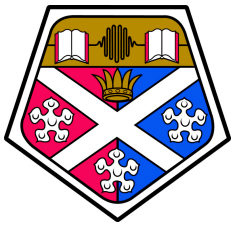
On the pro-cyclicality of fiscal policies



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This thesis is the result of the author's original research. It has been composed by the author and has not been previously submitted for examination which has led to the award of a degree.

Signed:

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I would like to dedicate this thesis to the memory of my beloved

mother and the love of my life, my wife Lenny ...

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On the pro-cyclicality of fiscal policy and its determinants in advanced, emerging and developing economies

Abstract

This thesis investigates the evidence on the evolving cyclicality of fiscal policies in advanced, developing, and emerging economies. Developing and emerging countries exhibited a far greater tendency to behave 'pro-cyclically' in previous decades, by increasing expenditures and reducing taxes in good times or by trimming expenditures and raising tax rates in bad times. Conversely, advanced economies have managed to enact a-cyclical fiscal policies.

Relying on time-series and cross-sectional analyses of data from developing, emerging and advanced economies, for the period 1960-2010, this study will seek to appraise the determinants of fiscal policy behaviour and access to international financial markets explaining the underlying shifts in their structure. Results indicate that several of these developing and emerging economies 'graduated' from pro-cyclicality to counter-cyclicality due to the credibility of fiscal positions relative to advanced economies.

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Chapter 1

Introduction

There is widespread agreement that fiscal policy ought to play a key role in macroeconomic stabilisation, at least to the extent of allowing automatic stabilisers to work. In broad terms this means that government expenditure should rise, and revenue fall, when private sector activity declines, while the opposite should occur when private sector activity rises (Alesina et al. (2008)). This form of counter-cyclical policy should mitigate the impact of shocks and reduce the volatility of the Gross Domestic Product (GDP). Existing evidence has found that advanced economies are more likely to follow counter-cyclical or a-cyclical policies than developing and emerging economies and that the last group have a tendency toward pro-cyclical bias in their fiscal policies. Pro-cyclical policy is undesirable in the sense that it exacerbates the impact of shocks and of any cycles in the private sector activity.

This chapter first outlines the key explanations that have been offered in the existing literature for the observed pro-cyclical bias in fiscal policies. Evidence which makes use of a comprehensive dataset for 184 advanced, developing and emerging economies over the period 1960-2010 is then presented which shows that advanced countries tend to exhibit a-cyclical behaviour and emerging and developing countries pro-cyclical behaviour in fiscal policy.

Frankel et al. (2012), amongst others, have suggested that some countries have 'escaped the trap' of pro-cyclical fiscal policy in the period 2000-2010 and have asserted that 'graduation' was largely related to countries' improved institutional quality. Using panel data, time-series and cross-sectional analysis the present study goes on to investigate the robustness of Frankel et al. (2012) findings, in terms of which countries graduate to enacting counter-cyclical policy during the time period; which seem constrained to follow pro-cyclical policy; and the extent to which improvements in institutional quality (or a number of other factors) can explain the underlying phenomenon. The additional factors investigated here draw on papers by Alesina et al. (2008), Perotti and Kontopoulos (2002), and Gelos et al. (2011) analysing the possible effects on fiscal policy adjustments of the countries' lack of financial depth, measures of macroeconomic and policy stability and political fragmentation.

In summary, the key contributions of this thesis lie in: i) checking the robustness of Frankel et al. (2012) findings on the prevalence of pro-, a- and counter-cyclical fiscal policy for a sample of 184 countries over the period 1960-2010; ii) checking which countries have 'graduated' from pro-cyclicality in recent years including those that were constrained to conduct pro-cyclical fiscal policy; and iii) investigating the key determinants of the differential cyclicality of fiscal policies across countries.

Appropriate econometric modeling is used throughout, largely following the existing literature, although the investigation of the determinants of the cyclicality of fiscal policy is conducted by using an ordered Probit model, which to the best of knowledge, has not been used in this literature before. The motivation for using this approach is carefully explained and in itself makes a contribution to the literature.

