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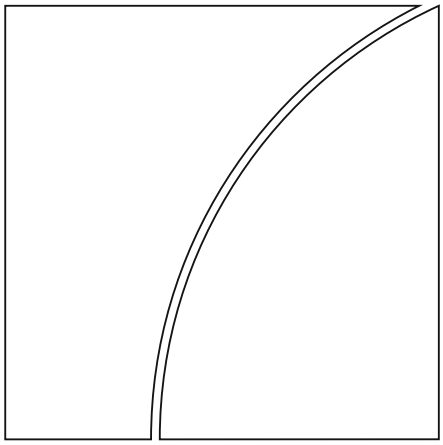

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Assessing fiscal policy through the lens of the financial and the commodity price cycles

Enrique Alberola and Ricardo Sousa[#]

Abstract

We assess the link between fiscal policy and credit and commodity price booms and busts. We do so by investigating the impact of financial and commodity price cycles on the identification of episodes of fiscal consolidation and stimulus and the size of the fiscal impulse. We find that controlling for the credit cycle has an impact on the magnitude of the change in the cyclically-adjusted budget balance. The impact is lower in the case of the commodity price cycle. In addition, we show that credit booms and busts influence the cyclicality of fiscal policy, but not to the extent of significantly altering the systematic response of fiscal policy to the dynamics of real economic activity. Again, the impact of the commodity price cycle is smaller and limited to some specific cases.

Keywords: fiscal policy, financial cycles, commodity price cycles, fiscal impulse, fiscal consolidation, fiscal stimulus, cyclicality.

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[#] Bank for International Settlements.

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1. Introduction

The Great Recession has made it clear how prolonged financial booms can end up in busts and lead to banking crises (Reinhart and Rogoff (2009)). The severity of the financial turmoil was just a confirmation that "financial crisis" recessions tend to have a more damaging macroeconomic effect than "normal" recessions (Jordà et al (2014)).

But financial boom-bust cycles can also have a large impact on public finances. By raising the likelihood of banking crises (Schularik and Taylor (2012)), private sector credit booms may materialize into a sharp deterioration of public finances (Borio et al (2016)) and force the adoption of fiscal austerity measures (Agnello et al (2013)). Reinhart and Rogoff (2011) show that government debt increases, on average, by about 86% over the three years following a crisis.

Systemic crisis episodes also lead to a sizeable increase in public debt (Laeven and Valencia (2013)). Thus, financial cycles can *"wreak havoc with public finances"* (Borio et al (2016)). Weaker public finances may also be intertwined with financial instability (Reinhart and Rogoff (2009, 2011)). Financing conditions have contributed to make fiscal policy in Latin America procyclical in recent times (Alberola et al (2016)).

As Obstfeld (2013) puts it, prudent public finance management should take into account the linkages between financial cycles and fiscal imbalances.

For resource-rich emerging market economies – but not only – financial cycles driven by capital flows and commodity cycles have been jointly interconnected with crisis episodes (Reinhart et al (2016)). Indeed, the commodity price cycle also influences the dynamics of the business cycle (Alberola et al (2016)), and it can be a source of macroeconomic imbalances with implications for the fiscal balance.

As commodity-linked revenues can represent an important share of government revenue in many of those countries (Sinnott (2009)), the commodity price cycle has the potential to make fiscal policy procyclical, with governments saving little during booms and dissaving too much during busts (Talvi and Végh (2005)). Villafuerte and Lopez-Murphy (2010) show that the fiscal balance substantially improved for oil-producing countries during the oil price cycle of 2003–2008. And procyclical fiscal policy is especially evident in Latin America; Alberola and Montero (2006); Ilzetski and Végh (2008)), but also in advanced economies (Lane (2003)).

Yet, the empirical evidence is not consensual. Some research suggests that fiscal policy has become *less* procyclical vis-à-vis commodity price changes in recent times. For instance, Pieschacon (2012) and Céspedes and Velasco (2014) find that fiscal policy turned from acyclical/procyclical in the commodity price boom of seventies-eighties to countercyclical in the boom of 2003–2008. They attribute such result to the institutional improvements, the fiscal rules adoption and the change in the exchange rate regime from a fixed to a flexible regime. Additionally, some authors argue that procyclical fiscal policy in low and middle-income countries accrues to lower political quality and weaker institutional factors (Tornell and Lane (1999); Erbil (2011)).

In contrast, other works provide support to the view that fiscal policy has become *more* procyclical due to the commodity cycle. For example, Arezki and Brückner (2010) find that commodity price booms tend to boost government spending and external debt in autocratic regimes. Alberola et al (2016) show that, after controlling the business cycle by the commodity (and financial) cycle, fiscal policy becomes more

procyclical in Latin American countries. Other authors highlight the increased procyclicality of fiscal policy with commodity prices despite the adoption of fiscal rules (Bjornland and Thorsrud (2015)). All in all, the commodity price cycle can affect the cyclicality of fiscal policy and lead to fiscal instability (Céspedes and Velasco (2014)).

In this context, our work aims at shedding more light on two main questions:

1. *Does controlling for financial/commodity price cycles affect the assessment of the fiscal stance in quantitative (eg size) and qualitative terms (eg identification of fiscal consolidation and stimulus episodes)?*

2. *How do credit (commodity price) booms and busts impact the cyclicality of fiscal policy?*

To answer these questions, we estimate the systematic reaction of the budget balance to economic activity and condition it on the phase of the financial (commodity price) cycle.

The response of the budget balance to economic activity is derived from a simple regression, based on Blanchard (1990), which allows us to identify: (i) the fiscal stance; and (ii) the cyclicality of fiscal policy.

The phases of the financial and commodity price cycles are derived from a novel methodology developed by Agnello et al (2015) and Burnside et al (2016), who apply it to the housing market cycle. Avdjiev et al (forthcoming) make use of the same framework to detect booms, busts and normal times in the credit cycle in 40 countries over the period 1940–2015, and we extend the identification to the case of commodity price cycles in 12 resource-rich countries for the period 1980–2015.

Then, we investigate how the response of the budget balance to economic activity is affected by the financial (commodity price) cycle by estimating a fiscal policy reaction function that incorporates not only real GDP but also an interaction term between real GDP and episodes of booms or busts.

Finally, we compute the fiscal stance: 1) without accounting for phase of the financial (commodity price) cycle; and 2) accounting for the phase of the financial (commodity price) cycle. And we identify single-year and multi-year episodes of large changes in the cyclically-adjusted budget balance (ie periods of fiscal consolidation (stimulus)) in both scenarios.

The results of the exercise show that credit cycles have a substantial impact on the characterisation of fiscal policy. The commodity price cycle has also some impact for the relevant countries, but it is of a much lower dimension.

In relation to the impact on the fiscal instance (the first question above) we conclude that:

1. Once we control for the phase of the financial cycle in the computation of the fiscal stance, the frequency of (successful) fiscal consolidations (stimuli) episodes is affected in single-year episodes and, to a lesser extent, in multi-year episodes; and the size of the change in the cyclically-adjusted budget balance (as a percentage of GDP) computed using a model that accounts for either credit booms or credit busts can differ by up to 1.6 percentage points of GDP relative to the standard model. This indicates that financial cycles affect not only the "qualitative" identification of the various fiscal episodes, but are also "quantitatively" important from an economic point of view.

2. The identification of periods of large "adjustments" in the cyclically-adjusted budget balance is also affected when we account for the phase of the commodity price cycle, but the quantitative differences in terms of size compared to the standard model are quite smaller than in the case of the financial cycle.

Regarding the second question –procyclicality- the results show that:

1. The effect of financial cycles on the cyclicality of fiscal can be quite diverse. Thus: (i) for countries where fiscal policy displays acyclicality, credit booms tends to make it procyclical; (ii) for countries where fiscal policy is procyclical, credit booms (busts) increase (decrease) procyclicality; and (iii) for countries where fiscal policy is countercyclical, credit booms and busts can either raise or decrease the degree of countercyclicality of fiscal policy. Thus the country-level experience regarding the effect of financial cycles on the cyclicality of fiscal can be quite diverse.
2. In some resource-rich countries where fiscal policy is countercyclical, the phase of the commodity price can be relevant, albeit not to the point of qualitatively changing the outcomes.

