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## To Consolidate or Not to Consolidate? A Multi-Step Analysis to Assess Needed Fiscal Sustainability

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# To Consolidate or Not to Consolidate? A Multi-Step Analysis to Assess Needed Fiscal Sustainability

## Abstract

We assess the specific need (or its absence) of a country to implement a fiscal consolidation programme by focusing specifically on their degree of success, notably in terms of fiscal sustainability. The “need” to consolidate is based on having a primary balance above or below the debt-stabilizing primary balance (provided by the IMF’s Debt Sustainability Analysis) for each country. We then link the need for and the actual (historical) existence of fiscal adjustments to their sustainability impact. Looking at a large sample of developed and developing economies over the period 1980-2018, we find that, on average, there is a higher need of consolidations in advanced economies than in developing economies. In addition, the implementation of a fiscal consolidation program implies an improvement in the degree of public finances’ sustainability, for in advanced and developing economies. Finally, fiscal sustainability deteriorates when the need to implement a fiscal retrenchment arises.

JEL-Codes: C230, E210, E620, H500, H620.

Keywords: fiscal consolidation, cyclically-adjusted primary balance, sustainability, panel data, time-varying.

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## 1. Introduction

The consensus among scholars regarding the importance of fiscal policy for macroeconomic stability emphasises the necessity of analysing the degree of public finance sustainability. The fiscal sustainability topic has become more relevant since the Global Financial Crisis of 2007/2008 and the subsequent Sovereign Debt Crisis that mainly affected European countries, when it became clearer the unsustainable path that public finances had evolved in several economies. As a result of the large fiscal (and external) imbalances observed, some countries received financial assistance from internationally recognized policy institutions, namely some Euro-area peripheral countries, aiming restoring a sustainable path for fiscal policy.

Notwithstanding the relevance of fiscal policy sustainability, analyses on the so-called expansionary fiscal consolidations has received much attention. The macroeconomic effects of such fiscal consolidations, related with the notion of non-Keynesian effects, are well described in the literature (see, for instance, von Hagen and Strauch, 2001, van Aarle and Garretsen, 2003, Giudice et al., 2007, Alesina et al., 2015, Alesina et al., 2019, Afonso and Leal, 2020, Afonso et al., 2021). In addition to looking at the non-Keynesian effects, the literature has devoted time and effort to identify fiscal episodes, i.e., periods when the change in the cyclically adjusted primary balance is greater than an ad-hoc positive threshold value (contractionary “discretionary” fiscal policy) or lower than a negative threshold value (expansionary “discretionary” fiscal policy). Several studies have reflected on those referred thresholds, suggesting different approaches to assess if a given economy is experiencing a contractionary or an expansionary fiscal episode (see Giavazzi and Pagano, 1996, Alesina et al., 1998, and Afonso, 2010). However, the literature has not paid much attention for the specific need (or its absence) of a country to implement a fiscal consolidation. Moreover, policymakers can engage into fiscal consolidations, regardless whether it is actually needed, possibly with different fiscal (and economic) outcomes.

On this note, in this paper we evaluate four possible scenarios of fiscal policy: (i) an economy should and then performs a fiscal consolidation; (ii) an economy should but then does not run a fiscal consolidation; (iii) an economy does not need but still consolidates its public finances; and lastly, (iv) an economy does not need and does not consolidate.

Consequently, we evaluate how these different set of cases impact on an estimated measure proxying the degree of fiscal sustainability. In other words, in our final step in the empirical analysis we study the effects of the need for fiscal consolidations by focusing on their degree of success of fiscal consolidations, measured in terms of an estimated time-varying fiscal

sustainability coefficient. The “need” to consolidate is based on having a primary balance above or below the debt-stabilizing primary balance (DSPB), provided by the IMF’s Debt Sustainability Analysis (DSA) for each country. The multi-step analysis proposed links the need for and the actual (historical) fiscal adjustments to their sustainability impact.

Looking at a large sample of developed and developing economies over the period 1980-2018, our results, show that, on average, there is a higher need of consolidations in advanced economies than in developing economies. In addition, the implementation of a fiscal consolidation program implies an improvement in the degree of public finances’ sustainability, for in advanced and developing economies. Finally, fiscal sustainability deteriorates when the need to implement a fiscal retrenchment arises.

The remainder of the paper is organised as follows. Section 2 reviews the related literature. Section 3 outlines the methodology while Section 4 presents and discusses the empirical results. Section 5 concludes and elaborates on the policy implications.

## **2. Related Literature**

The topics of fiscal episodes and fiscal sustainability have been recurrently examined in the economic literature. Several studies have pointed out the importance of fiscal retrenchment on the sustainability of public finances, namely when such imposed fiscal discipline is implemented through spending cuts (Zaghini, 2001; Guichard et al., 2007; Alesina and Ardagna, 2010; Brady, 2015). Fiscal episodes are associated to the so-called expansionary fiscal consolidations, advanced by Feldstein (1982), where the author claims the extreme relevance that expectations play when governments conduct a fiscal consolidation. In fact, when economic agents perceived a credible fiscal consolidation, the usual expected effect of government spending cuts or taxes increases may reverse, highlighting the existence of non-Keynesian effects.

The non-Keynesian topic have been vastly assessed in the literature. However, and while several studies do not provide crystal clear results regarding if the reversed effects from fiscal consolidations are obtained (see for instance, Hjelm, 2002; van Aarle and Garretsen, 2003; Yang et al., 2015, among others), other studies have supported the existence of expansionary fiscal consolidation effects as, for instance, the study conducted in Giudice et al. (2007), where the authors conclude that non-Keynesian effects mainly emerge when an economy is below its potential level. Despite the finding of non-Keynesian effects results, when de Cos and Moral-Benito (2013) allow for feedback effects from growth to fiscal consolidations, the traditional Keynesian effects turn out to overcome the non-Keynesian

effects found earlier. Additionally, the (non-)success of fiscal consolidation regarding its effects on economic growth are closely related with the (mis)evaluation of the fiscal multipliers, which can support erroneous conclusions (see the studies conducted in Blanchard and Leigh (2014) and Jordà and Taylor (2016), among others, on this subject). Moreover, and despite the assessment economists have made on the fiscal multipliers, the government credibility is found to be a crucial element on the success of fiscal consolidations and non-Keynesian effects (Gupta et al., 2018).

In what concerns fiscal sustainability, the existing literature has mainly assessed public finances sustainability, through a long-run relationship between public revenues and expenditures, for advanced economies and concluding for the fiscal policy sustainability (Afonso and Rault, 2010; Afonso and Jalles, 2014b; Afonso and Rault, 2014; Afonso and Jalles, 2017; Magazzino et al, 2019). However, when examining different country regions within advanced economies, some different results emerge, namely the unsustainable path that peripheral Euro-area economies has taken as the Greek and Spanish cases, for instance (Paniagua et al., 2017; Brady and Magazzino, 2018). Furthermore, for these set of countries, Paniagua et al. (2017) claim that only when a given debt-level threshold is reached, fiscal authorities start to look for the fiscal sustainability problem, whose result is also in accordance with other studies that also analyse the relationship between debt levels and fiscal sustainability behaviour (Checherita-Westphal et al., 2014; Chen, 2014; Baharumshah et al., 2017; Tran, 2018). Additionally, while the structure of debt composition matters for fiscal sustainability, namely when governments issue long-term debt.

Lastly, there have been some studies that have analysed the fiscal sustainability and its dynamics across government tiers. For instance, Claeys et al. (2008) analysed the German and United States cases. In the case of the European country is found that central government accounts mainly for fiscal sustainability, while it is found that in the case of United States, a fiscal sustainability behaviour is assured equally by both federal and state government levels. In addition, Jalles (2021) concludes that the higher the power low levels of government have to influence national policies the higher are the promises gaps, i.e., the difference between the planned expansionary levels of public spending and the actual levels realized by those governments. Moreover, and in what concerns to a political economy perspective, governments led by left-wing political parties are responsible by those gaps which may signed lower fiscal sustainability levels.

### 3. Methodology and Data

The purpose of this paper is to empirically understand to what extent fiscal consolidations affected the degree of fiscal policy sustainability. Let's partition the problem into two parts. In the first part, we focus on two types of fiscal consolidations, namely: i) those fiscal consolidations that would have been needed on the basis of the position of the cyclically-adjusted budget balance (in percent of GDP) for a given country and year relative to the debt-stabilizing primary balance (CAPB) (in percent of GDP) obtained from the IMF's Debt Sustainability Analysis; and ii) those that actually took place irrespectively of whether they were needed or not. Once we have this categorization, we will check the influence of needed consolidations and consolidations that actually took place on a fiscal sustainability parameter. In this second part, a sustainability coefficient will be obtained by estimating time-varying country specific regressions of government revenues on government expenditures.

As can be understood from the previous exposition, we need to progress in several steps. For the first part, we first need to classify countries and years based on their need (or absent of) to consolidate. Mathematically we have  $need_t = 1$  if  $DSPB > CAPB$  and  $need_t = 0$  if  $DSPB \leq CAPB$ .

The issue then is to obtain a reliable measure of the CAPB. Resorting to the IMF's World Economic Outlook is an obvious but limited possibility. As in this paper we are interested in exploring a large heterogeneous sample of countries encompassing developing ones, the use of the IMF WEO is therefore limiting due to many missing observations in this particular income group. Note that the IMF does not have an official method for computing potential output and every country desk decides which measure fits best. While the most common IMF approach uses a production function approach, assumptions vary greatly across countries and discretion is left to the country desks. As an alternative, we compute a new measure of the CAPB which implies estimating first new potential output and output gap (OG) variables. Despite substantial progress in the estimation methodologies to calculate potential output, there is still not a widely accepted approach in the profession. According to Borio (2013), researchers frequently adopt two alternative approaches to estimate potential GDP: i) there are univariate statistical approaches, which usually consist of filtering out the trend component from the cyclical one; ii) there are the structural approaches, which derive the estimates directly from the theoretical structure of a model. We adopt the former strategy and employ the commonly used Hodrick-Prescott (HP) filter. Once the new output gap is obtained, we then use it to get our new measure of the CAPB. Reflecting the fact that the elasticity of government revenues ( $REV$ ) to output growth is close to one while primary expenditure ( $PEXP$ ) is largely inelastic to growth (we take



the same assumption as Girouard and André, (2005), we multiply government revenues by the factor  $[1/(1+OG/100)]$  to get  $REV_{adj}$  (revenue adjusted). Mathematically we have  $CAPB = REV_{adj} - PEXP$ , where  $REV_{adj} = REV * [1/(1+OG/100)]$ .

On the issue of identifying fiscal consolidations, we adopt Alesina and Perotti (1997) approach.<sup>1</sup> According to these authors a fiscal consolidation episode is defined as a minimum annual improvement in the CAPB-to-GDP ratio of 0.5 pp over two consecutive years.<sup>2</sup> The data, presented in Tables 1 and 2, comes from a recent paper (Afonso et al., 2021). All in all, we have an unbalanced panel of 189 economies, including 38 advanced economies and 151 developing economies over the 1980-2018 period.

