percent of GDP)	3.3	5.4	7.4	0.4	17.0
Average annual change in the actual primary balance (percent of GDP)	1.0	1.7	2.2	0.2	7.0
CAPB at end of episode (percent of potential GDP)	-0.4	1.1	4.1	-4.9	10.4
Change in the CAPB, t to end of episode (percent of potential GDP)	3.1	4.8	7.8	0.9	18.6
Average annual change in the CAPB (percent of potential GDP)	1.1	1.6	2.1	0.4	6.0
Debt at t (percent of GDP)	30	53	69	13	264
Duration (years)	2	3	4	2	8
<b>Advanced</b>					
Actual primary balance at end of episode (percent of GDP)	-0.8	1.6	4.5	-3.8	10.6
Change in actual primary balance at end of episode (percent of GDP)	3.5	5.5	8.2	1.5	15.5
Average annual change in the actual primary balance (percent of GDP)	1.1	1.6	2.0	0.5	6.0
CAPB at end of episode (percent of potential GDP)	0.2	2.2	5.3	-2.9	9.0
Change in the CAPB, t to end of episode (percent of potential GDP)	3.1	5.1	7.4	1.1	18.6
Average annual change in the CAPB (percent of potential GDP)	1.2	1.5	1.8	0.4	4.6
Debt at t (percent of GDP)	39	61	84	13	170
Duration (years)	3	4	4	2	8
<b>Developing</b>					
Actual primary balance at end of episode (percent of GDP)	-1.2	0.0	2.1	-3.7	10.9
Change in actual primary balance at end of episode (percent of GDP)	2.9	5.0	6.9	0.4	17.0
Average annual change in the actual primary balance (percent of GDP)	0.9	1.8	2.3	0.2	7.0
CAPB at end of episode (percent of potential GDP)	-0.6	0.8	2.8	-4.9	10.4
Change in the CAPB, t to end of episode (percent of potential GDP)	2.7	4.7	8.0	0.9	14.3
Average annual change in the CAPB (percent of potential GDP)	0.9	1.7	2.3	0.5	6.0
Debt at t (percent of GDP)	28	37	55	13	264
Duration (years)	2	3	4	2	7

<sup>1</sup>Based on the cumulative distribution function for each variable, the percentile cut-off indicates the value at which the percentile bracket begins.

Table 4. Distribution of Levels and Changes in the Actual and Cyclically Adjusted Primary Balances

Actual primary balance at the end of the episode			
Actual PB Level (percent of GDP)	Percentile		
	Full Sample	Advanced	Developing
7.0	92.5	89.8	96.2
6.5	90.9	87.0	95.5
6.0	87.3	82.1	94.4
5.5	86.0	79.7	93.0
5.0	83.9	77.6	91.8
4.5	81.4	72.9	90.6
4.0	77.4	67.4	89.4
3.5	76.6	66.0	88.2
3.0	69.8	61.4	80.1
2.5	65.4	56.9	76.0
2.0	63.8	54.2	74.7
1.5	60.5	49.6	73.0
1.0	56.5	48.1	66.3
0.5	55.6	47.0	64.5
0.0	40.0	31.9	50.0

CAPB at the end of the episode			
CAPB level (percent of GDP)	Percentile		
	Full Sample	Advanced	Developing
7.0	92.5	90.2	95.4
6.5	89.5	86.3	94.4
6.0	88.2	83.8	93.3
5.5	85.4	80.6	92.2
5.0	81.6	73.6	90.9
4.5	79.7	71.9	89.2
4.0	72.6	64.6	82.7
3.5	70.4	62.0	80.4
3.0	66.7	57.4	78.0
2.5	61.1	52.2	71.4
2.0	56.9	49.1	65.5
1.5	53.0	45.6	61.3
1.0	47.9	39.6	57.4
0.5	39.4	30.8	48.4
0.0	32.2	23.5	40.6

Change in the actual primary balance from t to the end of the episode			
Actual change in the PB (percent of GDP)	Percentile		
	Full Sample	Advanced	Developing
12.0	91.2	91.8	91.7
11.5	90.1	89.8	90.6
11.0	87.8	87.4	90.0
10.5	86.7	85.3	89.6
10.0	85.1	82.1	89.1
9.5	84.4	80.8	88.7
9.0	83.6	79.4	88.2
8.5	80.8	76.0	86.9
8.0	78.5	74.1	84.7
7.5	76.7	72.6	81.1
7.0	70.8	67.6	75.5
6.5	64.0	63.0	66.3
6.0	59.6	58.8	60.8
5.5	52.4	50.4	55.0
5.0	48.1	46.2	50.1
4.5	40.8	42.1	39.8
4.0	37.0	36.9	36.9
3.5	30.1	25.8	34.6
3.0	19.9	13.1	26.1

Change in the CAPB from t to the end of the episode			
Change in the CAPB (percent of GDP)	Percentile		
	Full Sample	Advanced	Developing
12.0	91.4	90.5	93.5
11.5	89.0	89.0	90.6
11.0	86.8	88.3	86.0
10.5	86.0	87.7	85.0
10.0	85.3	86.8	84.3
9.5	84.6	85.4	83.6
9.0	79.7	80.4	80.3
8.5	78.5	79.6	77.7
8.0	77.0	78.8	74.8
7.5	73.8	75.5	72.5
7.0	69.2	70.8	68.5
6.5	63.8	61.8	66.6
6.0	58.6	52.7	65.3
5.5	56.7	51.3	62.1
5.0	52.6	49.5	55.7
4.5	43.7	44.9	42.3
4.0	39.4	41.2	36.9
3.5	31.4	30.4	31.3
3.0	24.2	20.9	26.9

Note: Percentiles are based on the cumulative distribution function for each group of countries. Blue (dark) indicates values below the 50<sup>th</sup> percentile; yellow (medium) indicates value between the 50<sup>th</sup> and 75<sup>th</sup> percentile; red (light) indicates values above the 75<sup>th</sup> percentile.



## B. What Was the Total Size of Fiscal Consolidation?

Changes in the actual primary balance and CAPB during the consolidation episodes were similar for advanced and developing countries. For advanced economy episodes, half reached a change in the actual primary balance of 5.5 percent of GDP (5.1 percent of GDP in cyclically adjusted terms), and a quarter reached 8.2 percent of GDP (7.4 percent of GDP in cyclically adjusted terms) (Table 3). For developing country episodes, half reached a change in the actual primary balance of 5 percent of GDP (4.7 percent of GDP in cyclically adjusted terms), and a quarter achieved 6.9 percent of GDP (8 percent of GDP in cyclically adjusted terms). Table 5 confirms that the results would be comparable even if different criteria were used in the sample selection. The level and change in the CAPB would be broadly similar when looking only at episodes during 1980-2009 instead of 1945-2012, using only episodes with primary gaps for two consecutive years above 1 percent instead of 2 percent of GDP, excluding cases of debt default, and including only episodes of countries with high debt.