The remainder of the paper is as follows. Section 2 presents the empirical frameworks. Section 3 provides a description of the data and briefly discusses the identification of the financial and the commodity price cycles. Section 4 analyses the empirical results. Finally, in Section 5, we conclude and derive the main policy implications.

2. Empirical frameworks

2.1 Discretionary fiscal policy

Implicit in the evaluation of the fiscal policy stance is the recognition that (i) some components of government spending (such as unemployment benefits) can be negatively related to GDP growth because of automatic stabilizers and (ii) some components of government revenue can be positively related to GDP due to the progressivity of the tax system. In both cases, the government deficit would rise (fall) *endogenously* during economic recessions (booms). Fatás and Mihov (2009) highlight that fiscal policy is a combination of three elements: 1) these *automatic stabilizers* due to the link between certain categories of revenues and spending to changes in GDP; 2) *endogenous discretionary fiscal policy*, ie fiscal policy measures implemented in response to changes in real economic activity and not coded in tax or spending laws; and 3) *exogenous discretionary fiscal policy*, which includes changes in fiscal policy unrelated with the business cycle.

There is a large literature determining the fiscal policy stance and its relation to the business cycle. The cyclically-adjusted budget balance is computed for policy purposes and, in particular, to provide an assessment of the fiscal stance once the cyclical component of the budget balance and the effects of the automatic stabilizers have been removed (Girouard and André (2005)). Changes in the cyclically-adjusted budget balance inform on the direction of fiscal policy: increases (reductions) in the cyclically-adjusted budget balance indicate a contractionary (expansionary) fiscal stance. And regressing the changes in the cyclically-adjusted budget balance on the

output gap (Ilzetki and Végh (2008); Alberola et al (2016)) or the budget balance on output (Fatás and Mihov (2003); Ilzetki and Végh (2008)) allows to assess the cyclicality of fiscal policy.

As pointed out by Girouard and André (2005), this (OECD) approach to compute the cyclically-adjusted budget balance suffers from important limitations. First, it quantifies the impact of the business cycle on the budget balance by using indicators of the degree of resource utilisation, which are typically unobservable (such as the deviation between actual and potential output or the gap between actual and structural unemployment). This has the potential of introducing some degree of arbitrariness and endogeneity and can be subject to measurement error. Second, it assumes that the elasticity of four different types of government revenue (ie personal income tax, social security contributions, corporate income tax and indirect taxes) with respect to the output gap and the elasticity of one item of public spending (ie unemployment-related transfers) with respect to the ratio of structural to actual unemployment are constant. Thus, in one hand, the approach requires an important degree of granularity of the fiscal data, which makes the computation of the cyclically-adjusted budget balance unfeasible for long time periods or large country samples, in particular, if the country set includes emerging economies. On the other hand, the framework does not account for the fact that the elasticity of government revenue/spending with respect to the business cycle may be time-varying. Finally, the cyclically-adjusted budget balance may be influenced by temporary factors, such as classification errors, creative accounting or one-off operations (Koen and van den Noord, 2005) and asset prices cycles (Girouard and Price, 2004). Yet, none of these factors is related with the business cycle.

Therefore, there have been simpler, more direct methods to determine the fiscal stance and its relation with the business cycle.[1] Here we follow Blanchard (1990), Alesina and Perotti (1995) and Alesina and Ardagna (2010), who define the cyclically-adjusted budget balance as what the budget balance of any given year would be if the business cycle had remained unchanged from the previous year. We rely on the same approach and, as in Fatás and Mihov (2003) and Ilzetki and Végh (2008), regress the budget balance on a time trend and the real GDP,[2] that is

$$BAL_t = \alpha_0 + \alpha_1 TREND + \alpha_2 Y_t + \xi_t, \quad (1)$$

where *TREND* is a time trend and Y_t is the real GDP and ξ_t is the error term.

This model is estimated by Instrumental Variables/Generalised Method of Moments (IV/GMM) to correct for endogeneity, as suggested by Ilzetki and Végh (2008). The authors show that this correction allows to interpret the parameter α_2 as

[1] For instance, Fatás and Mihov (2003) estimate the following equation

$$BAL_t = \alpha + \beta \Delta Y_t + \gamma BAL_{t-1} + \boldsymbol{\delta} \mathbf{W_t} + \zeta_t,$$

where Y_t is the logarithm of real GDP, $\boldsymbol{W_t}$ is a vector of control variables (including a time trend, inflation and inflation squared) and ζ_t is the error term. The parameters β and γ capture the responsiveness (ie the elasticity) of the budget balance to the business cycle and the persistence of changes in the budget balance, while ζ_t measures the discretionary component of the budget balance. The authors consider the panel data version of this fiscal policy rule and use an Instrumental Variables (IV) approach, where current output growth is instrumented with two lags of GDP growth, the index of oil prices and lagged inflation.

[2] Unemployment data are notably contentious in emerging market economies. For this reason, we use real GDP instead of unemployment.

capturing the cyclicality of fiscal policy.[3] More precisely: (i) when $\alpha_2>0$, the budget balance improves with economic activity and fiscal policy can be defined as *countercyclical*; (ii) when $\alpha_2<0$, fiscal policy is *procyclical*; and (iii) when $\alpha_2=0$, fiscal policy is *acyclical*.

Then, using the coefficients and the residuals from the estimated regressions, we predict the budget balance-to-GDP ratio in period *t,* had the real GDP been the same as in the previous year, ie

$$BAL_t(Y_{t-1}) = \widehat{\alpha_0} + \widehat{\alpha_1} TREND + \widehat{\alpha_2} Y_{t-1} + \hat{\xi}_t, \quad (2)$$

where the $\widehat{\alpha_i}'s$ are the estimated coefficients in Equation (1) and $\hat{\xi}$ is the estimated residual in the same regression.

Following Alesina and Ardagna (2010), the cyclically-adjusted value of the change in the budget balance-to-GDP ratio (which they identify as the "fiscal impulse") is then constructed as the difference between this measure of the budget balance-to-GDP ratio in period *t* computed as if the business cycle was equal to the one in period *t–1* (ie $BAL_t(Y_{t-1})$) and the actual value of the balance-to-GDP ratio in period *t–1* (ie BAL_{t-1}):[4]

$$BAL_t(Y_{t-1}) - BAL_{t-1} =$$
$$= \left(\widehat{\alpha_0} + \widehat{\alpha_1} TREND + \widehat{\alpha_2} Y_{t-1} + \hat{\xi}_t\right) - \left(\widehat{\alpha_0} + \widehat{\alpha_1} TREND + \widehat{\alpha_2} Y_{t-1} + \hat{\xi}_{t-1}\right). \quad (3)$$

We can characterise the direction of fiscal stance as follows: a positive (negative) value of $BAL_t(Y_{t-1}) - BAL_{t-1}$ indicates an improvement (deterioration) in the cyclically-adjusted budget balance and, therefore, a contractionary (expansionary) fiscal policy.

Summing up, the main advantage of this simple approach is that it allows: (i) to determine whether, at each point in time, the fiscal policy stance is contractionary or expansionary and, in particular, whether specific fiscal adjustment programs can be labelled as episodes of fiscal consolidation or stimulus; and (ii) to characterise fiscal policy in relation to the business cycle, ie whether fiscal policy is countercyclical ($\alpha_2>0$), or procyclical ($\alpha_2<0$).

2.2 Episodes of fiscal consolidation and stimulus

Characterising the fiscal policy history can be done by focusing on single or multi-year periods of large changes in discretionary fiscal policy, as in (Blanchard (1990); Alesina and Perotti (1995); Alesina and Ardagna (2010)), that is, by identifying episodes of fiscal consolidation and fiscal stimulus. We can define consolidations and stimuli episodes in different ways, summarised in Table 1. Firstly, a period of fiscal consolidation (stimulus) can be identified as a year in which the cyclically-adjusted budget balance improves (deteriorates) by at least 1.5 per cent of GDP (Alesina and

[3] In particular, Ilzetki and Végh (2008) show that fiscal policy can be *countercyclical* even when the correlation between BAL_t and Y_t is positive. However, the claim that this positive correlation can be interpreted as *procyclical* fiscal policy is false. More specifically, when fiscal (output) shocks dominate output (fiscal) shocks, the covariance BAL_t and Y_t is positive (negative).