**Table 1. Need to consolidate based on the CAPB from WEO and HP (Advanced Economies)**

	WEO-based CAPB	HP-based CAPB
Australia	1991-1995; 2008-2016	1990-1996; 2008-2016
Austria	1995-2000; 2002-2014	1988; 1991-2000; 2002-2006; 2008-2010; 2012-2014
Belgium	1980-1987; 1990-1993; 1996; 2009; 2011-2014	1980-1988; 1990-1993; 1996; 2003; 2009; 2011-2014
Canada	1979; 1981-1996; 2001; 2008-2013; 2015-2016	1979-1996; 1998; 2001-2003; 2008-2013; 2015-2016
Cyprus	1995-1997; 1999; 2002-2003; 2009-2014	1995-1999; 2002-2004; 2009-2014
Czech Republic	1995-2012	1995-2006; 2008-2013
Denmark	1986-1996; 2009-2013; 2015-2016	1979-1998; 2002-2003; 2009-2013; 2015; 2018
Estonia	2007-2008	1995; 1999; 2008-2009
Finland	1979-1996; 2009-2014	1979; 1983; 1987; 1991-1996; 2009-2016
France	1980; 1988-1997; 2001-2017	1980; 1983-1988; 1990-1998; 2002-2005; 2008-2018
Germany	1991-1999; 2001-2005; 2008-2010	1991-1999; 2001-2005; 2009-2010
Greece	1988-1990; 1992-1993; 1999; 2004-2005; 2007-2013	1993; 2004-2005; 2007-2015
Hong Kong SAR	2008; 2013	2008-2009; 2013
Iceland	1980-1982; 1992-1993; 2002-2003; 2008-2012	1980-1982; 1991-1995; 2002-2003; 2008-2012
Ireland	2007-2013	1980-1995; 2008-2013
Israel	2000-2003; 2008-2009; 2012-2013	2000-2004; 2008-2009; 2012-2013
Italy	1988-1994; 2005-2006; 2008-2013	1988-1994; 1996; 2003; 2005-2006; 2008-2015
Japan	1994-2014; 2016-2017	1979-1984; 1986; 1993-2014; 2016-2018
Korea	2009	2009
Latvia	2008-2010; 2014-2015	1998-2001; 2006-2010
Lithuania	2000-2002; 2006-2013	2000-2002; 2004; 2007-2013
Luxembourg	1995; 2003-2004; 2009	1995; 2003-2005; 2009
Macao SAR	n.a.	2001-2017
Malta	2001-2004; 2008-2009	2001-2004; 2008-2009
Netherlands	1995; 2002-2004; 2008-2013	1995-1996; 2002-2004; 2009-2015
New Zealand	2009-2012	1985; 1989-1992; 1998-1999; 2009-2013
Norway	1978-1979; 1981-2017	1978; 1986; 1988-1994; 1998
Portugal	1986-1991; 1993-1996; 2000-2014	1986-1996; 2000-2014
Puerto Rico	n.a.	2014-2015; 2018
San Marino	n.a.	2004-2011; 2018
Slovak Republic	1995-2003; 2005-2016	1995-2002; 2006-2016
Slovenia	2005-2013	1995; 2005; 2008-2015
Spain	1995-1996; 2008-2014; 2016	1980; 1985; 1990-1997; 2008-2016
Sweden	1993-1999; 2002; 2009; 2012-2013	1980-1997; 2002-2003; 2012-2014
Switzerland	1990-1999; 2002-2003; 2009	1983-1999; 2002-2004
United Kingdom	1981; 1983-1986; 1989-1996; 2002-2016	1981-1986; 1990-1997; 2002-2016
United States	2001-2004; 2007-2013	2001-2004; 2007-2013; 2016-2017
Average	5.461	6.560
Std. Dev.	5.689	4.661
Max.	37	22
Min.	1	2
Count	488	586

Source: Authors' calculations.

<sup>1</sup> Other alternative approaches included those of Alesina and Ardagna (1998), Giavazzi and Pagano (1996), or Afonso (2010). See Afonso and Jalles, 2014a, for a review. Note that the alternative “narrative approach” to identifying fiscal episodes cannot be considered in our study, which looks at a large heterogeneous sample of countries, the reason being that the publicly available dataset compiled by Devries et al. (2011) and updated by Alesina et al. (2019), covers only 16 advanced economies and it ends in 2014 (which is by now outdated).

<sup>2</sup> The start year of a fiscal consolidation episode is, therefore, the year in which there is a minimum annual improvement in the CAPB-to-GDP ratio of 0.5 pp, provided that there is also a minimum annual improvement in the CAPB-to-GDP ratio of 0.5 pp in the following year. Accordingly, the end year of a fiscal tightening episode is the last year (in a sequence of years) with a minimum annual improvement in the CAPB-to-GDP ratio of 0.5 pp, after which the annual CAPB-to-GDP either improves by less than 0.5 pp or worsens.

Results of the sets of years by country for which we have  $need_t = 1$  for the two types of CAPB (WEO and HP-based) are shown in Table 1 and 2 for Advanced and Developing Economies, respectively. Comparing both income groups, we can conclude advanced economies are more prone to the need for conducting fiscal consolidations. In fact, and on average, there is more need for consolidation episodes in advanced economies than in developing economies, independently of the criteria used for assessing the need for a fiscal contraction (WEO-based CAPB or HP-based CAPB). This is evident when we look at the average duration of the “need to perform” a fiscal retrenchment.

**Table 2. Need to consolidate based on the CAPB from WEO and HP (Developing Economies)**

	WEO-based CAPB	HP-based CAPB
Afghanistan	n.a.	2008-2009; 2011; 2013-2015; 2017
Albania	n.a.	1997; 2000-2002; 2004; 2008-2009; 2011-2015
Algeria	2009-2010; 2012; 2014-2017	1990-1991; 1998; 2009; 2011-2018
Angola	2000; 2008-2009; 2014-2015	1996-2000; 2008-2009; 2014-2017
Anguilla	n.a.	2000-2004; 2009-2010; 2012-2013; 2015-2018
Antigua and Barbuda	n.a.	1990-1991; 1995; 2001-2003; 2006-2011; 2013
Argentina	1995-2001	1995-1996; 1998-2001; 2012-2018
Armenia	n.a.	2007-2011; 2014-2017
Azerbaijan	n.a.	1994-1995; 2015
Bahamas, The	n.a.	1990-1994; 1997; 2002-2018
Bahrain	n.a.	1990-1995; 1997-1999; 2002; 2009-2010; 2012-2018
Bangladesh	n.a.	1990-2003; 2015-2018
Barbados	1994; 2002-2003; 2007-2016	1994; 2002-2003; 2007-2016
Belarus	n.a.	2001-2004; 2006; 2009
Belize	n.a.	1996-2005; 2009; 2015-2017
Benin	n.a.	1989-1999; 2001-2002; 2005; 2009; 2013-2018
Bhutan	n.a.	1987-1993; 2001; 2003
Bolivia	n.a.	1985-2004; 2014-2018
Bosnia and Herzegovina	1998; 2000-2001; 2008-2012; 2014	1998; 2000-2003; 2008-2014
Botswana	2001-2017	2001-2018
Brazil	1996-2002; 2014-2017	1996-2002; 2014-2018
Brunei Darussalam	n.a.	1985-2006; 2015-2018
Bulgaria	2009-2015	1998; 2009-2015
Burkina Faso	n.a.	1985-2002; 2004-2005; 2007-2010; 2012-2018
Burundi	n.a.	1992-2000; 2010-2012; 2014-2018
Cabo Verde	n.a.	1994-1997; 2000-2002; 2004-2005; 2009-2015
Cambodia	n.a.	1996-1998; 2000-2003; 2009-2013; 2018
Cameroon	n.a.	2010-2018
Central African Republic	n.a.	1988-1997; 2000; 2003; 2010-2011; 2013-2014
Chad	n.a.	1995-2000; 2009-2010; 2013-2017
Chile	2009; 2013-2017	1990-1991; 1998-2002; 2009; 2013-2018
China	1990-1995; 1999-2000; 2016-2017	1989-1995; 1999; 2016; 2018
Colombia	2001; 2009-2010; 2014-2015	1989-1996; 1999; 2001-2002; 2009-2010; 2015; 2017
Comoros	n.a.	1984; 1992; 1994; 1996; 2004; 2006; 2014; 2016; 2018
Congo, D. R.	n.a.	1996-2000; 2015-2017
Congo, Republic of	n.a.	1989-2002; 2013-2017
Costa Rica	1996; 2002; 2009-2017	1990-1996; 2002; 2009-2018
Croatia	2002-2015	1992-2015
Côte d'Ivoire	n.a.	1997; 2000; 2004; 2011; 2016-2018
Djibouti	n.a.	1990-2004; 2009; 2012-2018
Dominica	n.a.	1990; 1994-1995; 1998-2003; 2007-2014
Dominican Republic	1997; 1999-2003; 2008-2009; 2011-2013; 2016-2017	1997; 2008-2009; 2011-2013; 2016-2017
Ecuador	2001; 2009; 2012-2017	1995-2001; 2009; 2012-2017
Egypt	2002-2003; 2011-2016	2002; 2011-2016
El Salvador	2000-2006; 2008-2010; 2012-2017	1990-1991; 1996; 1998-2005; 2008-2010; 2012-2017
Equatorial Guinea	n.a.	1986-1994; 1998; 2009-2010; 2012-2016
Eritrea	n.a.	1992-2000; 2005-2008; 2010-2018
Eswatini	n.a.	1980-1993; 2002-2004; 2009-2011; 2014-2018
Ethiopia	n.a.	1980-1992; 1998; 2002
Fiji	n.a.	1992; 1996-1997; 2000-2002; 2006-2007; 2009; 2014-2015; 2018
Gabon	n.a.	1990-1993; 1998; 2013; 2015-2016
Gambia, The	n.a.	2000; 2005-2006; 2011; 2013; 2016
Georgia	2007-2010; 2012-2014	1995-2000; 2008-2009; 2013-2014
Ghana	n.a.	1980-1990; 2010; 2012-2014; 2018
Grenada	2000-2002; 2006; 2009-2013	1990-1991; 1999-2002; 2004; 2006-2011
Guatemala	1995-2001; 2003; 2009-2014	1995-2001; 2003; 2006; 2009-2014; 2018
Guinea	n.a.	1990; 2009; 2013-2015
Guinea-Bissau	n.a.	1991-1998; 2003-2004; 2006; 2012-2014; 2016; 2018