Table 5. Level and Changes in CAPB Across Alternative Samples  
(Percent of potential GDP)

	CAPB, end of episode	Change in the CAPB, t to end of episode
<b>Median across episodes</b>		
Baseline	1.1	4.8
Only episodes between 1980-2008	2.6	4.7
Episodes with primary gap above 1 percent	1.5	4.3
Excluding episodes of debt default <sup>1</sup>	1.0	4.7
Only high debt episodes <sup>2</sup>	1.9	5.6
<b>75th percentile</b>		
Baseline	4.1	7.8
Only episodes between 1980-2008	5.3	7.1
Episodes with primary gap above 1 percent	4.1	7.1
Excluding episodes of debt default <sup>1</sup>	4.1	7.2
Only high debt episodes <sup>2</sup>	5.3	8.0

<sup>1</sup> Seven episodes are excluded from the sample because the country defaulted on its debt during the episode, as identified by Standard & Poor's.

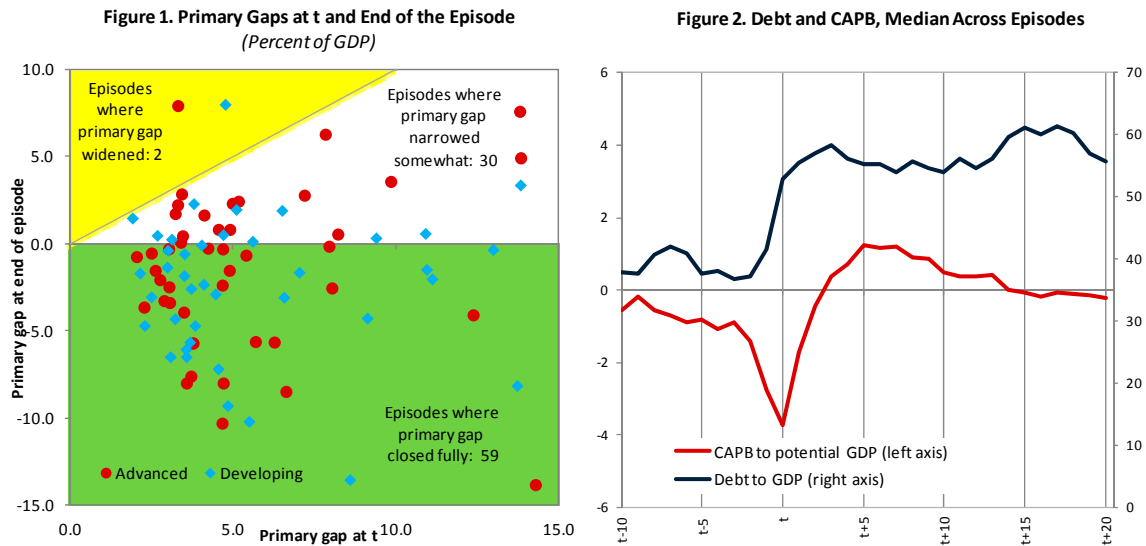
<sup>2</sup> Episodes with debt to GDP that is in the top half of the distribution: above 45.2 percent of GDP for advanced economies, and above 37.9 percent of GDP for developing countries at time t.

Table 4 also maps the sample distribution of the changes in the actual and cyclically adjusted primary balances. The table shows that a change in the CAPB of 5.5 percent of GDP—which corresponds to the difference between the estimated CAPB needed to stabilize debt to GDP

at 2013 levels and the CAPB observed in 2009 for advanced economies— is just below the 50<sup>th</sup> percentile of the sample distribution for advanced economies. This implies that countries were able to achieve this CAPB or higher in more than half of advanced economy episodes.

### C. Was Adjustment Enough to Stabilize Debt?

In most episodes, countries were able to stabilize debt (i.e., closing the primary gap), and in many cases went beyond to put debt on a downward path. Figure 1 shows that in two-thirds of the episodes, primary gaps were negative by the end of the episode, indicating that primary balances were high enough not only to stabilize debt but to start reducing it. This does not however imply that debt returned to initial levels. Indeed, debt-to-GDP ratios for the majority of episodes remained some 15 percent of GDP above the levels observed before the adjustment episode (Figure 2). While countries kept primary balances well above those observed before the adjustment episode, they did not sustain primary balances at the highest levels for prolonged periods of time.<sup>11</sup> This suggests that countries make substantial efforts to stabilize debt but, once this is achieved, they see room to ease primary balances and do not necessarily seek to get back to the lower initial debt-to-GDP ratio.<sup>12</sup>



<sup>11</sup> This result is in line with IMF (2013a), which finds that high primary surpluses may be easier to achieve than to maintain.

<sup>12</sup> Our analysis focuses on the size of fiscal consolidation implemented when countries have faced an adjustment need, and not on the factors that drive successful debt reduction. The analysis of Abbas and others (2013)—based on 26 episodes of large debt reversals in advanced economies since the 1980s and other empirical evidence—suggest that periods of decreasing debt were often associated with higher growth rates and strong primary balances. They also find that only about one-third of all fiscal consolidation spells—defined as a large adjustment in the CAPB—are successful in reducing debt levels.

In most cases, the improvement in the primary balance was the main contributor to closing the primary gap, though favorable interest rate-growth differentials also contributed. Figure 3 reveals that changes in the debt stabilizing primary balances were relatively small as compared to improvements in the primary balances.<sup>13</sup> Indeed, changes in the primary balance explain about 80 percent of the change in the primary gap across episodes. Figure 3 also shows that improvements in the interest rate-growth differential were not negligible, with a reduction of 2.9 percentage points between the beginning and the end of the episode, though only 1.4 percentage points in advanced economies. In advanced economies the improvement in r-g was driven in most part by a recovery in real GDP growth, while developing countries benefitted from a sharp decline in real interest rates (due to both a moderate decline in nominal interest rates and some rebound in inflation rates).