[4] In their seminal works, Blanchard (1990) and Alesina and Perotti (1995) instead define the fiscal impulse as the difference between the actual measure of the budgetary position of the government and the level of the same measure, had the effect of the cycle been taken into account. As is obvious, this only implies a change in the interpretation of the sign of the fiscal impulse as either a contractionary or an expansionary fiscal policy stance.

Ardagna (2010)). This procedure rules out small, albeit prolonged, consolidation/stimulus episodes, thus picking up rather sharp and large adjustments in the fiscal stance.[5] Under this definition, we construct a *single-year fiscal consolidation (stimulus)* dummy variable that takes the value of one if the cyclically-adjusted budget balance improves (deteriorates) by at least 1.5 per cent of GDP at year *t*, and zero otherwise.

We can also define a period of successful fiscal consolidation as a period in which the *cumulative* reduction of the debt-to-GDP ratio two years *after* the beginning of a fiscal adjustment is greater than 4.5 percentage points. According to Alesina and Ardagna (2010), this is the value of the 25th percentile of the empirical density for the change of the debt-to-GDP ratio in all episodes of fiscal adjustment. Thus, we construct a *single-year successful fiscal consolidation (stimulus)* dummy variable that takes the value of one if the cyclically-adjusted budget balance improves (deteriorates) by at least 1.5 per cent of GDP at year *t and* the *cumulative* reduction of the debt-to-GDP ratio two years *after* the beginning of a fiscal adjustment is greater than 4.5 percentage points, and zero otherwise.

Definitions of episodes of fiscal adjustments

Table 1

Fiscal episode	Change in the cyclically-adjusted budget balance	Time horizon	Cumulative change in public debt	Time horizon
Single-year fiscal consolidation	≥ 1.5%	One year	–	–
Single-year successful fiscal consolidation	≥ 1.5%	One year	≤-4.5%	Two years after the beginning of the episode
Single-year fiscal stimulus	≤ -1.5%	One year	–	–
Single-year successful fiscal stimulus	≤ -1.5%	One year	≤-4.5%	Two years after the beginning of the episode
Multi-year fiscal consolidation	≥ 1%	Two consecutive years	–	–
Multi-year successful fiscal consolidation	≥ 1%	Two consecutive years	≤-4.5%	Two years after the beginning of the episode
Multi-year fiscal stimulus	≤ -1%	Two consecutive years	–	–
Multi-year successful fiscal stimulus	≤ -1%	Two consecutive years	≤-4.5%	Two years after the beginning of the episode

[5] We note that, due to the lack of data for the interest payments on government debt, our definitions are based on the budget balance and not on the primary balance. Despite this, we highlight that the value of 75th percentile of the change of the cyclically-adjusted budget-to-GDP ratio is 1.9%, which is close to the threshold of 1.5% for the cyclically-adjusted balance-to-GDP ratio considered in Alesina and Perotti (1995) and Alesina and Ardagna (2010). Thus, the threshold is high enough to avoid picking up years of "cyclical" adjustment in the budget balance ie years of "business as usual" (Alesina and Perotti (2010)).

Finally, we allow for the possibility that large fiscal adjustments take place on a multi-year basis.[6] Thus we consider a *multi-year fiscal consolidation (stimulus)* dummy variable that takes the value of one if the cyclically-adjusted budget balance improves (deteriorates) by at least 1 per cent of GDP over two consecutive years, and zero otherwise. The corresponding *multi-year successful fiscal consolidation (stimulus)* episodes are constructed in an analogous way to single-year successful episodes, that is, the dummy variable takes the value of one if the cyclically-adjusted budget balance improves (deteriorates) by at least 1 per cent of GDP over two consecutive years *and* the *cumulative* reduction of the debt-to-GDP ratio two years *after* the beginning of a fiscal adjustment is greater than 4.5 percentage points, and zero otherwise.

We use all the available fiscal data at the quarterly frequency. This maximises the number of usable data points and increases the accuracy of the computation of the cyclically-adjusted budget balance. Then, changes in the cyclically-adjusted budget balance are quantified over a time window of one year (ie four quarters). This makes sure that the definitions of the various fiscal episodes are "aligned" or as close as possible to those of Blanchard (1990), Alesina and Perotti (1995) and Alesina and Ardagna (2010). Finally, given that changes in cyclically-adjusted budget balance can be volatile within each year for reasons other than those motivated by fiscal policy actions, we focus our attention on the changes at the end of each year. In practical terms, this means that we compute the change in the cyclically-adjusted budget balance between the last quarter of year *t-1* and the last quarter of year *t*. When this change exceeds (falls below) the thresholds described above, we set the dummy variables identifying specific fiscal consolidation (stimulus) episodes to take the value of one in all the quarters of year *t*.

2.3 Accounting for the financial and the commodity cycles

To investigate the impact of the commodity price and the financial cycles on the cyclicality of fiscal policy and the fiscal policy stance, we adjust the fiscal policy rule described by Equation (1) by adding an interaction term between real GDP and episodes of booms or busts in the credit cycle (or the commodity price cycle). More specifically, we estimate the following models

$$BAL_t = \alpha_0 + \alpha_1 TREND + \alpha_2 Y_t + \alpha_3 Boom \cdot Y_t + \xi_t, \qquad \text{(1Bo)}$$

$$BAL_t = \alpha_0 + \alpha_1 TREND + \alpha_2 Y_{t_t} + \alpha_3 Bust \cdot Y_{t_t} + \xi_t, \qquad \text{(1Bu)}$$

where *Boom* is a dummy variable that takes the value of one during a credit (commodity price) boom and zero otherwise, *Bust* is a dummy variable that takes the value of one during a credit (commodity price) bust and zero otherwise, and ξ_t is the error term.

With this setup we can explore how boom and busts affect, first, the identification of fiscal policy episodes and, second, the cyclicality of fiscal policy.

[6] For an assessment of the drivers of the duration of fiscal consolidation episodes, see Agnello et al (2013). Using continuous-time and discrete-time duration models, the authors show that higher fiscal deficits are associated with longer fiscal consolidation programs, while improvements in general economic conditions contribute to shorter fiscal consolidation episodes.

Using the coefficients and the residuals from the estimated regressions, we predict the budget balance-to-GDP ratio in period *t,* had the real GDP been the same as in the previous year, ie

$$BAL_t(Y_{t-1}) = \widehat{\alpha_0} + \widehat{\alpha_1}TREND + \widehat{\alpha_2}Y_{t-1} + \widehat{\alpha_3}Boom \cdot Y_{t-1} + \hat{\xi}_t, \quad (2Bo)$$

$$BAL_t(Y_{t-1}) = \widehat{\alpha_0} + \widehat{\alpha_1}TREND + \widehat{\alpha_2}Y_{t-1} + \widehat{\alpha_3}Bust \cdot Y_{t-1} + \hat{\xi}_t, \quad (2Bu)$$

where the $\widehat{\alpha_\iota}'s$ are the estimated coefficients in Equations (1Bo)–(1Bu) and $\hat{\xi}$ is the estimated residual in the same regressions. The cyclically-adjusted change in the budget balance-to-GDP ratio, controlling by booms or busts, is constructed in an analogous way as above:

$$BAL_t(Y_{t-1}) - BAL_{t-1} =$$
$$= \left(\widehat{\alpha_0} + \widehat{\alpha_1}TREND + \widehat{\alpha_2}Y_{t-1} + \widehat{\alpha_3}Boom \cdot Y_{t-1} + \hat{\xi}_t\right) -$$
$$-\left(\widehat{\alpha_0} + \widehat{\alpha_1}TREND + \widehat{\alpha_2}Y_{t-1} + \widehat{\alpha_3}Boom \cdot Y_{t-1} + \hat{\xi}_{t-1}\right), \quad (3Bo)$$

or

$$BAL_t(Y_{t-1}) - BAL_{t-1} =$$
$$= \left(\widehat{\alpha_0} + \widehat{\alpha_1}TREND + \widehat{\alpha_2}Y_{t-1} + \widehat{\alpha_3}Bust \cdot Y_{t-1} + \hat{\xi}_t\right) -$$
$$-\left(\widehat{\alpha_0} + \widehat{\alpha_1}TREND + \widehat{\alpha_2}Y_{t-1} + \widehat{\alpha_3}Bust \cdot Y_{t-1} + \hat{\xi}_{t-1}\right). \quad (3Bu)$$

To analyse how the commodity price and the financial cycles affect the characterisation of the fiscal policy history, we compare the episodes of consolidation or stimulus derived from the cyclically-adjusted change in the budget balance-to-GDP ratio estimated in Equation (3) with the ones estimated after controlling by booms (Equation (3Bo)) and busts (Equation (3Bu)).