	WEO-based CAPB	HP-based CAPB
Guyana	2000-2003; 2005-2006; 2008-2009; 2013-2014; 2017	1997-1998; 2001; 2003; 2005; 2009; 2012-2014; 2016-2018
Haiti	n.a.	1997; 1999-2004; 2006-2015; 2017-2018
Honduras	n.a.	1990; 2002-2003; 2008-2014
Hungary	2002-2011	1995; 2002-2012
India	1997-2003; 2008; 2011; 2014-2016	1989-1991; 1997; 1999-2003; 2008; 2011; 2014-2018
Indonesia	2013; 2015-2016	1993-2000; 2013; 2015-2017
Iran	n.a.	2014-2015
Jamaica	n.a.	1990-1999
Jordan	2009-2010; 2012; 2015-2016	1985-1989; 1999-2000; 2009-2016; 2018
Kazakhstan	2002; 2009; 2015-2017	2002; 2009; 2015-2017
Kenya	2002; 2010; 2013-2017	1982-1998; 2002; 2010; 2012-2018
Kiribati	n.a.	1990; 1992; 1995-1996; 1999; 2001; 2003-2012; 2018
Kosovo	n.a.	2010-2018
Kyrgyz Republic	2016	1995-2000; 2002; 2010; 2012-2017
Lao P.D.R.	n.a.	2000-2001; 2009; 2016-2018
Lebanon	2000-2006; 2010-2017	1990-2003; 2005-2006; 2011; 2013-2018
Lesotho	n.a.	1982-1988; 1998-1999; 2009-2011; 2016-2018
Liberia	n.a.	2000; 2003; 2008; 2011-2018
Madagascar	n.a.	1980-1990; 2002; 2009; 2011-2015; 2017-2018
Malawi	n.a.	2002; 2017
Malaysia	1999-2004; 2006; 2009; 2012-2013; 2015	1990; 1998-2003; 2009; 2012-2013; 2015; 2018
Maldives	n.a.	1990-1997; 2000-2001; 2005; 2008-2010; 2012; 2014-2016; 2018
Mali	n.a.	2000; 2003-2004; 2007-2018
Marshall Islands	n.a.	1997; 2005
Mauritania	n.a.	2009; 2014-2015
Mauritius	1990-2000	2000-2001; 2009-2010; 2013-2014; 2016
Mexico	1990-1996; 2001-2002; 2009; 2012-2016	1990-1996; 2001-2003; 2009; 2012-2015
Moldova	n.a.	1995; 2008-2018
Mongolia	n.a.	1991-2018
Montenegro, Rep. of	n.a.	2002; 2008-2013; 2015-2018
Morocco	2000-2002; 2005; 2009-2017	1990; 1992-1993; 1995; 2000; 2002; 2004-2005; 2010-2018
Mozambique	n.a.	1980-1999; 2009; 2011-2012; 2014-2015
Myanmar	n.a.	1998; 2016
Namibia	n.a.	1990-1993; 1996-1998; 2003-2004; 2010-2018
Nepal	n.a.	2000; 2002; 2017-2018
Nicaragua	n.a.	2009; 2015-2018
Niger	n.a.	1995; 1999-2000; 2004; 2009-2011; 2013-2018
Nigeria	n.a.	1990; 1999; 2009-2010; 2013-2018
North Macedonia	2009-2017	1997-1999; 2001-2002; 2009-2017
Oman	n.a.	1990-1995; 1998; 2009; 2014-2018
Pakistan	n.a.	1993-1994; 2008; 2010; 2012-2013; 2015-2018
Panama	1994; 2000-2003; 2014	1994-1995; 2000-2003; 2014-2015; 2018
Papua New Guinea	n.a.	1992-1994; 2009; 2012-2016; 2018
Paraguay	2012; 2015	1979-1990; 2012; 2015
Peru	2000-2001; 2009; 2015-2017	2000-2001; 2009; 2015-2018
Philippines	1990-1993	1989-1993; 2009
Poland	1995; 2001-2006; 2008-2016	1995; 2001-2006; 2008-2016
Qatar	n.a.	1991; 1993-1994; 1996; 1998; 2001; 2015-2016
Romania	2006-2011	1991-2000; 2007-2013; 2016; 2018
Russia	1999; 2009-2010; 2013; 2015-2017	1998-1999; 2009-2010; 2013-2017
Rwanda	n.a.	1992-1995; 1999; 2012; 2014-2015; 2018
Saudi Arabia	n.a.	1991-1995; 1997-1998; 2001-2002; 2009; 2014-2018
Senegal	1994-1996; 2006-2016	1994-1996; 2006-2016
Serbia	2009-2015	2000; 2009-2015
Seychelles	n.a.	1983-1991; 1994-1996; 1998-2002
Sierra Leone	n.a.	2000-2001; 2014-2018
Solomon Islands	n.a.	1997-2003; 2015-2018
South Africa	2000; 2009-2017	2000; 2009-2018; 011-2016; 018
South Sudan	n.a.	2011-2016; 2018
Sri Lanka	n.a.	1990; 2009; 2014-2015
St. Kitts and Nevis	n.a.	1990-2003; 2009-2010
St. Lucia	n.a.	1985-1994; 1996-1997; 2000-2002; 2005; 2008-2013; 2018
St. Vincent and the Grenadines	n.a.	1984-1990; 1994; 1996-1997; 2003-2011; 2013-2014
Sudan	n.a.	1990-1992; 2007; 2009; 2011-2018
Suriname	2009-2010; 2012-2015	1990; 2009-2018
Syria	n.a.	1990; 2003; 2009-2010
São Tomé and Príncipe	n.a.	2001; 2009-2012; 2014-2015
Tajikistan	n.a.	1998-2005; 2007-2011; 2015-2018
Tanzania	n.a.	1991-2001; 2009
Thailand	2002; 2009	2002; 2009; 2012; 2014
Togo	n.a.	1989-2006; 2011-2016
Tonga	n.a.	2000-2018
Trinidad and Tobago	n.a.	1988; 1992-1993; 1997-1998; 2002; 2009-2010; 2012-2018
Tunisia	1991; 2011-2013; 2015-2016	1991; 2002; 2009; 2011-2017
Turkey	2000; 2009	2000; 2009; 2016; 2018
Tuvalu	n.a.	2005-2011; 2014; 2017
Uganda	n.a.	1997; 2010; 2012-2018
Ukraine	2008-2009; 2012-2014	1995-1997; 2008-2010; 2012-2014
United Arab Emirates	n.a.	1991-1999; 2002; 2009; 2015-2017
Uruguay	2000-2001	1999-2002
Uzbekistan	n.a.	1997
Vanuatu	n.a.	1991-1993; 1995-1996; 1998; 2000-2002; 2009-2012; 2014-2017
Venezuela	n.a.	1988-2018
Yemen	n.a.	1990-1999; 2003; 2007-2013; 2015-2018
Zambia	n.a.	2000; 2012-2015; 2017-2018

	WEO-based CAPB	HP-based CAPB
Zimbabwe	n.a.	2005-2008; 2014-2017
Average	3.583	4.724
Std. Dev.	2.871	4.728
Max.	17	31
Min.	1	1
Count	434	1968

Source: Authors' calculations.

Regarding the characteristics of fiscal episodes<sup>3</sup>, it is found larger fiscal consolidations for lower values of CAPB, being advanced economies more concerned with sustainability of their public finances than developing economies. This pattern is more evident when we analyse the size of fiscal contractions, that is, advanced economies tend to apply long lasting fiscal contraction programs when compared to developing economies, meaning these last source of economies tend to concentrate fiscal austerity measures than the highest income economies. Additionally, and independently the development stage of economies, the data display improvements in the CAPB are associated with both decrease in government spending and increasing government revenues. The set of years occurring fiscal consolidation episodes are summarized by income group in tables 3 and 4, respectively.

**Table 3. Fiscal Consolidations based on the change in the CAPB from WEO and HP (Advanced Economies)**

Country	WEO-Based	HP-Based
Australia	1995-1997, 2012-2013	1995-1997, 2012-2013
Austria	1997, 2011-2013	1997, 2011
Belgium	1985-1987, 1990, 1998	1985-1987, 1990, 1994, 1998
Canada	1987-1988, 1995-1997, 2012-2015	1987-1988, 1995-1997, 2012-2014
Cyprus	2005, 2013-2014	2005-2007, 2013-2014, 2018
Czech Republic	1997, 2011	2007, 2011, 2016-2017
Denmark	1997-1998, 2005, 2014	1984-1986, 1998-1999, 2005, 2014, 2017
Estonia	2010	2010
Finland	n.a.	1989, 1997-1998, 2007, 2016-2017
Germany	1993-1994, 2004, 2012	1997, 2000, 2007, 2012
Greece	1991-1994, 2000, 2011-2013	1991-1992, 2011-2013, 2016
Hong Kong SAR	2007, 2010, 2017	2007, 2010, 2017
Iceland	2005-2006, 2010-2014	1991, 1996-1997, 2005, 2012-2014
Ireland	2004, 2011-2015	1997, 2004, 2012-2014
Israel	2004-2005, 2015	2005-2006, 2011, 2015
Italy	1992-1993, 1996-1997	1991-1993, 1996-1997, 2011-2012
Japan	2005-2006, 2015	1981, 1985, 1988, 2005-2006, 2015
Latvia	2012, 2016	2011-2012
Lithuania	2003, 2010	n.a.
Luxembourg	1997, 2006, 2012	2006-2007
Macao SAR	n.a.	2004-2008, 2011
Malta	2005, 2017	2005, 2010, 2017
Netherlands	2005, 2012-2014	2005, 2012-2014, 2017
New Zealand	2012-2013	1987-1988, 1994-1995, 2003, 2012-2016
Norway	1994-1997	1980, 1994-1997, 2000, 2005-2006, 2011-2012, 2018
Portugal	2007, 2012-2013, 2016	2007, 2012-2013, 2016
Puerto Rico	n.a.	2016
San Marino	n.a.	2010-2012
Slovak Republic	1998, 2004	1998
Slovenia	2012-2013, 2016	2015-2016
Spain	1997, 2011-2014	1987, 1997-1999, 2006, 2014, 2017
Sweden	1995-1998, 2001, 2016	1984, 1987, 1995-1998, 2005, 2016
Switzerland	1995	1995, 2006
United Kingdom	1995-1999, 2011, 2017	1980, 1995-2000, 2011, 2016-2017
United States	2006, 2012-2014	2006, 2011-2013
<b>Years with episodes</b>	122	169
<b>Average duration (years)</b>	1.783	1.690

Source: Afonso et al. (2021).

<sup>3</sup> A more detailed description of fiscal consolidation episodes is provided in Afonso et al. (2021).