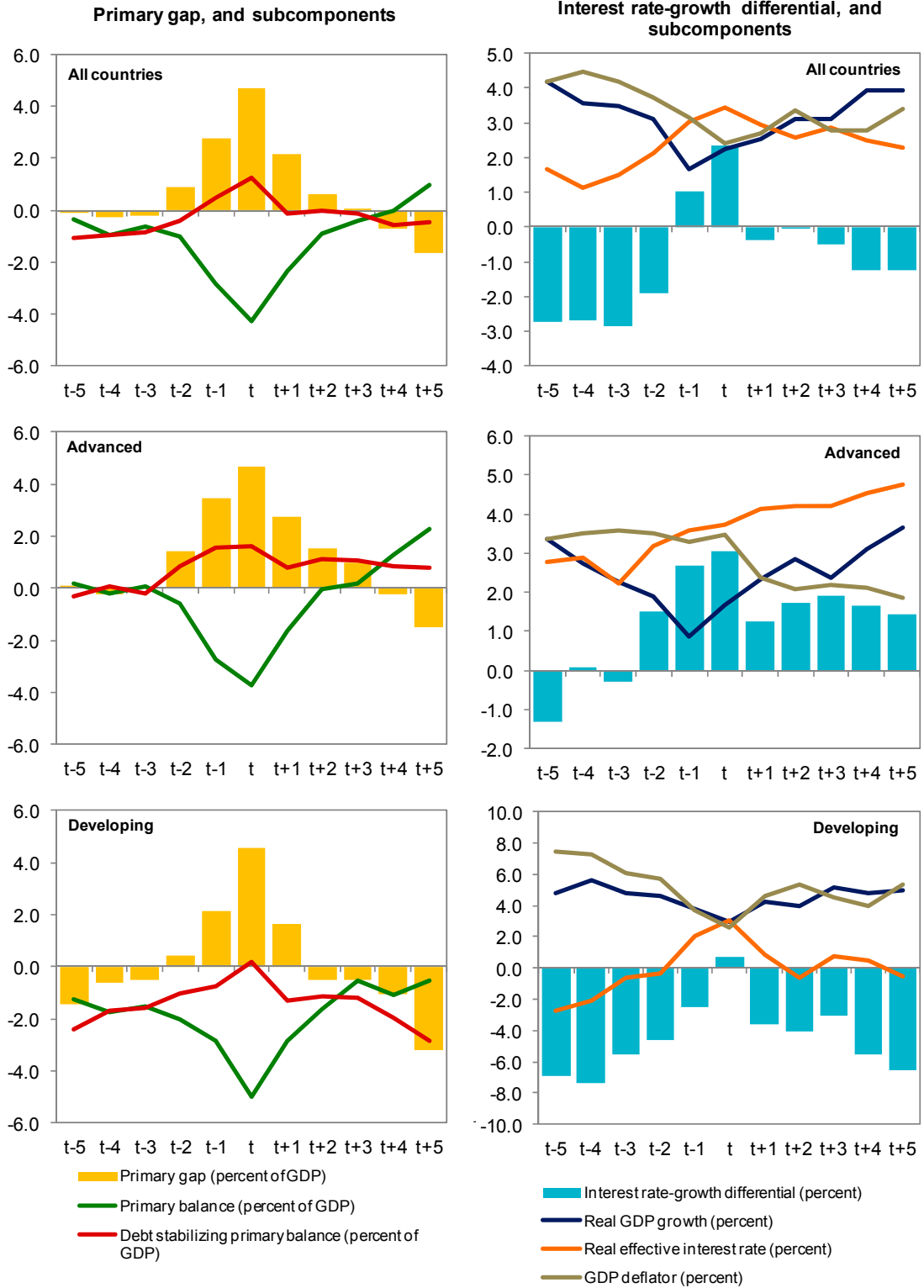
#### **D. Accompanying Factors**

Figure 4 illustrates other accompanying factors related to fiscal policy, the monetary and exchange rate environment, and credit conditions. Figure 4 offers the bilateral associations, and do not imply causality among the variables. Fiscal adjustments tend to be larger the longer the duration for both advanced and developing countries. However, there does not appear to be a strong relationship with the composition of fiscal adjustment. Countries that were able to reduce their short-term interest rates tended to have larger fiscal adjustments, more so in the case of advanced economies. Credit conditions, as measured by the change in credit to the private sector as a ratio to GDP, also appear to have a positive relationship with fiscal adjustment for both advanced and developing countries. However, the relationship between exchange rate movements and fiscal adjustment does not appear to be strong.

---

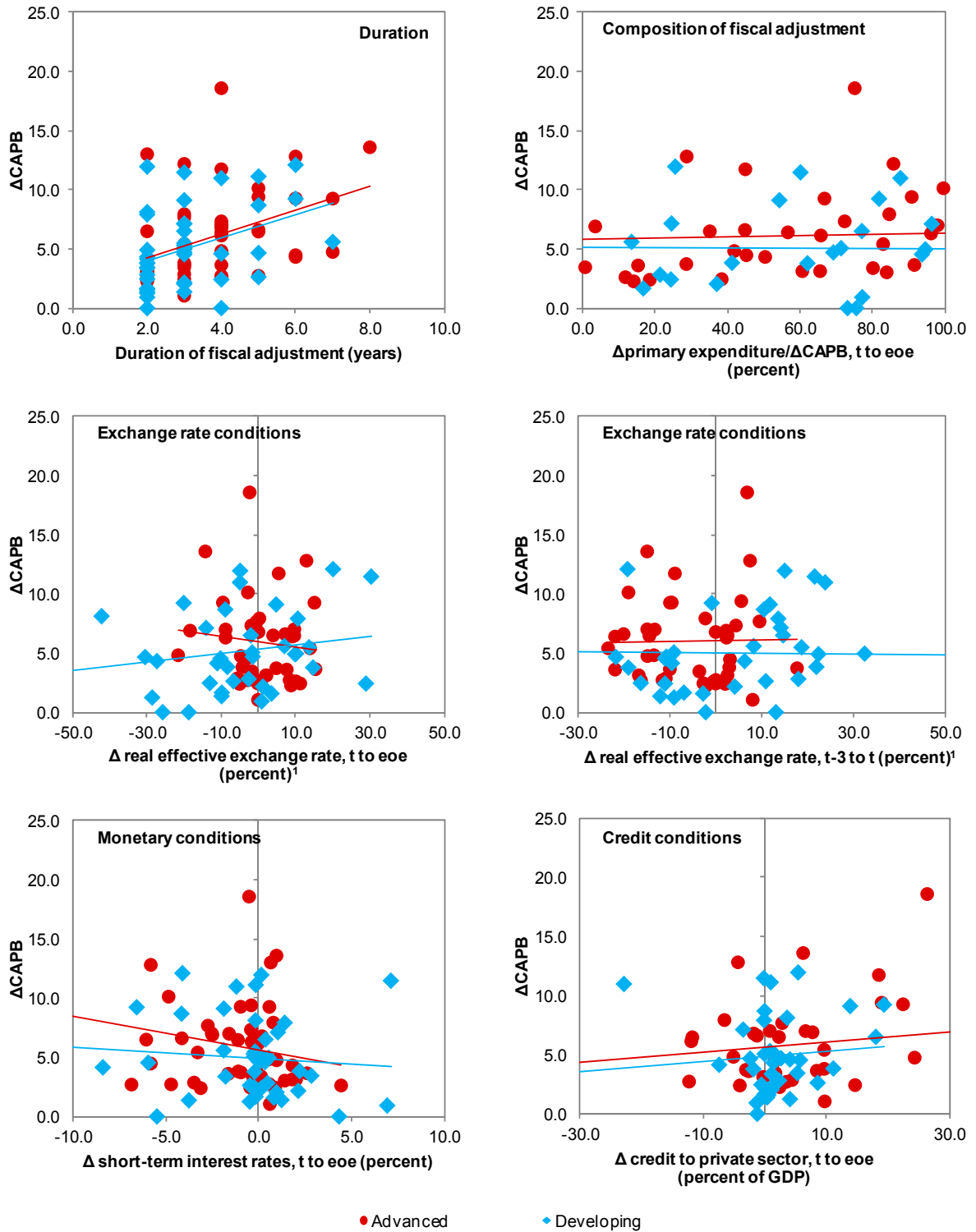
<sup>13</sup> In some cases, debt restructuring helped to close the primary gap (for example Ghana in 1982 and Argentina in 2002).