Finally, an assessment of the impact of commodity price (financial) booms and busts on the cyclicality of fiscal policy can be made by comparing the parameters α_2 and α_3. Consider the case where fiscal policy is *countercyclical* (α_2>0). Then: (i) if the interaction term in Equation (1Bo)/(1Bu) is positive, ie $\alpha_3 > 0$, booms/busts will make fiscal policy *more countercyclical*; and (ii) if α_3<0, booms/busts will make fiscal policy *less countercyclical*. In contrast, let us assume that fiscal policy is *procyclical* (α_2<0). Then: (i) if α_3<0, booms/busts will make fiscal policy *more procyclical*; and (ii) if α_3>0, booms/busts will make fiscal policy *less procyclical*.

3. Data and financial/commodity cycles

3.1 Data

In the identification of the financial cycle, we use quarterly data for 40 countries over the period 1940–2015.[7] We rely on the BIS total credit to the private non-financial sector series. Commodity price cycles are identified using quarterly data for country-

[7] The countries included in the analysis and for which we identify the phases of financial cycle are: Argentina, Australia, Austria, Belgium, Brazil, Canada, Chile, China, Czech Republic, Denmark, Finland, France, Germany, Greece, Hong Kong, Hungary, India, Indonesia, Ireland, Italy, Japan, Korea, Luxembourg, Malaysia, Mexico, the Netherlands, Norway, Poland, Portugal, Russia, Saudi Arabia, Singapore, South Africa, Spain, Sweden, Switzerland, Thailand, Turkey, the United Kingdom and the United States.

specific commodity export price indices from 3-digit UN Comtrade and over the period 1980–2015.[8] These are based on the market prices of commodities and weighted according to the participation of 83 UN Comtrade commodity groups in total exports (Kohlscheen et al (forthcoming)). Data for government budget balance are sourced from the Datastream. GDP and CPI data come from the BIS.

3.2 Identification of financial/commodity price cycles

The episodes of booms, busts and normal times in the financial (commodity price) cycle are identified using the methodology applied by Agnello et al (2015) and Burnside et al (2016) in the context of the housing market cycle.

In the case of the financial cycle, this approach requires the preliminary detection of upturns and downturns in real credit to the non-financial sector (Avdjiev et al (2016)). In this context, quarterly real credit growth is smoothed using a five-quarter moving average and, in order to be called a boom (bust), the (cumulative) real credit change in a run-up (downturn) needs to exceed (fall below) a minimum (maximum) threshold. As for the commodity price cycle, the same algorithm is applied to the quarterly nominal growth of the country-specific commodity export price index.

This methodology is particularly useful at capturing the main characteristics of financial (commodity price) cycles (ie magnitude, persistence and own history). Moreover, it overcomes some limitations of the "threshold method" (Gourinchas et al (2001); Calderón and Kubota (2012)), as it does not require a preliminary decomposition of the relevant series into their cyclical and trend components. Thus it is not sensitive to the choice of a specific filtering (or de-trending) technique, which necessarily implies a judgement about the optimal smoothing parameter. In addition, our approach does not involve any choice of a threshold for the factor (or scalar) that, once applied to the standard deviation of the cyclical component, allows one to characterise and identify periods of booms (ie periods of (excessive) growth above the threshold) or busts (ie periods of (excessive) growth below the threshold).

Using this framework, credit booms are periods of consecutive upturns in real credit to the private non-financial sector totalling 51% in cumulative terms, and credit busts as periods of consecutive downturns in real credit to the private non-financial sector totalling -7% in cumulative terms (Avdjiev et al (2016)). We identify commodity price booms as periods of consecutive upturns in the nominal country-specific commodity export index amounting to 20% cumulatively, and commodity price busts are periods of consecutive downturns in the nominal country-specific commodity export index amounting to -26% cumulatively.

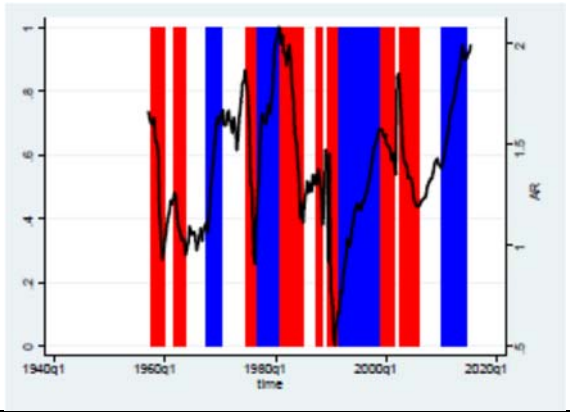
Graph 1 shows, for a selection of countries, the credit booms (blue areas) and the credit busts (red regions) as compared with the normal periods of the credit cycle (non-shaded areas). The solid line denotes the smoothed series of the real credit to the private non-financial sector. Similarly, Graph 2 plots the commodity price booms (blue areas) and the busts (red regions), as well as the normal periods in the commodity price cycle (non-shaded areas) for a sub-set of countries. The solid line

[8] We focus on 12 commodity exporting countries for which we identify the phases of the commodity cycle, namely: Australia, Brazil, Canada, Chile, Colombia, Mexico, Malaysia, Norway, New Zealand, Peru, Russia and South Africa.

corresponds to the smoothed series of the nominal country-specific commodity export price index.

Credit, booms, busts and normal times Graph 1

AR



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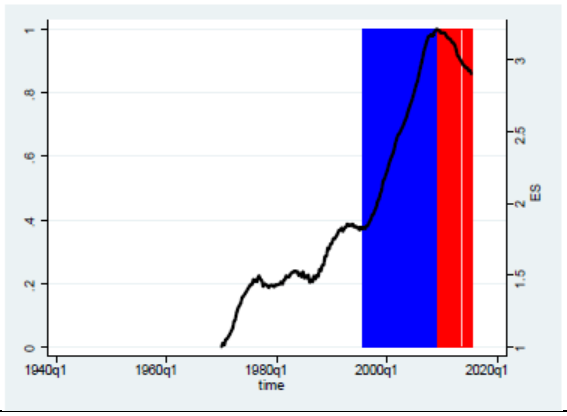

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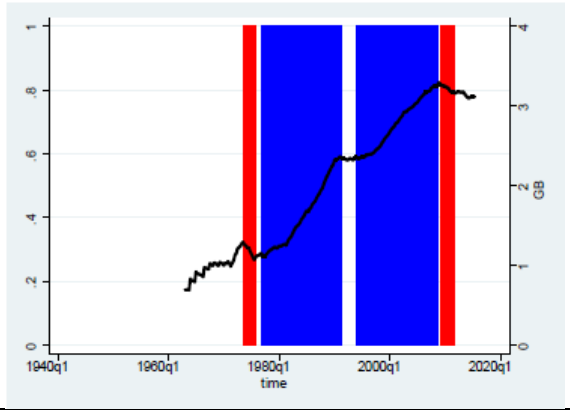

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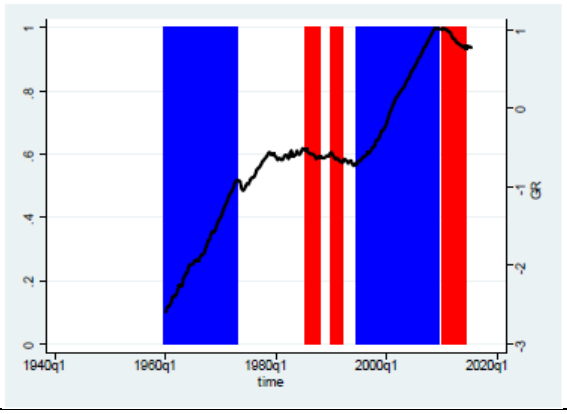