**Table 4. Fiscal Consolidations based on the change in the CAPB from WEO and HP (Developing Economies)**

Country	WEO-Based	HP-Based
Afghanistan	n.a.	2006, 2010, 2016
Albania	n.a.	2016
Algeria	2011, 2017	1995-1996, 2000, 2017-2018
Angola	2004-2006, 2010	2005-2006, 2011
Anguilla	n.a.	2003, 2006-2007, 2011
Antigua and Barbuda	n.a.	1996, 2003-2004
Argentina	2003-2004	2003-2004
Armenia	n.a.	2011-2012, 2018
Azerbaijan	n.a.	1998, 2001, 2017-2018
Bahamas, The	n.a.	1994, 1999, 2015-2016
Bahrain	n.a.	1996, 1999-2000, 2004-2005, 2017-2018
Barbados	1998, 2017	2017
Belarus	2012, 2017	2010-2012, 2017-2018
Belize	n.a.	2005-2008, 2011, 2017-2018
Benin	n.a.	1993, 2004, 2007, 2017-2018
Bhutan	n.a.	1991, 2007-2009
Bolivia	n.a.	1995, 2004-2006
Bosnia and Herzegovina	2002-2003, 2006, 2011-2013	2002-2003, 2006, 2011-2013, 2016-2018
Botswana	2004-2006, 2011-2013	2004-2006, 2011-2013
Brazil	1999, 2017	1999
Brunei Darussalam	n.a.	1991, 1996, 2000, 2004-2006, 2011, 2018
Bulgaria	2004, 2012, 2016	2012, 2016
Burkina Faso	n.a.	1989, 1992
Cabo Verde	n.a.	1996-1998, 2004, 2014-2016
Cambodia	n.a.	2005, 2014
Cameroon	n.a.	2006, 2018
Central African Republic	n.a.	1993, 1996, 2015-2016
Chad	n.a.	1998, 2005-2006, 2011, 2016-2018
Chile	2005-2006, 2011	2004-2006, 2011
China	2004	2004
Colombia	2012	1991, 2001, 2012
Comoros	n.a.	1986-1989, 1997, 2005, 2010, 2013
Congo, D. R.	n.a.	2002, 2005
Congo, Republic of	n.a.	1994-1996, 2000, 2004-2006, 2017-2018
Costa Rica	n.a.	2006-2007
Croatia	2016-2017	1994, 2016-2017
Cote d'Ivoire	n.a.	2001
Djibouti	n.a.	2004-2006, 2017-2018
Dominica	n.a.	1996, 2012-2013, 2018
Dominican Republic	2005	2005, 2014-2015
Ecuador	2010-2011	2000, 2011, 2018
Egypt	2004, 2017	2018
El Salvador	2004, 2017	2007, 2017
Equatorial Guinea	n.a.	1996-1997, 2002, 2006, 2011, 2017-2018
Eritrea	n.a.	1997, 2003-2004
Eswatini	n.a.	1988-1989, 2006, 2012
Ethiopia	n.a.	1992-1993, 2004
Fiji	n.a.	1995, 2008, 2013
Gabon	n.a.	1995, 2000, 2018
Gambia, The	n.a.	n.a.
Georgia	2011	2011
Ghana	n.a.	1982, 1995, 2015
Grenada	2004, 2009-2010, 2015-2016	1992-1993, 2004, 2009-2010, 2015-2016
Guinea	n.a.	2005
Guinea-Bissau	n.a.	1996, 2000-2001, 2009
Guyana	2010	2008
Haiti	n.a.	2005, 2015-2016
Honduras	n.a.	1992, 1995, 2005, 2011, 2015
Hungary	2008-2009	2000, 2004, 2008
India	2000, 2005-2007, 2013	1995, 2000, 2005-2007, 2013
Indonesia	n.a.	1999, 2002
Iran	n.a.	2004
Jamaica	n.a.	1999-2000, 2013
Jordan	2011, 2014, 2017	1989, 2014
Kazakhstan	2006, 2011	2006, 2011
Kenya	2004	1988, 1994-1995, 1999, 2004, 2018
Kiribati	n.a.	1998, 2010, 2013-2015
Kosovo	n.a.	2015-2016
Kyrgyz Republic	n.a.	2001-2002-2006-2008, 2018
Lao P.D.R.	n.a.	2011-2012, 2015
Lebanon	2002, 2009-2010, 2014-2016	1998-1999, 2002-2003
Lesotho	n.a.	1984, 1990, 2003-2004
Liberia	n.a.	2015-2016
Madagascar	n.a.	1982-1983, 1996-1997, 2006
Malawi	n.a.	n.a.
Malaysia	1994, 2002, 2005, 2011	1994, 2002, 2005, 2011
Maldives	n.a.	2007, 2011-2013
Marshall Islands	n.a.	2017
Mauritania	n.a.	2010, 2016-2018

Country	WEO-Based	HP-Based
Mauritius	2008	n.a.
Mexico	2000-2001	2001, 2016-2017
Moldova	n.a.	1998-1999, 2017
Mongolia	n.a.	1995, 2000-2001, 2004-2006
Montenegro, Rep. of	n.a.	2007, 2013-2014
Morocco	2007	1997, 2007
Mozambique	n.a.	1985, 1988-1989, 1992, 2003, 2013, 2016-2017
Myanmar	n.a.	2013
Namibia	n.a.	1994, 2000, 2005-2007
Niger	n.a.	2001, 2006, 2011
Nigeria	n.a.	1995, 2000, 2011
North Macedonia	2017	2000, 2016
Oman	n.a.	1996-1997, 2000, 2005, 2011, 2018
Panama	2000, 2006-2007	1996, 2000, 2006-2007, 2016
Papua New Guinea	n.a.	1995, 2007, 2015
Paraguay	n.a.	1986, 1990, 1994, 2004, 2011
Peru	2007, 2011	2007, 2011
Philippines	2004-2006	2004-2006
Poland	2012	2005, 2012, 2018
Qatar	n.a.	1999-2000, 2012-2013, 2018
Romania	2010-2012	1998-1999, 2011-2012
Russia	2005, 2011	2000, 2005, 2011, 2018
Rwanda	n.a.	2004, 2016
Saudi Arabia	n.a.	1995-1997, 2000, 2004-2006, 2011, 2018
Senegal	2015	2017
Serbia	2016-2017	2004-2005, 2016-2017
Seychelles	n.a.	1988
Sierra Leone	n.a.	2018
Solomon Islands	n.a.	2010
South Africa	n.a.	2006
Sri Lanka	n.a.	1997, 2003
St. Kitts and Nevis	n.a.	1995, 2002-2003, 2012-2013
St. Lucia	n.a.	1994, 2014-2016
St. Vincent and the Grenadines	n.a.	1993, 1999-2001, 2009-2012, 2015-2016
Sudan	n.a.	1993-1994, 1997, 2014-2015
Suriname	2006-2007, 2017	1993-1996, 2006-2007, 2017-2018
Syria	n.a.	1996-1997
São Tomé and Príncipe	n.a.	2013, 2017-2018
Tajikistan	n.a.	2002, 2011-2012, 2018
Tanzania	n.a.	1996, 2017
Thailand	n.a.	2011
Togo	n.a.	1995
Tonga	n.a.	2003-2004, 2014, 2017-2018
Trinidad and Tobago	n.a.	1990-1991, 2018
Tunisia	1993-1994	1993-1994, 1998, 2018
Turkey	n.a.	2011
Tuvalu	n.a.	2008, 2012-2013
Uganda	n.a.	2004, 2017
Ukraine	2015	1999, 2011, 2015
United Arab Emirates	n.a.	n.a.
Uruguay	2002-2003	2001-2004
Uzbekistan	n.a.	2004, 2007-2008, 2011
Vanuatu	n.a.	1997, 2004-2005, 2012-2013
Yemen	n.a.	1996, 2000, 2011
Zimbabwe	n.a.	2009, 2010
<b>Years with episodes</b>	103	503
<b>Average duration (years)</b>	1.474	1.462

Source: Afonso et al. (2021)

Regarding the second part, the estimation of the fiscal sustainability coefficient, we borrow inspiration from Afonso (2005) and Afonso and Jalles (2016). Here, the relevant question for fiscal (un)sustainability is whether a linear combination of government revenues and government expenditures is stationary. If such a combination exists, government revenues and expenditures become cointegrated, which implies that the variables are attracted to a stable long-run (equilibrium) relation and any deviation from this relation reflected short-run

(temporary) disequilibria. Formally, we are interested in estimating for each country  $i$  the following regression<sup>4</sup>:

$$R_t = \alpha + \beta G_t + u_t \quad (1)$$

where  $R_t$  denotes the government revenues-to-GDP ratio and  $G_t$  denotes the government expenditures-to-GDP ratio, both retrieved from the IMF WEO.  $u_t$  is a standard i.i.d. disturbance term satisfying usual assumptions. The closer to unity is the estimated  $\beta$  coefficient, the more sustainable public finances will be, since a unitary increase in government spending will be mostly matched by an increase in government revenues. We estimate equation (1) using a time-varying parameter model. Two common possibilities in this setting are of a fixed-length moving window or an expanding window that weights historical data equally. We relied on the latter with an expanding window of 20 years. That is, we estimate for each country a series of  $\beta$ 's for the period 1980-2000, 1980-2001, 1980-2002, and, lastly, 1980-2018.

We then treat the value of  $\beta$  as our relative measure of success. Consequently, the final step is to check if certain types of fiscal consolidations enhance this degree of success in making fiscal policy more sustainable. We estimate the following Weighted Least Squares panel regressions:

$$\beta_t = \alpha_0 + \alpha_1 \cdot \beta_{t-1} + \alpha_2 \cdot (\beta_{t-1} * Need_t) + \alpha_3 \cdot Debt_{t-1} + v_t \quad (2)$$

$$\beta_t = \gamma_0 + \gamma_1 \cdot \beta_{t-1} + \gamma_2 \cdot (\beta_{t-1} * Did_t) + \gamma_3 \cdot Debt_{t-1} + \epsilon_t \quad (3)$$

where  $\beta$  was estimated in (1), *Need* and *Did* are dummy variables that take the value of one if a given economy needed or did a fiscal consolidation in a given year as described above, while *Debt* represents the government debt-to-GDP ratio. Since the dependent variable is based on estimates (and it is measured with different levels of precision), the WLS estimator assumes that the errors  $v_t$  in equations (2) and (3), are distributed as  $v_t \sim N\left(0, \frac{\sigma^2}{s_i}\right)$  in which  $s_i$  are the estimated standard deviations of the time-varying sustainability coefficients for each country  $i$ , and  $\sigma^2$  is an unknown parameter that is estimated in the second-

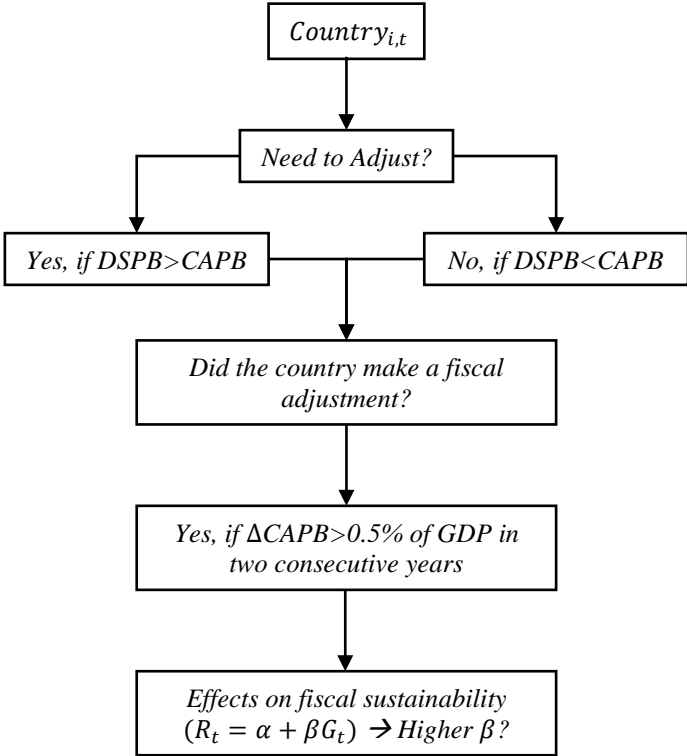
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<sup>4</sup> Note that the issue of stationarity of variables has been assessed. In table A3 in the appendix we checked country-by-country the stationarity properties of both government revenues and expenditures both in levels and in first differences. As the majority of countries was found to have non-stationary variables (one or the two), equation (1) was estimated in first differences.

stage regression. Note that some specifications in the next section will impose the constraint  $\alpha_3 = 0$  or  $\gamma_3 = 0$ .