Figure 3. Primary Gap and the Interest Rate-Growth Differential (Percent of GDP)



Note: Graphs present the median across episodes.

Figure 4. Accompanying Factors



Note:  $\Delta\text{CAPB}$  is change in the cyclically adjusted primary balance from time t to the end of the episode (eoe), as a percent of potential GDP.

<sup>1</sup> "+" denotes appreciation.

## V. EMPIRICAL MODEL

### A. Model Specification and Data Sources

This section explores the conditions that accompanied fiscal adjustment across episodes, with special focus on the characteristics of fiscal adjustment, monetary and exchange rate conditions, and credit availability. Given the relative paucity of relevant episodes, our focus is not on a causal analysis. Rather, the exercise below allows us to present conditional correlations in order to identify the factors commonly associated with adjustment.

We estimate the following linear model by OLS using robust standard errors:

$$\Delta CAPB = \alpha + \beta_1 INI + \beta_2 ECO + \beta_3 FISC + \beta_4 MON + \beta_5 EXR + \beta_6 FIN + \mu \quad (3)$$

Where *INI* is a vector of initial budgetary conditions (*CAPB*, debt and primary gap), *ECO* is a vector of macroeconomic and global conditions (real GDP growth, inflation, and U.S. long-term interest rates), *FISC* is a vector of variables that characterize the fiscal adjustment strategy (duration and primary expenditure cuts as a percent of the total adjustment), *MON* captures monetary conditions proxied by the change in short-term interest rates, *EXR* includes exchange rate movements (before and during the episode), and *FIN* proxies credit availability by growth in domestic credit to the private sector as a percent of GDP.

The regression analysis is based on a cross-sectional dataset of 91 episodes over the period 1945-2012. Data are drawn from several databases. Fiscal variables and real GDP growth are from the WEO where available, and IFS and Mauro and others (2013) for the historical data. Inflation and trading partner real GDP growth are from WEO. Real effective exchange rates are from OECD, BIS, and IFS. Short-term interest rates and U.S. long-term interest rates are from IFS and WEO. Credit to the private sector as a percent of GDP is from the World Development Indicators.

### B. Results

Table 6 shows the results of the empirical analysis for all episodes, separating advanced and developing countries. Initial conditions are found to be significantly associated with the size of fiscal adjustments: a higher *CAPB* decreases the size of adjustment, but larger levels of debt increase the size of the adjustment. This result is in line with the findings of Kumar and others (2007), Ardagna (2009), Barrios and others (2010), and Afonso and Tovar Jalles (2011). For every additional percentage point in the initial *CAPB*, the size of the fiscal adjustment is 0.7–0.8 percent of GDP lower. This may indicate that large deficits made it more necessary to consolidate given possible financing constraints, and, at the same time, raised public awareness of the extent of the fiscal imbalance problem, making it easier to act. For every additional percentage point in the initial debt-to-GDP ratio, the subsequent size of the adjustment increases by 0.02 for the full sample (column 1), and doubles to

0.04 percentage points of GDP for developing countries (column 6), though it is no longer significant for advanced countries in the simplified specification (column 4).<sup>14</sup> This implies that a developing country that started the episode with debt of 60 percent of GDP could be expected to adjust by 1¼ percentage point of GDP more than a country that started with a 30 percent of GDP debt ratio. Although the primary gap is significant when all countries are included (columns 1 and 2), it ceases to be significant when the sample is split.

Accompanying macroeconomic conditions show weaker significance than expected. For developing countries, average real GDP growth between the beginning and the end of the episode is found to be significant, with a negative sign. This could have several alternative interpretations. The result suggests that developing countries tend to follow procyclical policies, as countries can afford to reduce their fiscal adjustment effort if growth is strong without compromising their objective of stabilizing debt. The negative relationship between growth and adjustment could also be related to availability of financing, as weak growth prospects could constrain developing countries' access to international capital markets at a time of still emerging domestic markets, requiring them to run lower deficits. However, given that each episode spans over a number of years, the result could also be picking up some reverse causality, where a large fiscal consolidation takes a toll on economic activity. Interestingly, average real GDP growth is not significant for advanced countries, consistent with Molnar (2012) who finds economic growth to be insignificant except for very small consolidations. This finding implies that experience across advanced economies has been diverse, perhaps reflecting differences in terms of financing constraints or in terms of the impact of consolidation on economic activity. Inflation and U.S. long-term interest rates were not found to be significant.<sup>15</sup>

The design of the fiscal adjustment instead plays a crucial role. The duration of the adjustment is a clear factor explaining larger adjustments, in line with Afonso and Tovar Jalles (2011) and Molnar (2012). For every additional year of adjustment, the size increases by 1 percentage point in advanced countries and 0.6 percentage points in developing countries. This likely reflects the fact that it takes longer to achieve larger consolidations. Primary expenditure cuts as a percent of total fiscal adjustment are found to be significant in the case of advanced countries (column 3), consistent with the findings of previous studies.

---

<sup>14</sup> This result is consistent with Mendoza and Ostry (2008) who find that the response of the primary balance to debt in advanced and emerging market economies with a history of high debt (median debt ratio exceeding 57.8 percent and 64.5 percent of GDP, respectively) is not statistically different from zero. In our sample, 60 percent of advanced economy episodes have debt above the corresponding threshold, while only 20 percent of developing country episodes exceed the threshold.

<sup>15</sup> Trading partner real GDP growth, average U.S. real GDP growth and average world real GDP growth rates were also used as alternative proxies for real GDP growth, but were not significant. The Goldman Sachs financial conditions index was used as another measure of global liquidity instead of the U.S. long-term interest rate, but it was not significant either.

However, we find the coefficient to be relatively modest, and it loses significance in the simplified specification (column 4). The composition of adjustment is not found to be significant in the case of developing countries. This could be related to relatively lower initial revenue-to-GDP ratios that provided more room to implement tax reforms in the case of large adjustments, as found by Baldacci and others (2010) and Gupta and others (2005). Overall, the results suggest that the ability to implement large fiscal adjustment is affected more by how long the effort is sustained rather than the balance between expenditure cuts and revenue raising measures.

Changes in the short-term interest rates during the episode were found to be an important factor for both advanced and developing countries. For every one percentage point reduction in short-term interest rates, fiscal adjustment was found to be 0.4 percentage points of GDP higher in the case of advanced economies, and 0.2 percentage points of GDP higher in the case of developing countries. Changes in real short-term interest rates (defined as nominal rates minus the GDP deflator) were also found to be significant, but the nominal measure provided a better fit of the model.<sup>16</sup> This suggests that monetary policy helped consolidation efforts by supporting economic activity through lower interest rates, as also found in Ahrend and others (2006) and Baldacci and others (2010).