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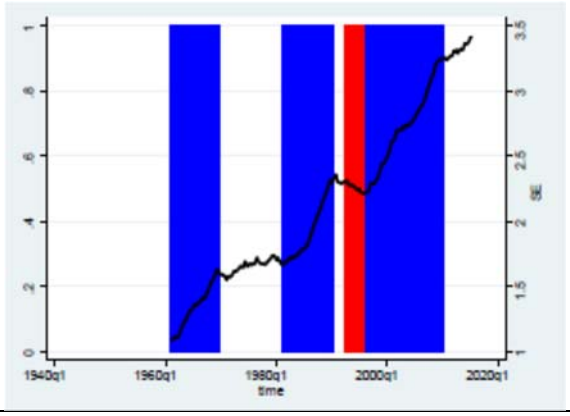
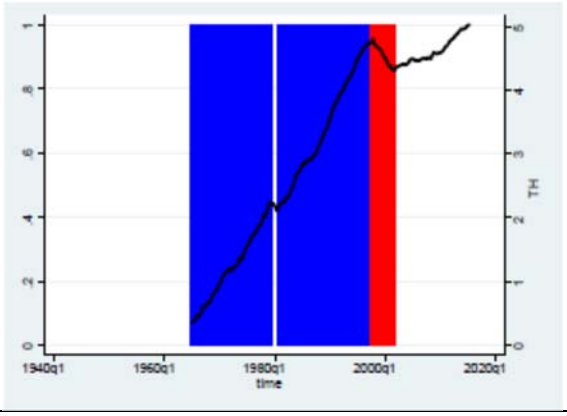


TH



Commodity price booms, busts and normal times Graph 2

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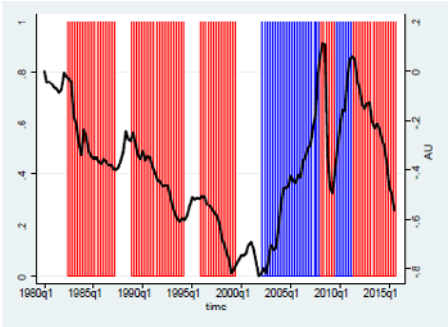

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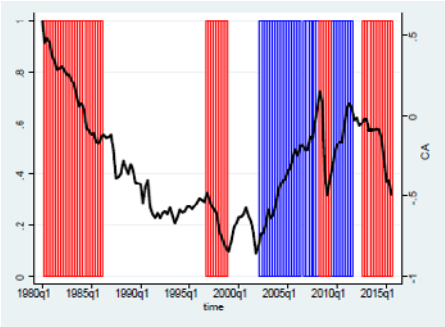
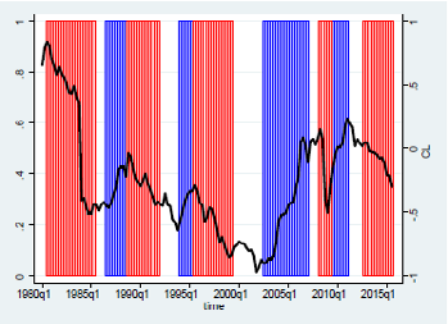


CL



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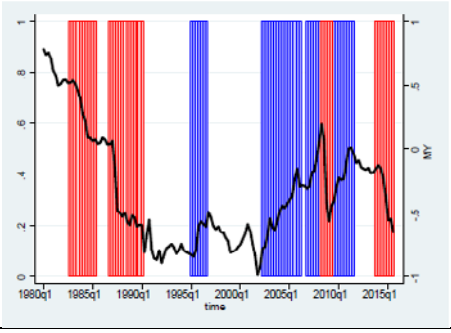

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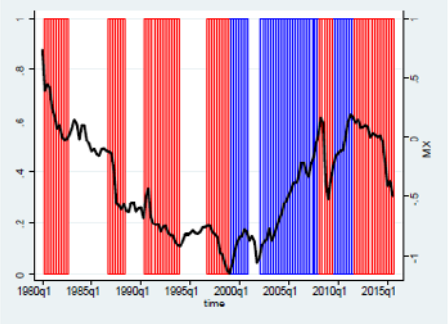

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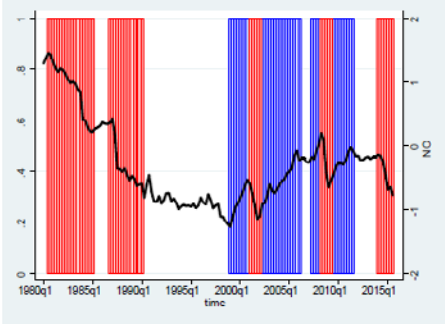
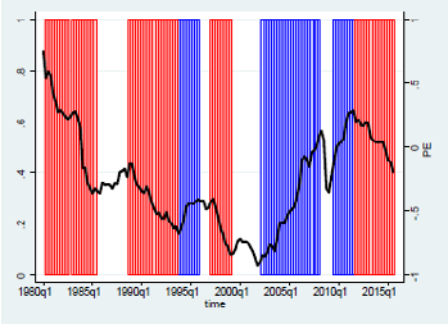
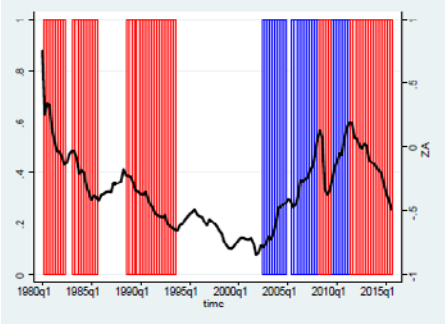


PE



ZA



4. Empirical results

Now, we explore in turn the impact on the financial and commodity cycle on the fiscal stance and how they affect the procyclicality of fiscal policy

4.1 Does controlling for the financial cycle affect the assessment of the fiscal stance?

We start by investigating the extent to which financial cycles impact the identification of episodes of "large" fiscal adjustments, that is, fiscal consolidation and fiscal stimulus episodes. To address this question, we use the labelling of large fiscal adjustment episodes described in Section 2.2., and compare: 1) the benchmark case, in which we do not account for the phase of the financial cycle (Equation (3)); 2) the case in which we account for the booms of the financial cycle (Equation (3Bo)); and 3) the case in which we account for credit busts (Equation (3Bu)).

Table 2 presents the frequencies of large fiscal adjustments (as percentages of the observations in our sample) using the definitions above both *accounting* and *without accounting* for the financial cycle. When we do not control for the financial cycle, our definition identifies 31.9% of the observations as single-year fiscal consolidations, 5.6% as single-year successful fiscal consolidations, 28.2% as single-year fiscal stimuli, and 6.0% as successful fiscal stimuli. Accounting for credit booms implies that both the frequency of single-year fiscal consolidations (33.1%) slightly increases, while the fraction of the observations identified as single-year fiscal stimulus episodes remains broadly unchanged (28.6%). Similarly, the likelihood of successful fiscal adjustments does not change in the case of consolidations, while slightly decreases in the case of fiscal stimuli.

Large fiscal adjustments and the financial cycle – a qualitative view

Frequency of episodes (as a percentage of the total) Table 2

	Standard model	Boom model	Bust model
Fiscal episode	without accounting for the financial cycle (%)	accounting for the financial cycle (%)	accounting for the financial cycle (%)
Single-year fiscal consolidation	31.9%	33.1%	32.3%
Single-year successful fiscal consolidation	5.6%	5.6%	5.6%
Single-year fiscal stimulus	28.2%	28.6%	28.0%
Single-year successful fiscal stimulus	6.0%	5.6%	5.6%
Multi-year fiscal consolidation	13.7%	14.6%	13.7%
Multi-year successful fiscal consolidation	2.0%	2.0%	2.4%
Multi-year fiscal stimulus	10.0%	9.4%	10.0%
Multi-year successful fiscal stimulus	2.4%	2.0%	2.4%

Note: See Table 1 for the definitions of the episodes.