To summarize diagrammatically (see Figure 1), we are interested in the following empirical exercise:

**Figure 1 - Multi-step analysis to assess the success of fiscal adjustments.**



Source: authors.

**4. Empirical Results**

We previously mentioned, we have estimated the impact of the need and the implementation of a fiscal consolidation equations on fiscal sustainability coefficients, through equations (2) and (3), respectively. We estimated such equations by income group, that is, for the advanced economies (AE) and for developing economies (DEV). Additionally, and also for the same estimations, we analysed each fiscal consolidation cases (need or did) by region, namely, Africa, Asia, Europe and Latin America. The economies composing each region group are available in Table A1, in the Appendix. Both estimations were run with country and time fixed effects<sup>5</sup>.

<sup>5</sup> In Appendix we provide additional estimations without both country and time fixed effects and also results resorting to country or time fixed effects approach. See these estimations in tables A5 to A9.



Regarding the need for implementing a fiscal consolidation, in Table 5a, the need for fiscal consolidation programmes is only significant for advanced economies. In fact, fiscal sustainability seems to deteriorate when an advanced economy needs to implement a fiscal retrenchment. Moreover, increasing government debt levels also emerge as a significant variable to explain fiscal sustainability, notably reducing the magnitude of sustainability, but again for only most developed economies. These results can be associated to those found for the same analysis but now by regions (Table 5.b). There are indeed similar results of the need of fiscal austerity for European economies, which could be explained by the fact that most of these economies also belong to the advanced economies' group. Additionally, and independently the absence or not of the need to implement a fiscal contraction, Asian economies' fiscal sustainability also depict some sensitivity to a raise in debt-to-GDP ratios. Furthermore, when we assess the need for fiscal consolidation programmes through WEO-based approach, we also found that, with the exception of Latin American economies, all the other region group economies signal significant effect between the need of implementing fiscal consolidation measures and balanced path for their public finances (Table A10, in the Appendix).

**Table 5.a Weighted Least Squares estimation results for equation 2, 1980-2018, HP-based  
(by income group)  
(Need to consolidate)**

Variables	. Income Group			
	AE		DEV	
$\beta_{t-1}$	0.209*** (0.064)	0.199*** (0.065)	0.275** (0.125)	0.266** (0.123)
$\beta_{t-1} * Need_t$	-0.196*** (0.064)	-0.186*** (0.065)	0.049 (0.053)	0.039 (0.051)
$Debt_{t-1}$		-0.001*** (0.000)		-0.000 (0.000)
Obs.	615	615	2,562	2,505
$R^2$	0.884	0.887	0.861	0.863

Note: Constant term, country and time effects estimated and omitted for reasons of parsimony. Robust standard errors in parenthesis. \*, \*\*, \*\*\* denote statistical significance at the 10, 5 and 1 percent levels, respectively.

**Table 6.b Weighted Least Squares estimation results for equation 2, 1980-2018, HP-based  
(by geographical region)  
(Need to consolidate)**

Variables	Regions							
	Africa		Asia		Europe		Latin America	
$\beta_{t-1}$	0.309*** (0.091)	0.306*** (0.091)	0.738*** (0.064)	0.701*** (0.064)	0.130*** (0.037)	0.117*** (0.032)	0.539*** (0.161)	0.540*** (0.163)
$\beta_{t-1} * Need_t$	-0.047 (0.077)	-0.047 (0.077)	-0.035 (0.036)	-0.035 (0.035)	-0.116*** (0.036)	-0.104*** (0.032)	0.046 (0.031)	0.042 (0.030)
$Debt_{t-1}$		0.000 (0.000)		-0.001** (0.000)		-0.001*** (0.000)		-0.000 (0.000)
Obs.	766	758	558	546	762	761	571	562
$R^2$	0.811	0.811	0.941	0.942	0.907	0.931	0.939	0.939

Note: Constant term, country and time effects estimated and omitted for reasons of parsimony. Robust standard errors in parenthesis. \*, \*\*, \*\*\* denote statistical significance at the 10, 5 and 1 percent levels, respectively.

On the other hand, the actual implementation of a fiscal consolidation program, in Table 6a, signals an improvement of public finances sustainability, for both advanced and developing economies. However, when introduced the government debt level variable, developing economies evidence some loss of fiscal sustainability sensitivity when implementing measures improving public finances. Analysing the application of a fiscal consolidation program, by regions, we found that fiscal austerity programs present some success on African economies (Table 6.b). When estimating the same equation (3) but now without fixed effects, we find that also European economies improve their public finances sustainability when applying a fiscal consolidation program (see Table A7, in Appendix).

**Table 7.a Weighted Least Squares estimation results for equation 3, 1980-2018, HP-based  
(by income group)  
(Did consolidate)**

Variables	Income Group			
	AE		DEV	
$\beta_{t-1}$	0.585*** (0.115)	0.578*** (0.116)	0.260** (0.107)	0.259** (0.107)
$\beta_{t-1} * Did_t$	0.060** (0.026)	0.061** (0.026)	0.086* (0.050)	0.086 (0.052)
$Debt_{t-1}$		-0.000* (0.000)		-0.000 (0.000)
Obs.	587	587	834	827
$R^2$	0.950	0.950	0.915	0.915

Note: Constant term, country and time effects estimated and omitted for reasons of parsimony. Robust standard errors in parenthesis. \*, \*\*, \*\*\* denote statistical significance at the 10, 5 and 1 percent levels, respectively.

**Table 8.b Weighted Least Squares estimation results for equation 3, 1980-2018, HP-based  
(by geographical region)  
(Did consolidate)**

Variables	Regions							
	Africa		Asia		Europe		Latin America	
$\beta_{t-1}$	0.066** (0.030)	0.066** (0.030)	0.592*** (0.050)	0.588*** (0.051)	0.494*** (0.138)	0.488*** (0.137)	0.693*** (0.119)	0.697*** (0.120)
$\beta_{t-1} * Did_t$	0.313*** (0.103)	0.310*** (0.104)	0.001 (0.014)	0.001 (0.014)	0.010 (0.013)	0.013 (0.013)	-0.000 (0.023)	-0.012 (0.020)
$Debt_{t-1}$		0.001 (0.002)		0.000 (0.000)		-0.000 (0.000)		0.000 (0.000)
Obs.	98	98	198	198	652	652	308	301
$R^2$	0.842	0.842	0.990	0.990	0.958	0.959	0.946	0.946

Note: Constant term, country and time effects estimated and omitted for reasons of parsimony. Robust standard errors in parenthesis. \*, \*\*, \*\*\* denote statistical significance at the 10, 5 and 1 percent levels, respectively.

## 5. Conclusions and Policy recommendations

We have assessed the specific need (or not) of a country to implement a fiscal consolidation by focusing specifically on the success of fiscal consolidations, notably in terms of fiscal sustainability. The “need” to consolidate is based on having a primary balance above or below the debt-stabilizing primary balance (provided by the IMF’s Debt Sustainability Analysis) for each country. Second, we have linked the need to consolidate and the existence of fiscal consolidations and its effect of the level of fiscal sustainability, for developed and developing economies, in the period 1980-2018.

As a 1<sup>st</sup> step we have checked the stationarity properties of both government revenues and expenditures. Since for the majority of the countries the two sides of the budget balance are non-stationary variables, we have estimated the magnitude of the response of revenues to spending in first differences.

In the 2<sup>nd</sup> step, we can conclude that, on average, there is more need of consolidation episodes for advanced economies than for developing economies, independently of the criteria used for assessing the need for a fiscal contraction. On the other hand, fiscal sustainability deteriorates when the need to implement a fiscal retrenchment arises. This result is understandable and conveys to policymakers the message that fiscal consolidations do enhance the sustainability of public finances, something that can also be rewarded by capital markets participants.

In addition, the implementation of a fiscal consolidation program implies an improvement in the degree of public finances sustainability, for both advanced and developing economies. Still regarding our results, increasing government debt levels also emerge as a significant variable to explain fiscal sustainability, decreasing it, but again for only most developed economies, which has a clear policy message.

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## Appendix

**Table A1. List of countries' acronyms.**

Country	Acronym	Country	Acronym	Country	Acronym
Afghanistan	AFG	Guatemala	GTM	Papua New Guinea	PNG
Albania	ALB	Guinea	GIN	Paraguay	PRY
Algeria	DZA	Guinea-Bissau	GNB	Peru	PER
Angola	AGO	Guyana	GUY	Philippines	PHL
Antigua and Barbuda	ATG	Haiti	HTI	Poland	POL
Argentina	ARG	Honduras	HND	Portugal	PRT
Armenia	ARM	Hong Kong SAR	HKG	Puerto Rico	PRI
Australia	AUS	Hungary	HUN	Qatar	QAT
Austria	AUT	Iceland	ISL	Republic of Congo	COG
Azerbaijan	AZE	India	IND	Romania	ROU
Bahrain	BHR	Indonesia	IDN	Russia	RUS
Bangladesh	BGD	Iraq	IRQ	Rwanda	RWA
Barbados	BRB	Ireland	IRL	Samoa	WSM
Belarus	BLR	Islamic Republic of Iran	IRN	San Marino	SMR
Belgium	BEL	Israel	ISR	Saudi Arabia	SAU
Belize	BLZ	Italy	ITA	Senegal	SEN
Benin	BEN	Jamaica	JAM	Serbia	SRB
Bhutan	BTN	Japan	JPN	Seychelles	SYC
Bolivia	BOL	Jordan	JOR	Sierra Leone	SLE
Bosnia and Herzegovina	BIH	Kazakhstan	KAZ	Singapore	SGP
Botswana	BWA	Kenya	KEN	Slovak Republic	SVK
Brazil	BRA	Kiribati	KIR	Slovenia	SVN
Brunei Darussalam	BRN	Korea	KOR	Solomon Islands	SLB
Bulgaria	BGR	Kosovo	UVK	South Africa	ZAF
Burkina Faso	BFA	Kuwait	KWT	South Sudan	SSD
Burundi	BDI	Kyrgyz Republic	KGZ	Spain	ESP
Cabo Verde	CPV	Lao P.D.R.	LAO	Sri Lanka	LKA
Cambodia	KHM	Latvia	LVA	St. Kitts and Nevis	KNA
Cameroon	CMR	Lebanon	LBN	St. Lucia	LCA
Canada	CAN	Lesotho	LSO	St. Vincent and the Grenadines	VCT
Central African Republic	CAF	Liberia	LBR	Sudan	SDN
Chad	TCD	Libya	LBY	Suriname	SUR
Chile	CHL	Lithuania	LTU	Sweden	SWE
China	CHN	Luxembourg	LUX	Switzerland	CHE
Colombia	COL	Madagascar	MDG	Syria	SYR
Comoros	COM	Malawi	MWI	São Tomé and Príncipe	STP
Costa Rica	CRI	Malaysia	MYS	Taiwan Province of China	TWN
Croatia	HRV	Maldives	MDV	Tajikistan	TJK
Cyprus	CYP	Mali	MLI	Tanzania	TZA
Czech Republic	CZE	Malta	MLT	Thailand	THA
Côte d'Ivoire	CIV	Marshall Islands	MHL	The Bahamas	BHS
Democratic Republic of the Congo	COD	Mauritania	MRT	The Gambia	GMB
Denmark	DNK	Mauritius	MUS	Timor-Leste	TLS
Djibouti	DJI	Mexico	MEX	Togo	TGO
Dominica	DMA	Micronesia	FSM	Tonga	TON
Dominican Republic	DOM	Moldova	MDA	Trinidad and Tobago	TTO
Ecuador	ECU	Mongolia	MNG	Tunisia	TUN
Egypt	EGY	Montenegro	MNE	Turkey	TUR
El Salvador	SLV	Morocco	MAR	Turkmenistan	TKM
Equatorial Guinea	GNQ	Mozambique	MOZ	Tuvalu	TUV
Eritrea	ERI	Myanmar	MMR	Uganda	UGA
Estonia	EST	Namibia	NAM	Ukraine	UKR
Eswatini	SWZ	Nepal	NPL	United Arab Emirates	ARE
Ethiopia	ETH	Netherlands	NLD	United Kingdom	GBR
Fiji	FJI	New Zealand	NZL	United States	USA
Finland	FIN	Nicaragua	NIC	Uruguay	URY
France	FRA	Niger	NER	Uzbekistan	UZB
Gabon	GAB	Nigeria	NGA	Vanuatu	VUT
Georgia	GEO	North Macedonia	MKD	Venezuela	VEN
Germany	DEU	Norway	NOR	West Bank and Gaza	WBG
Ghana	GHA	Oman	OMN	Yemen	YEM
Greece	GRC	Pakistan	PAK	Zambia	ZMB
Grenada	GRD	Panama	PAN	Zimbabwe	ZWE