In contrast, exchange rate depreciations were not found to be significant, whether preceding or during the episode. Several alternative measures were used but all were insignificant: nominal exchange rate against the U.S. dollar (NER); nominal effective exchange rate (NEER); real effective exchange rate (REER); a dummy variable equal to 1 if there was an appreciation of the exchange rate (NER, NEER, or REER); and a dummy variable equal to 1 if the REER was above a long-term average. The results are not surprising given that the literature is inconclusive regarding the effects of exchange rate developments on fiscal consolidation, with several studies reporting no effect (McDermott and Wescott, 1996; Barrios and others, 2010). The role of exchange rates in the regression could also be subdued to the extent that its effect on competitiveness and exports is mainly picked up through the real GDP growth variable.

---

<sup>16</sup> The change in the monetary policy stance relative to what would be expected to occur under a Taylor rule was not found to be significant. This could be due to the simplifying assumptions used to calculate the Taylor rule across episodes or to different nominal anchors used by countries over the time frame of the sample. As in Ahrend, Catte, Price (2006), the Taylor rule was constructed only for changes in real short interest rates, assigning a 0.5 percent weight to both changes in inflation and in the output gap. Unlike calculating the interest rate levels prescribed by a Taylor rule, this does not require assumptions regarding the levels of the neutral real interest rate and the inflation target.



Table 6. Determinants of the Size of Fiscal Adjustment

	(1)	(2)	(3)	(4)	(5)	(6)
	All countries	All countries	Advanced	Advanced	Developing	Developing
CAPB as percent of potential GDP, at t	-0.560*** (-4.808)	-0.572*** (-5.026)	-0.544** (-2.218)	-0.698*** (-4.614)	-0.635*** (-3.044)	-0.768*** (-3.738)
Debt as percent GDP, at t	0.0220* (1.916)		0.0229* (1.948)		0.0287 (1.366)	0.0414*** (5.679)
Primary gap as percent of GDP, at t	0.0987* (1.709)	0.188*** (6.258)	-0.00457 (-0.0207)		0.0760 (0.789)	
Real GDP growth, average t+1 to the end of the episode, percent	-0.288*** (-2.943)	-0.247*** (-3.485)	0.0357 (0.113)		-0.279 (-1.655)	-0.340** (-2.616)
Inflation, average t+1 to the end of the episode, percent	-0.00278 (-0.105)		0.275* (1.938)		-0.0414 (-0.848)	
Real GDP growth in trading partner countries, average t+1 to the end of the episode, percent	0.0740 (0.389)		0.332 (0.771)		-0.0195 (-0.0631)	
U.S. long-term interest rate, average t+1 to the end of the episode, percent	-0.0584 (-0.568)		-0.212 (-1.421)		0.0646 (0.301)	
Duration of the episode, years	0.889*** (4.030)	0.871*** (4.548)	1.029*** (4.533)	0.953*** (4.213)	0.751 (1.638)	0.632* (1.713)
Primary expenditure cuts as a share of total fiscal adjustment, percent	0.00279 (0.409)		0.0184* (2.031)		-0.00344 (-0.288)	
Change in the short term interest rate between t and the end of the episode	-0.196*** (-2.833)	-0.240*** (-3.093)	-0.291* (-1.910)	-0.423*** (-3.697)	-0.106 (-0.924)	-0.197*** (-2.876)
Change in the nominal exchange rate between t and the end of the episode (+ appreciation)	0.000717 (0.0512)		-0.0177 (-1.047)		-0.0201 (-0.573)	
Change in the nominal exchange rate between t-3 and t (+ appreciation)	0.0213** (2.132)		-0.0142 (-0.858)		0.0312 (1.136)	
Change in credit to GDP between t and the end of the episode	0.0484*** (2.976)	0.0567*** (3.236)	0.0676** (2.260)	0.0509** (2.039)	0.0314 (1.309)	0.0298* (1.737)
Dummy = 1 if there was a financial crisis as defined by Laeven and Valencia (2012)	0.175 (0.190)		1.927 (1.243)		0.974 (0.555)	
Dummy = 1 for advanced countries	-1.400** (-2.187)					
Constant	-0.464 (-0.337)	-0.177 (-0.223)	-5.320** (-2.116)	-0.701 (-0.863)	0.125 (0.0695)	-0.511 (-0.379)
Observations	81	83	43	44	38	39
R-squared	0.723	0.671	0.784	0.702	0.769	0.735

Robust t-statistics in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Credit conditions are found to be a significant factor in fiscal consolidation, though the size of the coefficient is small. A one percentage point increase in credit to the private sector as a percent of GDP is associated with a 0.05 percent of GDP higher adjustment for advanced economies and 0.03 percent of GDP higher adjustment for emerging economies. This effect of credit expansion on fiscal consolidation is above and beyond its indirect impact through real GDP growth. Two alternative measures to capture the ability of the financial sector to extend credit were also tested, but were not found to be significant: a dummy equal to 1 if the country experienced a financial crisis between the beginning and the end of the episode (as identified by Laeven and Valencia, 2012, and Reinhart and Rogoff, 2008) and a dummy equal to 1 if there was a credit boom in the previous five years to the episode (estimated in line with Dell’Arricia and others, 2012). These results suggest that what matters for fiscal consolidation is not whether a country has faced financial sector stress but how much this impairs its ability to extend credit to the private sector.

The results were robust to alternative specifications. Table 7 shows that the results of the simplified specifications remain broadly the same when the sample is limited to episodes between 1980 and 2008, which removes the fiscal consolidation episodes of the most recent crisis that may still be ongoing and the earlier episodes where data may be less reliable.<sup>17</sup> Only the coefficient on duration appears to be somewhat lower for both advanced and developing countries. The last column of Table 7 shows the results limiting the sample to only episodes with high debt—defined as countries with debt to GDP in the top half of the distribution of the entire sample (all country/years, not only those corresponding to selected episodes)—which corresponds to debt to GDP above 45.2 percent for advanced countries and above 37.9 percent for developing countries. In this case, the sample is not split among advanced and developing countries because of the lower number of observations. Again, the results are very similar to the baseline specification.

---

<sup>17</sup> Including additional variables to these simplified specifications does not materially alter the significance and size of coefficients.

Table 7. Determinants of the Size of Fiscal Adjustment, Robustness Checks

	Advanced 1980-2008	Developing 1980-2008	All countries High debt 1/
CAPB as percent of potential GDP, at t	-0.700*** (-4.401)	-0.964*** (-3.714)	-0.590*** (-4.198)
Debt as percent GDP, at t		0.0415*** (6.426)	
Real GDP growth, average t+1 to the end of the episode, percent		-0.290** (-2.158)	-0.211* (-1.782)
Duration of the episode, years	0.717** (2.676)	0.418* (1.708)	0.954*** (3.093)
Change in the short term interest rate between t and the end of the episode	-0.432*** (-3.721)	-0.239*** (-3.314)	-0.249*** (-2.707)
Change in credit to GDP between t and the end of the episode	0.0528** (2.059)	0.0315* (1.706)	0.0705** (2.486)
Constant	0.325 (0.317)	-0.843 (-0.678)	-0.466 (-0.342)
Observations	34	32	50
R-squared	0.670	0.821	0.677

Robust t-statistics in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

1/ Countries with debt to GDP that is in the top half of the distribution: above 45.2 percent in the case of advanced countries and above 37.9 percent in the case of developing countries.