Considering the alternative definition of fiscal adjustments, which is more restrictive as it only selects multi-year episodes, it identifies a smaller number of fiscal consolidations and fiscal stimuli. Moreover, the empirical evidence corroborates the previous findings. Thus when we control for the booms of the financial cycle, the frequency of multi-year fiscal consolidations (14.6%) slightly increases vis-à-vis the standard model (13.7%). And the likelihood of multi-year fiscal adjustments (ie consolidations and stimuli) and multi-year successful consolidations is similar across the two models.

Finally, the identification of the various fiscal episodes that emerges from the bust model follows very closely that of the boom model. This is not surprising as the correlation between boom and bust episodes is large, negative and statistically significant.

At first glance, the qualitative information presented so far suggests that the frequency of the various episodes identified by accounting for the booms and the busts of the financial cycle is only slightly different from that implied by the standard model. But how important are such differences from a quantitative point of view?

To answer this question, Table 3 reports, for the various fiscal episodes and the three models under consideration, the average change in the cyclically-adjusted budget balance (as a percentage of GDP). It can be seen that the change in the fiscal stance is generally smaller (in absolute terms) in single-year fiscal episodes than in multi-year fiscal episodes, as well as in successful fiscal episodes.

Looking across the three models reveals that the differences in the size of the fiscal stance are quantitatively important in certain cases. For instance, for single-year fiscal stimuli, multi-year fiscal stimuli and multi-year successful fiscal stimuli episodes, the size of the fiscal impulse in the boom model differs from that of the standard model by 0.7, 0.9 and 1.6 percentage points of GDP, respectively. And in the case of the bust model, the size of the fiscal impulse is similar to that of the boom model.

Large fiscal adjustments and the financial cycle – a quantitative view

Average change in the cyclically-adjusted budget balance (as a percentage of GDP) Table 3

	Standard model	Boom model	Bust model
Fiscal episode	without accounting for the financial cycle (%)	accounting for the financial cycle (%)	accounting for the financial cycle (%)
Single-year fiscal consolidation	5.3%	5.2%	5.4%
Single-year successful fiscal consolidation	4.6%	4.5%	4.8%
Single-year fiscal stimulus	-6.7%	-7.0%	-7.1%
Single-year successful fiscal stimulus	-7.0%	-7.7%	-7.2%
Multi-year fiscal consolidation	4.5%	4.5%	4.3%
Multi-year successful fiscal consolidation	3.0%	3.2%	3.3%
Multi-year fiscal stimulus	-5.6%	-6.5%	-5.4%
Multi-year successful fiscal stimulus	-6.7%	-8.3%	-6.8%

Note: See Table 1 for the definitions of the episodes.

4.2 Does controlling for the commodity price cycle affect the assessment of the fiscal stance?

We now investigate the extent to which accounting for the commodity price cycle affects the identification of episodes of "large" fiscal adjustments, ie large changes in the cyclically-adjusted budget balance. This helps us understand whether commodity boom-bust cycles influence the identification of periods of fiscal consolidation or fiscal stimulus.

As mentioned before, we focus on 12 large commodity exporters. And, again, we use the labelling of large fiscal adjustment episodes described in Section 2.3., and compare: 1) the benchmark case (Equation (3)); 2) the case in which we account for commodity price booms (Equation (3Bo)); and 3) the case in which we control for busts in the commodity price cycle (Equation (3Bu)).

In Table 4, we show the frequency of large single-year and multi-year fiscal adjustments (as percentages of the observations in our sample) accounting and without account for the commodity price cycle. That is, we start by providing a qualitative view in that we investigate the extent to which controlling for commodity price booms and busts affects the labelling of various fiscal episodes.

Large fiscal adjustments and the commodity price cycle – a qualitative view

Frequency of episodes (as a percentage of the total) Table 4

	Standard model	Boom model	Bust model
Fiscal episode	without accounting for the commodity price cycle (%)	accounting for the commodity price cycle (%)	accounting for the commodity price cycle (%)
Single-year fiscal consolidation	26.2%	28.1%	28.1%
Single-year successful fiscal consolidation	5.3%	5.3%	3.5%
Single-year fiscal stimulus	23.8%	24.4%	24.4%
Single-year successful fiscal stimulus	5.3%	5.3%	5.3%
Multi-year fiscal consolidation	8.6%	7.9%	7.9%
Multi-year successful fiscal consolidation	1.9%	3.7%	1.9%
Multi-year fiscal stimulus	7.9%	7.9%	7.2%
Multi-year successful fiscal stimulus	1.9%	1.9%	1.9%

Note: See Table 1 for the definitions of the episodes.

The results show that when we do not control for the commodity price cycle, we identify 26.2% of the observations as single-year fiscal consolidations, 23.8% as single-year fiscal stimuli, and 5.3% as single-year successful fiscal episodes. After controlling for the commodity price booms and busts, the frequency only slightly changes in the case of single-year successful fiscal consolidations, where the frequency of this type of episode falls to 3.5%.

As for multi-year fiscal episodes, their frequency is substantially lower. The standard model labels 8.6% of the observations as multi-year fiscal consolidations,

7.9% as multi-year fiscal stimuli and only 1.9% as multi-year successful fiscal episodes. After controlling for the boom-bust phases of the commodity price cycle, we can see that the frequency of the various fiscal episodes only changes marginally. And controlling for either commodity price booms or commodity price busts provides a similar characterisation of such fiscal episodes.

We now move to the analysis of the same information, but taking a quantitative view. Thus, we ask about the size of the fiscal impulse (as a percentage of GDP) that underlines the previous identification of the different fiscal episodes.

Large fiscal adjustments and the commodity price cycle – a quantitative view

Average change in the cyclically-adjusted budget balance (as a percentage of GDP) Table 5

	Standard model	Boom model	Bust model
Fiscal episode	without accounting for the financial cycle (%)	accounting for the financial cycle (%)	accounting for the financial cycle (%)
Single-year fiscal consolidation	7.0%	6.1%	6.6%
Single-year successful fiscal consolidation	3.6%	2.9%	4.5%
Single-year fiscal stimulus	-8.2%	-7.5%	-8.1%
Single-year successful fiscal stimulus	-7.6%	-7.1%	-7.6%
Multi-year fiscal consolidation	5.4%	5.4%	5.1%
Multi-year successful fiscal consolidation	6.2%	3.4%	6.2%
Multi-year fiscal stimulus	-3.7%	-3.6%	-4.7%
Multi-year successful fiscal stimulus	-9.7%	-10.0%	-9.7%

Note: See Table 1 for the definitions of the episodes.

Table 5 provides a summary of such information. It can be seen that, in the standard model, the fiscal impulse is large for both single-year and multi-year fiscal consolidations and stimuli. The same applies to successful fiscal episodes. Compared to the standard model, the differences in the size of the fiscal impulse computed using the boom model are quantitatively large. For instance, in the case of single-year fiscal consolidations, the size of the fiscal impulse in the boom model differs from that of the standard model by 0.9 percentage points; and for single-year fiscal stimuli episodes, such difference totals 0.7 percentage points. The results do change less in the case of bust models. The main exceptions are the cases of multi-year fiscal stimulus episodes in which the difference is a 1 percentage point of GDP.

4.3 How do credit booms/busts impact the cyclicality of fiscal policy?

The empirical evidence presented in the previous section clearly shows that financial cycles have an impact on the identification of fiscal consolidation/stimulus episodes. But do they also affect the response of fiscal policy to real economic activity, thus making it more procyclical or less countercyclical?

In Table 6 and Graph 3, we summarise, for each country, the results associated with the estimation of Equations (1), (1Bo) and (1Bu), respectively. For brevity, in Table 6, we only report the coefficients associated with the GDP and the dummies of booms or busts. In Graph 3, the right-hand side panel shows the coefficients associated with real GDP (for the cases in which they have a positive sign) in the standard model, the model with the interaction between real GDP and credit booms and the model with the interaction between real GDP and credit busts; the left-hand side panel shows the same information for the cases in which the coefficients associated with real GDP are negative; and the centre panel shows whether the interaction terms are positive and significant (+), negative and significant (–) or not significant (0).