**Table A2. List of countries belonging to each countries' group.**

Group	Countries
Advanced	Australia, Austria, Belgium, Canada, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong SAR, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, Malta, Netherlands, New Zealand, Norway, Portugal, Puerto Rico, San Marino, Singapore, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Taiwan Province of China, United Kingdom, United States
Developing Economies	Afghanistan, Albania, Algeria, Angola, Antigua and Barbuda, Argentina, Armenia, Azerbaijan, Bahrain, Bangladesh, Barbados, Belarus, Belize, Benin, Bhutan, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Brunei Darussalam, Bulgaria, Burkina Faso, Burundi, Cabo Verde, Cambodia, Cameroon, Central African Republic, Chad, Chile, China, Colombia, Comoros, Costa Rica, Côte d'Ivoire, Croatia, Democratic Republic of the Congo, Djibouti, Dominica, Dominican Republic, Ecuador, Egypt, El Salvador, Equatorial Guinea, Eritrea, Eswatini, Ethiopia, Fiji, Gabon, Georgia, Ghana, Grenada, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Honduras, Hungary, India, Indonesia, Iraq, Islamic Republic of Iran, Jamaica, Jordan, Kazakhstan, Kenya, Kiribati, Kosovo, Kuwait, Kyrgyz Republic, Lao P.D.R., Lebanon, Lesotho, Liberia, Libya, Madagascar, Malawi, Malaysia, Maldives, Mali, Marshall Islands, Mauritania, Mauritius, Mexico, Micronesia, Moldova, Mongolia, Montenegro, Morocco, Mozambique, Myanmar, Namibia, Nepal, Nicaragua, Niger, Nigeria, North Macedonia, Oman, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Qatar, Republic of Congo, Romania, Russia, Rwanda, Samoa, São Tomé and Príncipe, Saudi Arabia, Senegal, Serbia, Seychelles, Sierra Leone, Solomon Islands, South Africa, South Sudan, Sri Lanka, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Sudan, Suriname, Syria, Tajikistan, Tanzania, Thailand, The Bahamas, The Gambia, Timor-Leste, Togo, Tonga, Trinidad and Tobago, Tunisia, Turkey, Turkmenistan, Tuvalu, Uganda, Ukraine, United Arab Emirates, Uruguay, Uzbekistan, Vanuatu, Venezuela, Yemen, Zambia, Zimbabwe
Africa	Angola, Benin, Botswana, Burkina Faso, Burundi, Cabo Verde, Cameroon, Central African Republic, Chad, Comoros, Côte d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Eritrea, Eswatini, Ethiopia, Gabon, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritius, Mozambique, Namibia, Niger, Nigeria, Republic of Congo, Rwanda, São Tomé and Príncipe, Senegal, Seychelles, Sierra Leone, South Africa, South Sudan, Tanzania, The Gambia, Togo, Uganda, Zambia, Zimbabwe
Asia	Australia, Bangladesh, Bhutan, Brunei Darussalam, Cambodia, China, Fiji, Hong Kong SAR, India, Indonesia, Japan, Kiribati, Korea, Lao P.D.R., Malaysia, Maldives, Marshall Islands, Micronesia, Mongolia, Myanmar, Nepal, New Zealand, Papua New Guinea, Philippines, Samoa, Singapore, Solomon Islands, Sri Lanka, Taiwan Province of China, Thailand, Timor-Leste, Tonga, Tuvalu, Vanuatu
Europe	Albania, Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, San Marino, Serbia, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom
Latin America	Antigua and Barbuda, Argentina, Barbados, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, The Bahamas, Trinidad and Tobago, Uruguay, Venezuela

**Table A3. Augmented Dickey-Fuller Stationarity Tests for the General Government Revenues and Expenditures, 1980-2018, in percentage of GDP.**

Country	Revenues				Expenditures				Country	Revenues				Expenditures			
	Levels	Obs.	F.D.	Obs.	Levels	Obs.	F.D.	Obs.		Levels	Obs.	First-Difference	Obs.	Levels	Obs.	First-Difference	Obs.
AFG	-1.504	15	-3.409**	14	0.988	15	-3.634**	14	LTU	-3.672**	22	-4.454***	21	0.36	27	-2.771*	21
ALB	-2.664*	20	-5.527***	19	0.247	20	-4.561***	19	LUX	-2.481	22	-4.268***	21	2.19	22	-5.065***	21
DZA	-1.684	27	-5.134***	26	-0.085	27	-5.265***	26	MDG	-2.918*	37	-6.265***	36	3.473	37	-5.325***	36
AGO	-1.689	21	-3.491**	20	-0.457	21	-3.467**	20	MWI	-2.975*	15	-3.343**	14	3.192	15	-3.423**	14
ATG	-2.5	27	-4.166***	26	-0.755	27	-5.006***	26	MYS	-1.695	27	-3.734**	26	0.629	27	-3.173**	26
ARG	-0.888	24	-3.483**	23	7.827	24	-2.233	23	MDV	-3.471**	27	-4.884***	26	2.043	27	-4.484***	26
ARM	-3.186**	24	-5.258***	23	1.257	24	-1.764	11	MLI	-2.766*	17	-4.52***	16	-1.322	17	-2.989*	16
AUS	-1.997	29	-3.214**	28	1.99	29	-4.854***	28	MLT	-2.647*	17	-4.206***	16	3.976	17	-2.996*	16
AUT	-3.253**	29	-4.099***	28	0.172	29	-3.633**	28	MHL	-1.962	20	-2.852*	19	0.749	22	-4.12***	19
AZE	-1.959	23	-4.383***	22	0.27	23	-3.306**	22	MRT	-3.015**	27	-4.955***	26	1.412	27	-2.951*	12
BHR	-2.32	27	-4.945***	26	-0.621	27	-4.453***	26	MUS	-1.291	17	-3.552**	16	0.752	17	-3.161**	17
BGD	-1.972	37	-3.93***	36	3.792	37	-6.103***	36	MEX	-1.179	27	-4.388***	26	2.175	27	-3.37**	26
BRB	-2.09	23	-4.281***	22	-0.842	23	-3.364**	22	FSM	-1.833	22	-4.055***	21	1.055	22	-4.967***	21
BLR	-3.042**	21	-3.696**	20	1.423	21	-2.593	15	MDA	-1.773	22	-2.6	21	2.397	22	-3.203**	21
BEL	-2.131	37	-4.844***	36	2.07	37	-3.514**	36	MNG	-2.091	36	-4.373***	35	2.437	36	-4.858***	35
BLZ	-1.15	21	-4.865***	20	0.342	21	-2.501	20	MNE	-2.651*	15	-3.088**	14	-1.175	15	-3.139**	14
BEN	-1.972	28	-3.744***	27	1.158	28	-4.122***	27	MAR	-1.447	27	-3.929***	26	0.365	27	-3.718**	26
BTN	-2.107	36	-4.297***	35	4.875	36	-4.057***	35	MOZ	-2.095	37	-6.069***	36	3.854	37	-5.188***	36
BOL	-1.681	36	-4.12***	35	-0.068	33	-4.687***	35	MMR	-2.461	19	-3.399**	18	-0.193	19	-2.145	18
BIH	-3.866***	19	-3.24**	18	-0.112	19	-2.881*	18	NAM	-2.487	27	-4.07***	26	1.13	27	-3.928***	26
BWA	-0.15	17	-3.626**	16	-0.586	17	-5.816***	36	NPL	1.554	17	-2.615	16	3.276	17	-0.477	16
BRA	-1.116	21	-3.597**	20	0.655	21	-5.114***	20	NLD	-1.345	37	-4.552***	36	1.197	37	-4.193***	36
BRN	-3.135**	31	-5.785***	31	-1.765	37	-5.817***	31	NZL	-1.588	32	-2.606	31	1.399	32	-3.999***	31
BGR	-2.323	19	-3.403**	18	0.195	19	-4.275***	18	NIC	-2.311	17	-3.532**	16	-0.386	17	-6.715***	16
BFA	-3.28**	32	-6.547***	31	0.609	32	-8.424***	31	NER	-2.621	22	-4.487***	21	-0.38	22	-3.6**	21
BDI	-1.756	27	-3.559**	26	-0.691	27	-4.98***	26	NGA	-1.764	27	-5.699***	26	-0.779	27	-3.485**	26
CPV	-3.93***	23	-3.418**	22	0.544	23	-4.127***	22	MKD	-1.171	20	-5.522***	19	0.232	20	-3.283**	19
KHM	0.908	21	-3.335**	20	4.276	21	-2.696*	20	NOR	-1.668	37	-5.439***	36	1.085	37	-5.066***	36
CMR	-2.706*	17	-4.007***	16	-1.685	17	-2.297	16	OMN	-3.022**	27	-4.849***	26	-1.17	27	-3.597**	26
CAN	-1.655	37	-3.628**	36	1.953	37	-4.365***	36	PAK	-2.725*	37	-6.237***	36	4.763	37	-3.99***	23
CAF	-3.664**	29	-5.104***	28	-0.962	29	-5.68***	28	PAN	-2.338	23	-3.677**	22	0.775	23	-8.561***	22
TCD	-1.927	22	-3.891***	21	-1.292	22	-3.351**	21	PNG	-2.546	34	-4.743***	33	1.724	34	-5.797***	33
CHL	-3.471**	27	-5.039***	26	1.363	27	-3.735**	26	PRY	-1.87	37	-4.521***	36	4.091	37	-3.633**	36
CHN	-0.946	35	-2.444	34	2.438	35	-2.921*	34	PER	-2.294	17	-2.548	16	-0.143	17	-4.478***	16
COL	-4.703***	37	-8.008***	36	4.397	37	-4.465***	34	PHL	-1.864	28	-3.472**	27	3.642	28	-3.154**	27
COM	-1.446	33	-5.674***	32	0.708	33	-4.622***	32	POL	-5.863***	22	-4.242***	21	1.723	22	-3.741***	21
CRI	-2.337	27	-4.645***	26	1.788	27	-4.428***	26	PRT	-1.996	31	-7.185***	30	-1.194	31	-5.224***	30
CIV	-1.878	20	-3.812***	19	1.743	20	-3.463**	19	PRI	0	3	0	2	0	3	0	2
HRV	-6.443***	25	-5.021***	24	-1.801	25	-4.696***	24	QAT	-2.676*	27	-5.102***	26	-1.021	27	-4.02***	26
CYP	-1.563	22	-3.661**	21	-0.867	22	-3.159**	21	COG	-1.368	28	-4.478***	27	-1.259	28	-2.87*	27
CZE	-1.623	22	-3.814***	21	0.792	22	-4.305***	21	ROU	-5.953***	27	-4.087***	26	1.577	27	-4.915***	26
COD	-1.417	21	-2.291	20	1.746	21	-2.883*	20	RUS	-3.103**	19	-3.41**	18	1.147	19	-4.052***	18
DNK	-2.773*	37	-4.153***	36	-0.773	37	-4.064***	36	RWA	-1.229	25	-9.909***	24	4.462	25	-9.791***	24
DJI	-2.033	27	-3.884***	26	1.654	27	-4.47***	26	WSM	-1.592	25	-5.893***	24	0.775	25	-4.411***	24
DMA	-1.815	27	-5.141***	26	-0.809	27	-2.029	26	SMR	-1.74	13	-2.548	12	-1.391	13	-2.544	12