## VI. HOW MUCH IS A LOT?

The analysis above can help inform the assessment on the feasible size of fiscal adjustment. Clearly, the econometric analysis provides results based on an average across the sample of selected episodes which may or may not apply to a particular country at a particular point in time. Nonetheless, drawing on that average experience, we can identify factors typically associated with the size of fiscal adjustment and their broad order of magnitude.

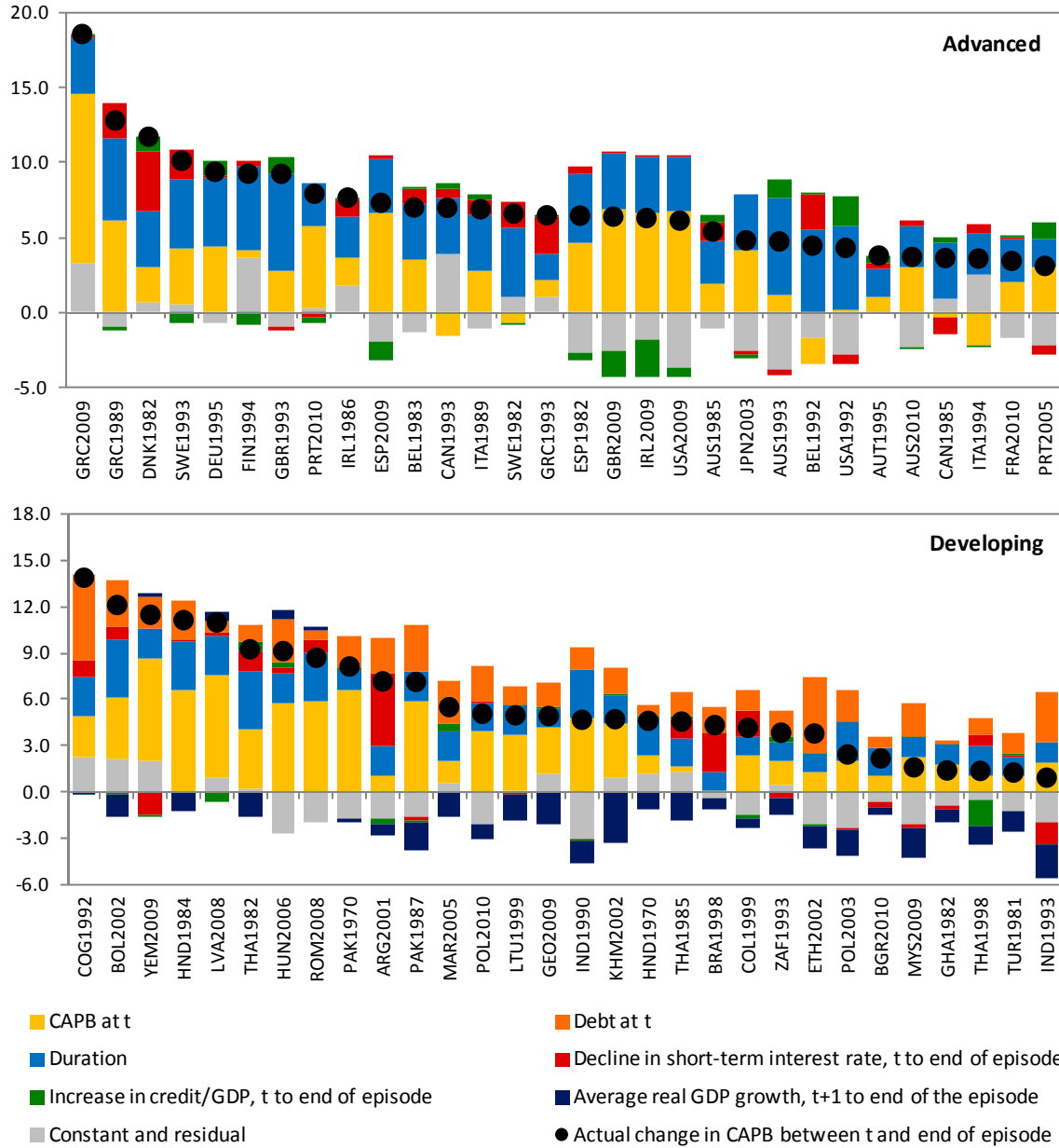
Figure 5 provides the fitted values of total fiscal adjustment based on the models in Table 6 (column 4 for advanced countries and column 6 for developing countries), with a breakdown of these factors.

- Among all factors, those that have been more strongly associated with the size of fiscal adjustment have been the initial level of the CAPB and the duration of the adjustment. Although the coefficient on the initial CAPB is lower for developing countries than for advanced economies, developing countries tended to start off with higher deficits and therefore the initial CAPB appears to be the dominant factor for the size of fiscal adjustment. The duration of the fiscal adjustment episode was associated with fiscal adjustment, more so in advanced economies than in developing countries. Countries with higher initial debt also tended to have larger fiscal consolidations in the case of developing countries.

- Episodes where the short-term interest rate declined over the adjustment period tended to have a larger fiscal adjustment, both for advanced and developing countries. Although countries that saw an increase in short-term interest rates tended to have a smaller fiscal adjustment, its effect was relatively small compared to other factors.
- The effect of changes in credit to the private sector as a percent of GDP is more visible in the case of advanced economies than in developing economies, both because the coefficient on this factor is larger but also because the magnitude of the changes in the credit-to-GDP ratio was larger for this group. Interestingly, there is no clear trend among the larger fiscal adjustments in terms of expansion or contraction of credit to GDP, as the experience seems to be mixed across these episodes. However, credit contraction appears to have been a more important factor in some of the more recent episodes of fiscal adjustment.
- In the case of developing countries, higher average real GDP growth during the episode tended to be associated with smaller fiscal adjustment. The few cases that saw average negative growth rates, occurring mainly during the recent crisis, were among those with the largest adjustment.

These results can help assess the feasible size of fiscal adjustment by identifying some of the elements that could facilitate or constrain fiscal consolidation and their relative importance. In the context of the global crisis, several advanced economies faced large initial deficits and debt, and several adopted consolidation strategies to be sustained over several years. These elements point to the possibility of implementing relatively large fiscal adjustments. However, past experience shows that fiscal adjustment tended to be higher when accompanied by a reduction in short-term interest rates, which may not be a favorable factor in the current environment where short-term interest rates are already at very low levels. There is also the risk that credit continues to be weak in several countries (IMF, 2014b), which historical experience shows would be a negative factor for the size of fiscal adjustment.

Figure 5. Contribution from Accompanying Factors to Fiscal Adjustment  
(Percent of potential GDP)



## VII. CONCLUSIONS

The credibility of fiscal adjustment plans hinges on the realism of the adjustment path. This paper attempts to respond to the question: “How much is a lot?” by drawing on historical experiences of fiscal adjustment in both advanced and developing countries, and across a wide time span. Past consolidation episodes show that when countries faced a fiscal adjustment need in order to stabilize debt to GDP and were willing to address this imbalance, they were able to implement sizeable fiscal consolidation: at least half managed to improve their primary balances by about 5 percent of GDP, and a quarter of countries improved by 7½ percent of GDP.