The empirical findings allows us to cluster the countries into three main groups. The first group, includes Denmark (DK), Portugal (PT), Sweden (SE) and Thailand (TH), the coefficient associated with real GDP is not statistically significant, thus fiscal policy is acyclical. In these four countries financial cycles do not exert a statistically significant effect on fiscal policy. In contrast, the coefficient associated with the interaction between real GDP and credit booms is negative for Austria (AT) and Finland (FI) and positive for India (IN), which implies that credit booms make fiscal policy somewhat procyclical in the former and somewhat countercyclical in the later. In case of Indonesia (ID), both interaction terms are statistically significant and negative, implying that credit boom-bust cycles induce cyclicality in the fiscal policy.

In the second group of countries, which includes Hungary (HU), fiscal policy is procyclical (ie α_2<0 and this parameter is statistically significant), but financial cycles do not affect it. However, credit booms reduce the procyclicality of fiscal policy in the case of Australia (AU). And for Spain (ES), Greece (GR) and the US, credit booms also make fiscal policy less procyclical, but credit busts tend to increase it.

In the third group of countries, which includes Belgium (BE), Great Britain (GB), Italy (IT), South Korea (KR), Luxemburg (LU), Norway (NO), Poland (PL), fiscal policy is countercyclical and insensitive to financial cycles. However, credit booms tend to increase fiscal policy countercyclicality in Brazil (BR), Russia (RU) and South Africa (ZA), and reduce it in the case of Ireland (IE). Finally, for Mexico (MX) and Turkey (TR), credit busts make fiscal policy more countercyclical while, for Japan (JP), they reduce fiscal policy countercyclicality.

Table 6: Cyclicality of fiscal policy and the financial cycle.

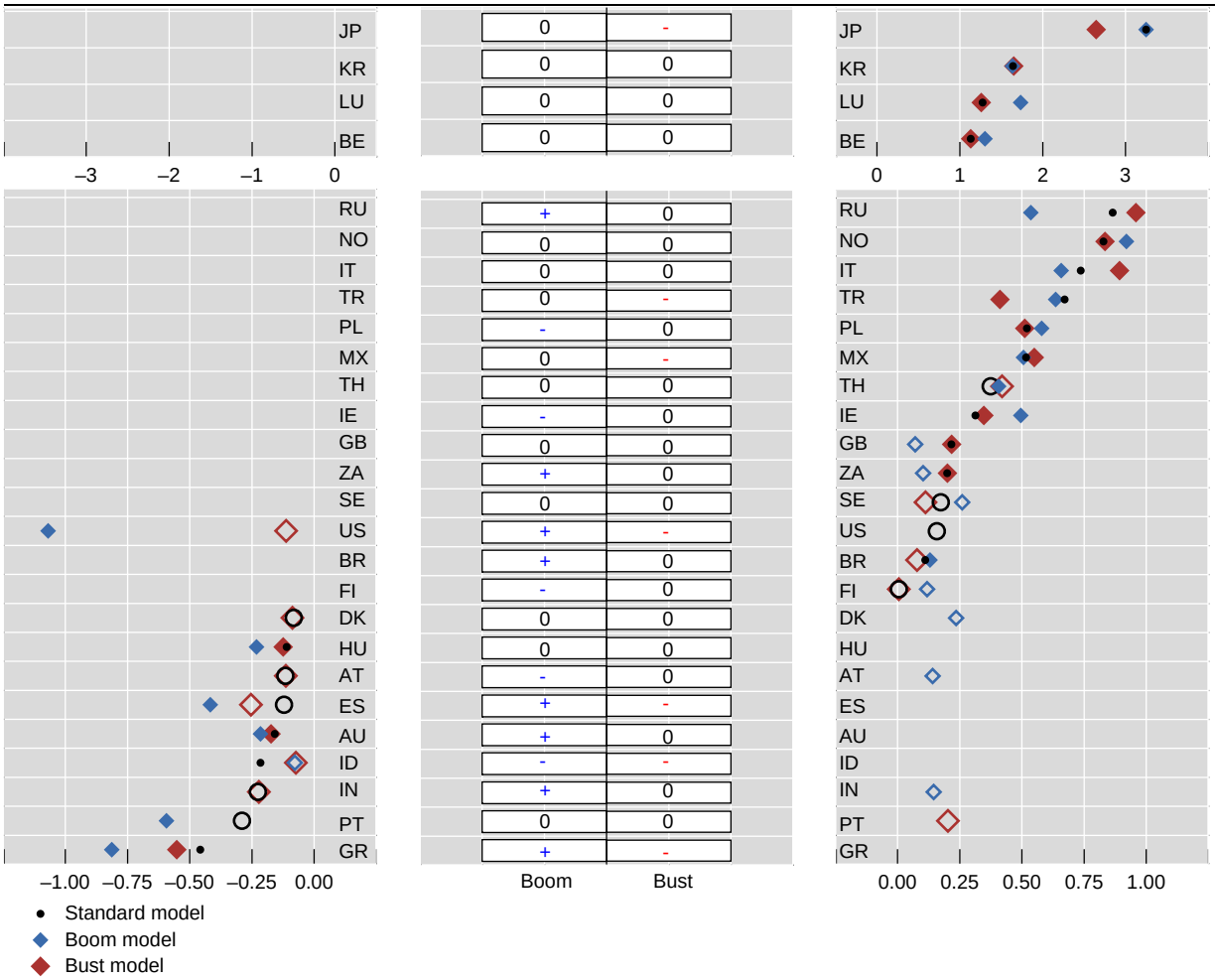
	Standard model	Boom model		Bust model	
	$\widehat{\alpha_2}$ Y_t	$\widehat{\alpha_2}$ Y_t	$\widehat{\alpha_3}$ *Boom*	$\widehat{\alpha_2}$ Y_t	$\widehat{\alpha_3}$ *Bust*
AT	-0.1152	0.1413	**-0.0357***	-0.1140	–
AU	**-0.1584****	**-0.2152*****	**0.0129****	**-0.1729****	–
BE	**1.1308*****	**1.3028*****	0.0378	–	–
BR	**0.1115****	**0.1297*****	**0.0260****	0.0784	–
DK	-0.0820	0.2359	-0.0426	-0.0874	–
ES	-0.1213	**-0.4171****	**0.1633*****	-0.2539	**-0.1633*****
FI	0.0049	0.1181	**-0.0215***	–	–
GB	**0.2161*****	0.0706	0.0264	**0.2172*****	0.0007
GR	**-0.4581*****	**-0.8140*****	**0.2170*****	**-0.5523*****	**-0.1493****
HU	**-0.1099***	**-0.2312***	0.0274	**-0.1245***	-0.0044
ID	**-0.2156*****	-0.0775	**-0.0320****	-0.0728	**-0.0721****
IE	**0.3132*****	**0.4951*****	**-0.0589****	**0.3466*****	0.0352

IN	-0.2266	0.1454	**0.0711***	–	–
IT	**0.7363*****	**0.6586****	0.0099	**0.8933*****	0.0375
JP	**3.2486*****	–	–	**2.6455*****	**-0.2035*****
KR	**1.6408*****	**1.6335*****	0.0058	–	–
LU	**1.2740*****	**1.7342****	-0.0549	–	–
MX	**0.5163*****	–	–	**0.5498*****	**-0.0696*****
NO	**0.8275*****	**0.9205****	-0.0206	–	–
PL	**0.5204*****	**0.5800*****	-0.0170	–	–
PT	-0.2898	**-0.5939***	-0.0726	0.2022	0.0991
RU	**0.8653*****	**0.5359*****	**0.1441*****	–	–
SE	0.1738	0.2598	-0.0283	–	–
TH	0.3748	–	–	0.4206	0.0052
TR	**0.6714*****	**0.6362****	0.0061	**0.4117***	**-0.1113***
US	0.1581	**-1.0699*****	**0.1209*****	-0.1124	-0.0354***
ZA	**0.1989*****	0.1030	**0.0224***	–	–

Note: Standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1. Significant coefficients are highlighted in bold. Colours indicate whether the estimated coefficients are those of the standard model, the boom model or the bust model. "–" indicates the absence of credit booms or credit busts. Countries for which we are not able to identify both credit booms *and* credit busts are not reported in Table.