Country	Revenues				Expenditures				Country	Revenues				Expenditures			
	Levels	Obs.	F.D.	Obs.	Levels	Obs.	F.D.	Obs.		Levels	Obs.	First-Difference	Obs.	Levels	Obs.	First-Difference	Obs.
DOM	-2.746*	20	-3.369**	19	1.506	20	-4.074***	19	STP	-2.017	17	-3.78***	16	-1.63	17	-3.076**	16
ECU	-1.037	22	-3.628**	21	-0.17	22	-3.078**	21	SAU	-1.884	26	-4.409***	25	-1.285	26	-4.363***	26
EGY	-1.596	18	-3.371**	17	2.637	18	-3.407**	17	SEN	-1.171	23	-3.469**	22	1.841	23	-2.962*	22
SLV	-0.321	27	-3.813***	26	0.902	27	-6.351***	26	SRB	-4.134***	17	-5.644***	16	-0.327	17	-5.382***	16
GNQ	-2.98**	37	-5.132***	36	-1.246	37	-4.188***	36	SYC	-1.021	34	-4.648***	33	2.596	34	-5.22***	33
ERI	-1.579	25	-4.628***	24	-0.761	25	-3.639**	24	SLE	-3.025**	17	-4.701***	16	1.287	17	-3.35**	16
EST	-2.211	22	-4.519***	21	0.726	22	-5.557***	21	SGP	-1.992	27	-3.966***	26	0.825	27	-4.912***	26
SWZ	-2.142	37	-4.56***	36	0.916	37	-4.573***	36	SVK	-1.823	22	-2.368	21	1.043	22	-4.322***	21
ETH	-2.647*	37	-4.001***	36	0.046	37	-5.278***	36	SVN	-2.54	22	-3.434**	21	-1.168	22	-3.683**	21
FJI	-2.174	25	-4.663***	24	2.534	25	-6.141**	24	SLB	-1.493	37	-3.185**	36	1.114	37	-3.349**	36
FIN	-2.246	37	-4.335***	36	-0.167	37	-3.916***	36	ZAF	-1.564	17	-2.864*	16	1.873	17	-4.327***	16
FRA	-1.279	37	-3.253**	36	0.06	37	-4.033***	36	SSD	-0.922	6	-3.305**	5	-1.208	6	-0.159	5
GAB	-1.538	27	-4.29***	26	-1.712	27	-6.644***	26	ESP	-2.953*	37	-3.938***	36	-0.328	37	-3.371**	36
GEO	-1.793	23	-2.801*	22	1.528	23	-2.581	21	LKA	-2.181	27	-3.646**	26	2.106	27	-5.007***	26
DEU	-1.601	26	-4.292***	25	2.231	26	-4.678***	25	KNA	-1.329	37	-4.465***	36	1.039	37	-4.797***	36
GHA	-1.348	37	-5.584***	36	6.638	35	-4.45***	36	LCA	-3.187**	32	-5.045***	31	1.247	32	-4.146***	31
GRC	-0.892	37	-4.238***	36	-0.992	37	-4.763***	36	VCT	-2.275	37	-4.774***	36	0.286	37	-5.875***	36
GRD	-1.862	27	-4.808***	26	1.17	27	-6.073***	26	SDN	-1.843	27	-4.243***	26	2.556	27	-4.564***	26
GTM	-3.374**	22	-3.637**	21	0.892	22	-3.101**	21	SUR	-2.915*	27	-5.333***	26	1.081	27	-4.833***	26
GIN	-1.097	27	-3.974***	26	3.452	27	-4.243***	26	SWE	-0.669	37	-4.196***	36	0.738	37	-4.283***	36
GNB	-3.781***	26	-6.981***	25	-1.031	26	-6.457***	25	CHE	-1.17	34	-3.489**	33	-0.094	34	-4.119***	33
GUY	-1.926	20	-3.041**	19	2.667	20	-4.096***	19	SYR	-0.941	19	-4.434***	18	2.393	19	-4.304***	18
HTI	-1.365	20	-2.82*	19	0.873	20	-2.36	19	TWN	-1.404	37	-5.818***	36	-0.853	37	-5.654***	36
HND	-1.564	27	-4.23***	26	2.537	27	-4.454***	26	TJK	-1.281	19	-1.377**	18	0.871	19	-2.601	18
HKG	-1.695	36	-6.709***	35	0.812	36	-5.429***	35	TZA	-1.592	26	-4.289***	25	1.689	26	-2.333	25
HUN	-2.136	22	-3.542**	21	0.418	22	-5.121***	21	THA	-1.457	22	-2.745*	21	1.657	22	-5.582***	21
ISL	-1.931	37	-5.242***	36	1.252	37	-6.171***	36	BHS	-0.828	27	-4.218***	26	0.015	27	-5.147***	26
IND	-1.779	29	-5.254***	28	4.02	29	-3.985***	28	GMB	-0.419	17	-6.546***	16	2.055	17	-4.099***	16
IDN	-1.952	36	-4.409***	35	3.391	36	-4.29***	23	TLS	-1.468	17	-3.179**	16	-0.809	17	-2.199	15
IRQ	-2.109	13	-2.471	12	-2.126	13	-3.916***	12	TGO	-0.65	28	-3.205**	27	4.198	28	-3.936***	27
IRL	-0.589	22	-2.926*	21	0.035	22	-2.99*	21	TON	0.414	18	-3.946***	17	2.033	18	-3.643**	17
IRN	-2.765*	27	-5.335***	26	6.42	27	-4.711***	26	TTO	-1.948	29	-4.889***	28	-1.037	29	-6.348***	28
ISR	-1.467	17	-3.523**	16	0.887	17	-7.112***	16	TUN	-1.557	27	-5.549***	26	2.375	27	-2.706*	25
ITA	-4.563***	29	-3.998***	28	-2.812*	29	-3.992***	28	TUR	-1.989	17	-4.206***	16	3.405	17	-2.962*	16
JAM	-0.873	27	-6.196***	26	3.462	27	-3.607**	26	TKM	-2.903*	20	-5.672***	19	-0.662	20	-2.818*	19
JPN	-0.469	37	-3.466**	36	-1.596	37	-4.081***	36	TUV	-0.004	13	-4.221***	12	1.376	13	-3.566**	12
JOR	-1.6	32	-5.706***	31	2.103	32	-5.019***	31	UGA	-1.555	20	-2.853*	19	3.289	20	-2.816*	19
KAZ	-2.026	23	-3.846***	22	0.749	23	-3.094**	14	UKR	-1.306	22	-3.078**	21	3.498	22	-4.206***	21
KEN	-0.765	35	-4.683***	34	1.429	35	-3.425**	34	ARE	-2.471	27	-4.594***	26	-0.698	27	-3.154**	25
KIR	-1.537	29	-4.571***	28	0.211	29	-4.712***	26	GBR	-2.039	37	-4.787***	36	1.957	37	-3.328**	36
KOR	-1.542	22	-3.065**	21	1.651	22	-4.097**	21	USA	-2.928*	16	-2.702*	15	-0.747	16	-2.344	15
UVK	-3.976***	17	-3.545**	16	-0.65	17	-3.122**	16	URY	-1.01	18	-5.049***	17	3.764	18	-3.795***	17
KWT	-2.252	27	-4.577***	26	-1.513	27	-9.925***	26	UZB	-2.171	25	-3.963***	24	1.202	26	-5.74***	24
KGZ	-0.724	24	-3.572**	23	2.11	24	-3.815***	21	VUT	-0.582	26	-3.898***	25	2.183	26	-3.807***	25
LAO	-1.171	17	-2.202	16	0.129	17	-2.507	16	VEN	-2.25	29	-5.541**	28	-5.938***	13	-6.148***	28
LVA	-1.197	19	-2.739*	18	-0.469	19	-4.779***	18	WBG	-3.891***	8	-2.856*	7	-0.969	8	-2.006	7
LBN	-1.837	27	-4.479***	26	0.295	27	-5.766***	26	YEM	-0.971	27	-3.245**	26	-1.41	27	-3.112**	26

Country	Revenues				Expenditures				Country	Revenues				Expenditures			
	Levels	Obs.	F.D.	Obs.	Levels	Obs.	F.D.	Obs.		Levels	Obs.	First-Difference	Obs.	Levels	Obs.	First-Difference	Obs.
LSO	-2.229	35	-4.974***	34	1.115	35	-4.196***	34	ZMB	-2.201	17	-4.045***	16	2.594	17	-2.311	16
LBR	-1.243	17	-1.791	16	-1.399	17	-1.991	16	ZWE	-1.939	12	-3.743**	11	-0.465	12	-2.494	11
LBY	-1.459	27	-4.329***	26	-1.499	27	-3.756***	26									

Notes: \*, \*\*, and \*\*\* denote statistical significance at the 10%, 5%, and 1% level respectively. Unit-root tests were carried out with one-lag, with constant and no trend.

**Table A4. Weighted Least Squares estimation results for equation 2, 1980-2018, HP-based (no fixed effects).**

	Income Group				Regions							
	AE		DEV		Africa		Asia		Europe		Latin America	
$\beta_{t-1}$	0.817*** (0.047)	0.806*** (0.048)	0.672*** (0.135)	0.669*** (0.136)	0.694*** (0.091)	0.685*** (0.092)	0.956*** (0.017)	0.951*** (0.018)	0.720*** (0.035)	0.718*** (0.035)	0.897*** (0.071)	0.898*** (0.073)
$\beta_{t-1} * Need_t$	-0.793*** (0.048)	-0.782*** (0.049)	0.128 (0.119)	0.125 (0.120)	-0.050 (0.162)	-0.049 (0.161)	-0.035 (0.030)	-0.045 (0.033)	-0.680*** (0.041)	-0.679*** (0.041)	0.060 (0.052)	0.058 (0.053)
$Debt_{t-1}$		-0.001*** (0.000)		0.000** (0.000)		0.000** (0.000)		-0.000** (0.000)		0.000 (0.000)		-0.000 (0.000)
Obs.	615	615	2,562	2,505	766	758	558	546	762	761	571	562
$R^2$	0.420	0.431	0.703	0.700	0.636	0.637	0.922	0.921	0.371	0.375	0.906	0.906

Note: Constant term estimated and omitted for reasons of parsimony. Robust standard errors in parenthesis. \*, \*\*, \*\*\* denote statistical significance at the 10, 5 and 1 percent levels, respectively.