The analysis also finds that most countries stabilized their debt-to-GDP ratios by the end of the episode, albeit at higher levels. While countries closed their primary gaps and kept primary balances well above those observed before the adjustment episode, they did not sustain primary balances at the highest levels for prolonged periods of time. This suggests that countries make substantial efforts to stabilize debt but, once this has been achieved, they see room to ease primary balances and do not necessarily seek to get back to the lower initial debt-to-GDP ratio.

We also find that the size of fiscal adjustment is significantly associated with several important factors. Fiscal adjustment was larger the greater the initial deficit and when adjustment efforts were sustained in time. The results also show that fiscal adjustment tended to be larger when accompanied by an easing of monetary conditions and, to a lesser extent, an improvement in credit conditions.

Appendix Table. List of Episodes

Advanced Economies			Developing Countries		
Country	Selection year (t)	First Year of Adjustment (t+1)	Country	Selection year (t)	First Year of Adjustment (t+1)
Australia	1978	1979	Argentina	2001	2002
Australia	1985	1986	Armenia	2009	2010
Australia	1993	1994	Bolivia	2002	2003
Australia	2010	2011	Brazil	1998	1999
Austria	1995	1996	Bulgaria	2010	2011
Belgium	1959	1960	Burkina Faso	2009	2010
Belgium	1983	1984	Cambodia	2002	2003
Belgium	1992	1993	Chad	2009	2010
Canada	1985	1986	China	1999	2000
Canada	1993	1994	Colombia	1999	2000
Denmark	1982	1983	Congo, Republic of	1992	1993
Finland	1994	1995	Congo, Republic of	1998	1999
France	1995	1996	Ethiopia	2002	2003
France	2003	2004	Georgia	2009	2010
France	2010	2011	Ghana	1963	1964
Germany	1975	1976	Ghana	1982	1983
Germany	1982	1983	Honduras	1970	1971
Germany	1995	1996	Honduras	1984	1985
Germany	2002	2003	Hungary	2006	2007
Greece	1951	1952	India	1959	1960
Greece	1989	1990	India	1986	1987
Greece	1993	1994	India	1990	1991
Greece	2009	2010	India	1993	1994
Ireland	1954	1955	India	2000	2001
Ireland	1957	1958	Latvia	2008	2009
Ireland	1986	1987	Lithuania	1999	2000
Ireland	2009	2010	Malaysia	2009	2010
Italy	1989	1990	Morocco	2005	2006
Italy	1994	1995	Nigeria	2010	2011
Japan	2003	2004	Pakistan	1963	1964
Korea	1961	1962	Pakistan	1970	1971
Korea	1966	1967	Pakistan	1978	1979
Netherlands	1981	1982	Pakistan	1987	1988
Netherlands	2010	2011	Poland	2003	2004
Portugal	2005	2006	Poland	2010	2011
Portugal	2010	2011	Romania	2008	2009
Spain	1982	1983	Senegal	2011	2012
Spain	1985	1986	South Africa	1993	1994
Spain	1993	1994	Thailand	1982	1983
Spain	2009	2010	Thailand	1985	1986
Sweden	1979	1980	Thailand	1998	1999
Sweden	1982	1983	Turkey	1981	1982
Sweden	1993	1994	Yemen	2009	2010
United Kingdom	1993	1994			
United Kingdom	2009	2010			
United States	1946	1947			
United States	1992	1993			
United States	2009	2010			

## REFERENCES

- Abbas, A.S. M., B. Akitoby, J.R. Andritzky, H. Berger, T. Komatsuzaki, and J. Tyson, 2013, "Dealing with Debt in and Era of Low Growth," IMF Staff Discussion Note No. 13/7 (Washington: International Monetary Fund).
- Afonso, A., and J. T. Jalles, 2011, "Measuring the Success of Fiscal Consolidations," University of Lisbon Department of Economics Working Paper No. 22/2011/DE/UECE (Lisbon: University of Lisbon).
- Ahrend, R., P. Catte, and R. Price, 2006, "Interactions between Monetary and Fiscal Policy: How Monetary Conditions Affect Fiscal Consolidation," OECD Economics Department Working Paper No. 521 (Paris: Organisation for Economic Co-operation and Development).
- Alesina A., and S. Ardagna, 1998, "Tales of Fiscal Adjustment," *Economic Policy*, Vol. 13, No. 27, pp. 487–545.
- , 2009, "Large Changes in Fiscal Policy: Taxes versus Spending," NBER Working Paper No. 15438 (Cambridge: National Bureau of Economic Research).
- Alesina, A., and R. Perotti, 1995, "Fiscal Expansions and Fiscal Adjustments in OECD Countries," NBER Working Paper No. 5214 (Cambridge: National Bureau of Economic Research).
- , 1997, "Fiscal Adjustments in OECD Countries: Composition and Macroeconomic Effects," *IMF Staff Papers*, Vol. 44, No. 2, June.
- Ardagna, S., 2004, "Fiscal Stabilizations: When They Work and Why," *European Economic Review*, 48, pp. 1047–74.
- , 2009, "Determinants and Consequences of Fiscal Consolidations in OECD Countries," European Commission Economic Papers 377 (Brussels: European Commission).
- Baldacci, E., B. Clements, S. Gupta, and C. Mulas-Granados, 2004, "Front-Loaded or Back-Loaded Fiscal Adjustments: What Works in Emerging Market Economies?" IMF Working Paper No. 04/157 (Washington: International Monetary Fund).
- , 2010, "Restoring Debt Sustainability After Crises: Implications for the Fiscal Mix," IMF Working Paper No. 10/232 (Washington: International Monetary Fund).



- , 2013, “Debt Reduction, Fiscal Adjustment, and Growth in Credit-Constrained Economies,” IMF Working Paper No. 13/238 (Washington: International Monetary Fund).
- Barrios, S., S. Langedijk, and L. Pench, 2010, “EU fiscal Consolidation after the Financial Crisis: Lessons from Past Experiences,” European Commission Economic Papers No. 418 (Brussels: European Commission).
- Bénétrix, A., and P. Lane, 2011, “Financial Cycles and Fiscal Cycles,” IIS Discussion Paper No. 403 (Dublin: Institute for International Integration Studies).
- Blanchard, O, 1993, “Suggestions for a New Set of Fiscal Indicators,” in *The Political Economy of Government Debt*, ed. by H.A.A. Verbon and F.A.A.M. van Winden (North-Holland: Elsevier Science Publishers).
- Cottarelli, C., and J. Escolano, 2014, “Debt Dynamics,” in *Post-Crisis Fiscal Policy*, ed. by C. Cottarelli, P. Gerson, and A. Senhadji (Cambridge: MIT Press).
- Dell’Ariccia, G., D. Igan, L. Laeven, H. Tong, B. Bakker, and J. Vandenbussche, 2012, “Policies for Macrofinancial Stability: How to Deal with Credit Booms,” IMF Staff Discussion Note No. 12/06 (Washington: International Monetary Fund).
- Devries, P., J. Guajardo, D. Leigh, and A. Pescatori, 2011, “An Action-based Analysis of Fiscal Consolidation in OECD Countries,” IMF Working Paper No. 1/128 (Washington: International Monetary Fund).
- Eichengreen, B., and U. Panizza, 2014, “A Surplus of Ambition: Can Europe Rely on Large Primary Surpluses to Solve Its Debt Problem?” NBER Working Paper No. 20316 (Cambridge: National Bureau of Economic Research).
- Escolano, J., 2010, “A Practical Guide to Public Debt Dynamics, Fiscal Sustainability, and Cyclical Adjustment of Budgetary Aggregates,” IMF Technical Notes and Manuals No. 10/02 (Washington: International Monetary Fund).
- Giavazzi, F., and M. Pagano, 1990, “Can Severe Fiscal Contractions be Expansionary? Tales of Two Small European Countries,” NBER Working Paper No. 3372 (Cambridge: National Bureau of Economic Research).
- Guichard, S., M. Kennedy, E. Wurzel, and C. André, 2007, “What Promotes Fiscal Consolidation: OECD Country Experiences,” OECD Economics Department Working Paper No. 553 (Paris: Organisation for Economic Co-operation and Development).