Cyclicality of fiscal policy and the financial cycle[1]

Graph 3



[1] Note: The right-hand side panel shows the coefficients associated with real GDP (for the cases in which they have a positive sign) in the standard model, the model with the interaction between real GDP and credit booms and the model with the interaction between real GDP and credit busts; the left-hand side panel shows the same information for the cases in which the coefficients associated with real GDP are negative; and the centre panel shows whether the interaction terms are positive and significant (+), negative and significant (–) or not significant (0). Figures with no fill represent non-significant coefficients.

Source: Authors' calculations.

In addition to the country-level evidence, we also present some regional and global evidence. Thus, we regress the same model specifications in panel framework using a Fixed-Effects–Instrumental Variables (FE–IV) approach. We also estimate the models expressed by Equations (1), (1Bo) and (1Bu) for two regional sub-samples for which the number of countries is reasonably large so we can explore cross-country heterogeneity: (1) Asia and Pacific; and (2) Europe.

The empirical findings are reported in Table 7. We find that, for the sample as a whole, fiscal policy can be characterised as procyclical – as the coefficient associated with real GDP is negative and statistically significant –, except for the boom model where this coefficient is not significant but financial booms (ie the interaction term between real GDP and credit booms) explain procyclicality.

Despite this, the panel framework masks some heterogeneity of fiscal policy across regions. More specifically, in Europe, fiscal policy tends to be relatively acyclical and financial cycles do not exert a significant impact. In the Asia and Pacific group, fiscal policy is procyclical (except in the boom model) and both credit booms and busts increase the procyclicality of fiscal policy.

Table 7: Cyclicality of fiscal policy and the financial cycle – panel evidence.

	Standard model	Boom model		Bust model	
	$\widehat{\alpha_2}$ Y_t	$\widehat{\alpha_2}$ Y_t	$\widehat{\alpha_3}$ *Boom*	$\widehat{\alpha_2}$ Y_t	$\widehat{\alpha_3}$ *Bust*
Full sample	**-0.0861*** **	-0.0130	**-0.0373*** **	**-0.1008*** **	**-0.0641*** **
Asia and Pacific	**-0.0851*** **	-0.0119	**-0.0373*** **	**-0.0987*** **	**-0.0652*** **
Europe	**-0.0792***	**-0.0788***	-0.0033	-0.0810	0.0031

Note: Standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1. Significant coefficients are highlighted in bold. Colours indicate whether the estimated coefficients are those of the standard model, the boom model or the bust model. "–" indicates the absence of credit booms or credit busts. For the full sample and the regional groups (ie Asia and Pacific and Europe), we only include countries for which we identify credit booms and/or credit busts over the period of the analysis. We do not estimate the models for other regional groups (ie Africa, Latin America, Middle East and North America), because these include only a small number of countries.

4.4 How do commodity price booms/busts impact the cyclicality of fiscal policy?

In this Section, we evaluate the impact of the commodity price cycle on the cyclicality of fiscal policy. Table 8 summarises, for each country, the results of the estimation of Equations (1), (1Bo) and (1Bu), respectively, while controlling for the commodity price cycle.

When compared to the financial cycle, the empirical findings are weaker regarding the role played by the commodity price cycle vis-à-vis the (a)(pro)(counter)cyclicality of fiscal policy. In fact, for countries where fiscal policy appears to be acyclical (Colombia (CO), Malaysia (MY) and Peru (PE)) or procyclical

(Australia (AU)), the interaction terms between commodity booms/busts and real GDP are not statistically significant. Similarly, for countries like Canada (CA), Chile (CL), Mexico (MX), Norway (NO) and South Africa (ZA) where fiscal policy can be characterized as countercyclical, commodity booms/busts do not significantly affect the response of the budget balance to real economic activity. However, for other countries where fiscal policy is countercyclical, we find that: (i) commodity price booms can reduce the countercyclicality (New Zealand (NZ)); (ii) commodity price busts can induce a more countercyclical behaviour (Russia (RU)); and (iii) commodity price booms can increase the countercyclicality, while commodity price busts can reduce it (Brazil (BR)).

All in all, these results suggest that the fiscal policy reaction function in only significantly impacted by commodity price cycles in the case of countries which typically adopt countercyclical fiscal policies. In fact, for countries with acyclical or procyclical fiscal policies, commodity price boom-bust cycles do not seem to exert a significant effect.

Table 8: Cyclicality of fiscal policy and the commodity price cycle.

	Standard model	Boom model		Bust model	
	$\widehat{\alpha_2}$	$\widehat{\alpha_2}$	$\widehat{\alpha_3}$	$\widehat{\alpha_2}$	$\widehat{\alpha_3}$
AU	**-0.1584****	**-0.1614****	0.0018	**-0.1578****	-0.0028
BR	**0.1115****	**0.1590*****	**0.0109****	**0.1532*****	**-0.0120****
CA	**0.0897***	**0.0840***	-0.0031	0.0753	0.0036
CL	**0.2663*****	**0.2673*****	-0.0045	**0.3075*****	0.0122
CO	-0.0583	-0.1128	-0.0046	-0.1023	0.0054
MX	**0.5163*****	**0.5167*****	0.0007	**0.4994*****	0.0093
MY	-0.0327	-0.0120	0.0081	-0.0302	-0.0009
NO	**0.8275*****	**0.8146*****	-0.0042	**0.8276*****	-0.0001
NZ	**4.4663*****	**4.2067*****	**-0.0980*****	–	–
PE	-0.0274	-0.0323	-0.0010	-0.0278	0.0001
RU	**0.8653*****	**0.8664*****	-0.0401	**0.8828*****	**0.0588***
ZA	**0.1989*****	**0.2345*****	-0.0092	**0.2248*****	0.0144

Note: Standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1. Significant coefficients are highlighted in bold. Colours indicate whether the estimated coefficients are those of the standard model, the boom model or the bust model. "–" indicates the absence of credit busts.

5. Conclusions

In this paper, we assess the relationship between financial and commodity price cycles and fiscal policy. We use a novel methodology to identify booms and busts and normal times, and apply to the credit cycle (40 countries over the period 1940–2015) and commodity price cycle (12 resource-rich economises in the period 1980–2015),

We show that financial cycles (in particular, credit booms or busts) cycles have an impact on the characterisation of the fiscal policy history. Indeed, while the number of episodes of large fiscal adjustments is not much altered (ie the qualitative dimension), controlling for the effect of financial cycles on the magnitude of the changes in the cyclically-adjusted budget balance (ie the quantitative view) is economically important vis-à-vis the standard model. In particular, the size of the fiscal stance (as a percentage of GDP) computed in the boom and the bust models

can differ by more than 1.5 percentage points of GDP from that of the standard model.

Commodity price cycles also shape the characterisation of periods of large "adjustments", impacting the size of the fiscal impulse (as a percentage of GDP) by up to 1 percentage point. As in the case of the financial cycle, the consideration of the commodity cycles do not affect much the number of episodes of large fiscal adjustment.

Finally, credit (commodity price) booms and busts also affect the cyclicality of fiscal policy, but not to the extent of implying a change in the systematic response of fiscal policy to the dynamics of real economic activity. In particular, the empirical findings suggest that the effect of financial cycles on the (a)(pro)(counter) cyclicality of fiscal policy is country-dependent. And, in the case of commodity price cycles, we find that the fiscal policy reaction function in only significantly affected in the case of countries with countercyclical fiscal policies.

Our work has some important policy implications. Borio et al (2016, p 17) highlight that: *"Financial booms and busts, or financial cycles, can wreak havoc with public finances"*. We provide empirical evidence corroborating this theoretical prediction. And show that the same applies, to a lesser extent, to commodity price booms and busts in commodity-rich nations. Thus, fiscal policy should be designed in a way that it takes the financial (commodity price) cycle into account, as a (necessary) pre-condition for the achievement of a macro-financially sound environment.

Our results also support the relevance of fiscal policy as part of a macro-prudential framework. In particular, they highlight the potential benefits of "leaning against the wind" fiscal policies, which: 1) proactively restrain financial (commodity price) booms; and 2) build fiscal buffers to effectively deliver some room of manoeuvre in case financial (commodity price) busts materialise.

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