**Table A5. Weighted Least Squares estimation results for equation 2, 1980-2018, HP-based (with country fixed effects).**

	Income Group				Regions							
	AE		DEV		Africa		Asia		Europe		Latin America	
$\beta_{t-1}$	0.206*** (0.059)	0.197*** (0.061)	0.277** (0.125)	0.268** (0.123)	0.309*** (0.091)	0.305*** (0.090)	0.739*** (0.063)	0.705*** (0.063)	0.134*** (0.033)	0.127*** (0.029)	0.548*** (0.158)	0.548*** (0.160)
$\beta_{t-1} * Need_t$	-0.193*** (0.059)	-0.184*** (0.061)	0.043 (0.051)	0.034 (0.049)	-0.045 (0.073)	-0.043 (0.074)	-0.035 (0.033)	-0.034 (0.032)	-0.120*** (0.032)	-0.114*** (0.029)	0.034 (0.028)	0.029 (0.026)
$Debt_{t-1}$		-0.001*** (0.000)		-0.000 (0.000)		0.000 (0.000)		-0.001** (0.000)		-0.001*** (0.000)		0.000 (0.000)
Obs.	615	615	2,562	2,505	766	758	558	546	762	761	571	562
$R^2$	0.880	0.886	0.860	0.862	0.810	0.810	0.940	0.941	0.904	0.930	0.938	0.938

Note: Constant term and country effects estimated and omitted for reasons of parsimony. Robust standard errors in parenthesis. \*, \*\*, \*\*\* denote statistical significance at the 10, 5 and 1 percent levels, respectively.

**Table A6. Weighted Least Squares estimation results for equation 2, 1980-2018, HP-based (with time fixed effects).**

	Income Group				Regions							
	AE		DEV		Africa		Asia		Europe		Latin America	
$\beta_{t-1}$	0.842*** (0.046)	0.832*** (0.047)	0.670*** (0.136)	0.667*** (0.137)	0.697*** (0.092)	0.688*** (0.094)	0.956*** (0.017)	0.952*** (0.018)	0.743*** (0.037)	0.743*** (0.037)	0.893*** (0.074)	0.894*** (0.075)
$\beta_{t-1} * Need_t$	-0.818*** (0.048)	-0.808*** (0.048)	0.133 (0.123)	0.130 (0.124)	-0.058 (0.172)	-0.060 (0.170)	-0.035 (0.032)	-0.045 (0.035)	-0.704*** (0.044)	-0.704*** (0.043)	0.072 (0.057)	0.070 (0.058)
$Debt_{t-1}$		-0.000*** (0.000)		0.000* (0.000)		0.000** (0.000)		-0.000** (0.000)		0.000 (0.000)		-0.000 (0.000)
Obs.	615	615	2,562	2,505	766	758	558	546	762	761	571	562
$R^2$	0.437	0.445	0.705	0.701	0.637	0.638	0.922	0.921	0.391	0.396	0.908	0.908

Note: Constant term and time effects estimated and omitted for reasons of parsimony. Robust standard errors in parenthesis. \*, \*\*, \*\*\* denote statistical significance at the 10, 5 and 1 percent levels, respectively.

**Table A7. Weighted Least Squares estimation results for equation 3, 1980-2018, HP-based (no fixed effects).**

	Income Group				Regions							
	AE		DEV		Africa		Asia		Europe		Latin America	
$\beta_{t-1}$	0.876*** (0.038)	0.875*** (0.038)	0.720*** (0.120)	0.714*** (0.122)	0.231** (0.097)	0.186** (0.082)	0.962*** (0.022)	0.956*** (0.025)	0.908*** (0.034)	0.908*** (0.034)	0.966*** (0.026)	0.966*** (0.026)
$\beta_{t-1} * Did_t$	0.104*** (0.036)	0.104*** (0.036)	0.128 (0.096)	0.135 (0.100)	0.433*** (0.085)	0.323*** (0.095)	0.024 (0.023)	0.021 (0.022)	0.060** (0.028)	0.059** (0.028)	0.010 (0.024)	0.013 (0.023)
$Debt_{t-1}$		-0.000 (0.000)		-0.000 (0.000)		0.007*** (0.002)		-0.000 (0.000)		0.000 (0.000)		0.000 (0.000)
Obs.	587	587	834	827	98	98	198	198	652	652	308	301
$R^2$	0.926	0.926	0.767	0.768	0.425	0.521	0.972	0.972	0.929	0.930	0.930	0.930

Note: Constant term estimated and omitted for reasons of parsimony. Robust standard errors in parenthesis. \*, \*\*, \*\*\* denote statistical significance at the 10, 5 and 1 percent levels, respectively.

**Table A8. Weighted Least Squares estimation results for equation 3, 1980-2018, HP-based (with country fixed effects).**

	Income Group				Regions							
	AE		DEV		Africa		Asia		Europe		Latin America	
$\beta_{t-1}$	0.590***	0.579***	0.270**	0.269**	0.068**	0.068**	0.614***	0.614***	0.513***	0.497***	0.694***	0.697***
	(0.116)	(0.117)	(0.109)	(0.109)	(0.027)	(0.027)	(0.049)	(0.049)	(0.138)	(0.139)	(0.114)	(0.115)
$\beta_{t-1} * Did_t$	0.055**	0.059**	0.079*	0.079	0.265***	0.267***	0.001	0.002	0.009	0.015	0.003	-0.008
	(0.025)	(0.025)	(0.048)	(0.050)	(0.100)	(0.099)	(0.013)	(0.013)	(0.013)	(0.014)	(0.020)	(0.016)
$Debt_{t-1}$		-0.000**		-0.000		-0.001		-0.000		-0.000*		0.000
		(0.000)		(0.000)		(0.001)		(0.000)		(0.000)		(0.000)
Obs.	587	587	834	827	98	98	198	198	652	652	308	301
$R^2$	0.948	0.948	0.912	0.912	0.821	0.822	0.989	0.989	0.956	0.956	0.945	0.945

Note: Constant term and country effects estimated and omitted for reasons of parsimony. Robust standard errors in parenthesis. \*, \*\*, \*\*\* denote statistical significance at the 10, 5 and 1 percent levels, respectively.

**Table A9. Weighted Least Squares estimation results for equation 3, 1980-2018, HP-based (with time fixed effects).**

	Income Group				Regions							
	AE		DEV		Africa		Asia		Europe		Latin America	
$\beta_{t-1}$	0.876***	0.875***	0.719***	0.713***	0.227**	0.147*	0.965***	0.959***	0.911***	0.911***	0.971***	0.971***
	(0.038)	(0.038)	(0.123)	(0.125)	(0.101)	(0.076)	(0.022)	(0.025)	(0.033)	(0.033)	(0.028)	(0.028)
$\beta_{t-1} * Did_t$	0.107***	0.107***	0.131	0.137	0.508***	0.282**	0.017	0.013	0.057**	0.057**	0.005	0.005
	(0.037)	(0.037)	(0.103)	(0.107)	(0.111)	(0.110)	(0.025)	(0.023)	(0.028)	(0.028)	(0.027)	(0.026)
$Debt_{t-1}$		-0.000		-0.000		0.012***		-0.000		0.000		0.000
		(0.000)		(0.000)		(0.002)		(0.000)		(0.000)		(0.000)
Obs.	587	587	834	827	98	98	198	198	652	652	308	301
$R^2$	0.928	0.928	0.768	0.768	0.466	0.622	0.974	0.974	0.932	0.932	0.931	0.931

Note: Constant term and time effects estimated and omitted for reasons of parsimony. Robust standard errors in parenthesis. \*, \*\*, \*\*\* denote statistical significance at the 10, 5 and 1 percent levels, respectively.

**Table A10. Weighted Least Squares estimation results for equation 2, 1980-2018, WEO-based.**

	Income Group				Regions							
	AE		DEV		Africa		Asia		Europe		Latin America	
$\beta_{t-1}$	0.013*** (0.003)	0.013*** (0.003)	0.278** (0.126)	0.277** (0.126)	0.367*** (0.101)	0.367*** (0.100)	0.775*** (0.055)	0.744*** (0.051)	0.013*** (0.003)	0.013*** (0.003)	0.529*** (0.166)	0.525*** (0.167)
$\beta_{t-1} * Need_t$	0.201*** (0.067)	0.191*** (0.071)	-0.044 (0.082)	-0.044 (0.081)	-0.282*** (0.093)	-0.282*** (0.093)	-0.025* (0.013)	-0.022* (0.012)	0.090*** (0.019)	0.079*** (0.019)	0.065 (0.050)	0.067 (0.049)
$Debt_{t-1}$		-0.001*** (0.000)		-0.000 (0.000)		0.000 (0.000)		-0.001** (0.000)		-0.001** (0.000)		-0.000 (0.000)
Obs.	615	615	2,451	2,434	758	758	502	502	752	752	552	544
$R^2$	0.884	0.887	0.867	0.867	0.822	0.822	0.969	0.970	0.928	0.929	0.940	0.941

Note: Constant term, country and time effects estimated and omitted for reasons of parsimony. Robust standard errors in parenthesis. \*, \*\*, \*\*\* denote statistical significance at the 10, 5 and 1 percent levels, respectively.

**Table A11. Weighted Least Squares estimation results for equation 3, 1980-2018, WEO-based.**

	Income Group				Regions							
	AE		DEV		Africa		Asia		Europe		Latin America	
$\beta_{t-1}$	0.589*** (0.115)	0.582*** (0.116)	0.393*** (0.085)	0.398*** (0.083)	0.284*** (0.095)	0.289*** (0.094)	0.591*** (0.050)	0.588*** (0.050)	0.503*** (0.134)	0.497*** (0.135)	0.689*** (0.116)	0.693*** (0.118)
$\beta_{t-1} * Did_t$	0.046* (0.026)	0.047* (0.026)	-0.164*** (0.047)	-0.175*** (0.048)	-0.222** (0.088)	-0.232** (0.088)	0.012 (0.013)	0.011 (0.013)	-0.025 (0.028)	-0.022 (0.027)	0.016 (0.028)	0.004 (0.024)
$Debt_{t-1}$		-0.000* (0.000)		0.000 (0.000)		0.003* (0.002)		0.000 (0.000)		-0.000 (0.000)		0.000 (0.000)
Obs.	587	587	834	827	98	98	198	198	652	652	308	301
$R^2$	0.950	0.950	0.922	0.923	0.828	0.832	0.990	0.990	0.959	0.959	0.946	0.946

Note: Constant term, country and time effects estimated and omitted for reasons of parsimony. Robust standard errors in parenthesis. \*, \*\*, \*\*\* denote statistical significance at the 10, 5 and 1 percent levels, respectively.