- Guajardo, J., D. Leigh, and A. Pescatori, 2014, “Expansionary Austerity: New International Evidence,” *Journal of the European Economic Association*, Vol. 12, No. 4, pp. 949–68.
- Gupta, S., E. Baldacci, B. Clements, and E.R. Tiongson, 2005, “What Sustains Fiscal Consolidations in Emerging Market Countries?” *International Journal of Finance and Economics*, Vol. 10, pp. 307–21.
- Hjelm, G., 2002, “Effects of Fiscal Contractions: The Importance of Preceding Exchange Rate Movements,” *Scandinavian Journal of Economics*, Vol. 104, No. 3, pp. 423–41.
- Heylen, F., and G. Everaert, 2000, “Success and Failure of Fiscal Consolidation in the OECD: A Multivariate Analysis,” *Public Choice*, Vol. 105, pp. 103–24.
- International Monetary Fund, 2003, *Evaluation Report: Fiscal Adjustments in IMF-Supported Programs* (Washington).
- , 2011, *Fiscal Monitor, September 2011: Addressing Fiscal Challenges to Reduce Economic Risks*, World Economic and Financial Surveys (Washington).
- , 2013a, *Fiscal Monitor, April 2013: Fiscal Adjustment in an Uncertain World*, World Economic and Financial Surveys (Washington).
- , 2013b, Staff Guidance Note for Public Debt Sustainability Analysis In Market-Access Countries, IMF Policy Paper (Washington).
- , 2014a, *Fiscal Monitor, April 2014: Public Expenditure Reform—Making Difficult Choices*, World Economic and Financial Surveys (Washington).
- , 2014b, *World Economic Outlook, April 2014: Recovery Strengthens, Remains Uneven*, World Economic and Financial Surveys (Washington).
- Kumar, M.S., D. Leigh, and A. Plekhanov, 2007, “Fiscal Adjustments: Determinants and Macroeconomic Consequences,” IMF Working Paper No. 07/178 (Washington: International Monetary Fund).
- Lambertini, L., and J. Tavares, 2007, “Exchange Rates and Fiscal Adjustments: Evidence from OECD and Implications for EMU,” *Contributions in Macroeconomics*, Vol. 5, No. 1.
- Laeven, L., and F. Valencia, 2012, “Systemic Banking Crises Database: An Update,” IMF Working Paper No. 12/163 (Washington: International Monetary Fund).

- Lavigne, R., 2011, "The Political and Institutional Determinants of Fiscal Adjustment: Entering and Exiting Fiscal Distress," *European Journal of Political Economy*, Vol. 27, No. 1, pp. 17–35.
- Mati, A., and J. Thornton, 2008, "The Exchange Rate and Fiscal Consolidation Episodes in Emerging Market Economies," *Economics Letters*, Vol. 100, pp. 115–8.
- McDermott, C.J., and R.F. Wescott, 1996, "An Empirical Analysis of Fiscal Adjustments," *IMF Staff Papers*, Vol. 43, No. 4.
- Mendoza, E., and J. Ostry, 2007, "International Evidence on Fiscal Solvency: Is Fiscal Policy "Responsible"?" NBER Working Paper No. 12947 (Cambridge: National Bureau of Economic Research).
- Molnar, M., 2012, "Fiscal Consolidation: Part 5. What Factors Determine the Success of Consolidation Efforts?" OECD Economics Department Working Papers No. 936 (Paris: Organisation for Economic Co-operation and Development).
- Mauro, P., 2011, *Chipping Away at Public Debt: Sources of Failure and Keys to Success in Fiscal Adjustment* (Washington: International Monetary Fund).
- Mauro, P., R. Romeu, R. Binder, and Z. Asad, 2013, "A Modern History of Fiscal Prudence and Profligacy," IMF Working Paper No. 13/05 (Washington: International Monetary Fund).
- Molnar, M., 2012, "Fiscal Consolidation: Part 5. What Factors Determine the Success of Consolidation Efforts?" *OECD Economics Department Working Papers* No. 936.
- Perotti R., 2012, "The Austerity Myth: Growth without Pain?" in *Fiscal Policy after the Financial Crisis*, ed. by A. Alesina and F. Giavazzi (Chicago: University of Chicago Press).
- Reinhart, C. and K. Rogoff, 2008, "This Time is Different: A Panoramic View of Eight Centuries of Financial Crises," NBER Working Paper No. 13882 (Cambridge: National Bureau of Economic Research).
- Riera-Crichton, D., C.A. Vegh, and G. Vuletin, 2012, "Tax Multipliers: Pitfalls in Measurement and Identification," NBER Working Papers No. 18497 (Cambridge: National Bureau of Economic Research).
- Romer, C., and D. Romer, 2010, "The Macroeconomic Effects of Tax Changes: Estimates Based on a New Measure of Fiscal Shocks," *American Economic Review*, Vol. 100, No. 3, pp. 763–801.

- Tsibouris, G. C., Horton, M. A., Flanagan, M. J., and W. Maliszewski, 2006, “Experience with Large Fiscal Adjustments,” IMF Occasional Paper No. 246 (Washington: International Monetary Fund).
- Von Hagen, J., A. H. Hallett, and R. Strauch, 2002, “Budgetary consolidation in Europe: Quality, Economic Conditions, and Persistence,” *Journal of the Japanese and International Economies*, Vol. 16, pp. 512–35.
- Von Hagen, J., and R. Strauch, 2001, “Fiscal Consolidations: Quality, Economic Conditions and Success,” *Public Choice*, Vol. 109, pp. 327–46.
- Zheng, L., 2014, “Determinants of the Primary Fiscal Balance: Evidence from a Panel of Countries,” in *Post-Crisis Fiscal Policy*, ed. by C. Cottarelli, P. Gerson, and A. Senhadji (Washington: International Monetary Fund).