The study finds that developing and emerging countries 'graduated' from pro-cyclicality in the mid-1980s and beginning of this century. Which determinants

explain these shifts? The improvement in the quality of governance, institutions, and financial system resulting in 'graduation' are the main determinants for developing and emerging economies. In addition, large countries and with high debt to GDP ratios increased their chance to access the international financial markets, with the exception of countries with high inflation and high levels of debt service to GDP. This is the second contribution of this work

The remainder of the thesis chapters are organised as follows. Chapter 2 discusses the theoretical explanations that have been offered in the existing literature to explain the pro-cyclical bias of fiscal policy in emerging and developing countries. Chapter 3 presents the macroeconomic framework. Chapter 4 discusses the empirical results on the cyclicality of fiscal policy, evidence on the existence of structural breaks from pro-cyclicality and reports results of a sensitivity analysis. Chapter 5 turns to motivating and explaining the ordered Probit model and robustness checks in a cross-sectional analysis used to assess the empirical determinants of the cyclicality of countries' fiscal policy, the analysis of political fragmentation and voracity effect, the role of international financial market constraints and Chapter 6 presents the conclusions of the study.

Chapter 2

Literature review

2.1 Theoretical background

In general, there is agreement among economists and policymakers that counter-cyclical fiscal policy is desirable, to mitigate the impact of shocks on the economy. See for example Alesina et al. (2008) p. 1006:

> "[M]ost economists agree with the normative prescription that tax rates and discretionary government spending as a fraction of GDP ought to remain constant over the business cycle. If governments respected these prescriptions, we should observe a counter-cyclical pattern in fiscal policy."

Nevertheless, pro-cyclical fiscal policy is often observed in practice, especially in developing countries. In particular, evidence suggests that government spending and deficit as a share of GDP increases during booms (good-times) and/or decreases during recessions (bad-times).

The existing literature on the causes of pro-cyclicality in fiscal policy within developing, and emerging economies is extensive, though in some ways diverse. In the review that follows, the main objective is to identify the key causal factors that have been proposed and to explain the pro-cyclical biases in fiscal policy. In reality, the causal factors might be interrelated, but to the extent that it is feasible, they are first discussed separately.

The main factors can be divided into three main groups: i) credit market imperfections; ii) political distortions and iii) volatility of the macroeconomic environment, perhaps exacerbated by dependence on primary commodities or natural resources. These will be dealt with in turn.

2.1.1 Credit market imperfections

A lack of access to international financial markets negatively impacts the ability to enact counter-cyclical fiscal policies in developing and emerging countries. Indeed, countries should build up international reserves during good times, foreseeing future credit constraints or sudden stops as a substitute for access to credit markets. The point is that this ability is lacking due to the voters' political pressures on accumulating debt instead (Alesina et al. (2008)) and because of a number of shocks to their economies (Gavin and Perotti (1997)). Moreover, this ability is further hampered by the requirement to repay debt in times of extreme duress. (Kaminsky et al. (2005)).

What are the implications of credit and capital market imperfections that result in pro-cyclicality in developing and emerging economies? Initially, the lack of financial depth and the inability to build up reserves restrains fiscal policy and overrides all the Keynesian fiscal policy prescriptions.[1] In addition, government

[1] The concept of financial depth is defined Caballero and Krishnamurthy (2004), as the availability of funds to the public and private sector in developing and emerging economies.

borrowing to finance expansionary fiscal policy, even with well-functioning credit markets, has the potential to push up interest rates payable on government bonds (since a higher risk premium is generally demanded as debt increases). To the extent that this feeds through to higher market rates of interest, the expansionary fiscal policy may crowd-out private investment and consequently result in a deterioration in future productivity, potential output and a decline in the value of the private sector capital stock. According to this precept, an increase in the share of the public debt relative to private assets decreases the aggregate creditworthiness of the country's assets.

Developing and emerging economies are likely to sell bonds to external investors to a greater extent than advanced economies. On the other hand, international investors are likely to react to a decline in creditworthiness by raising the risk premium they require, thereby further restraining the ability of the country's government (and private sector) to access affordable credit. Therefore, a perceived lack of fiscal discipline leads investors to reduce their valuation of the country's assets, and negatively impact its financial depth.

Essentially, fiscal fears and the crowding-out effect arise from the fact that investors anticipate that the government's fiscal policy is becoming irresponsible. These fears are exacerbated when the government in office that is increasing expenditures may not be around when the bills come due. This situation also worsens the financial depth and reduces the number of potential lenders.

Calvo and Végh (1997) explanation of the external constraint conundrum can be ascertained through the possibility of triggering a Balance of Payments (BoP) crisis and the role of credit market segmentation. A BoP crisis is the situation in which the government finds itself unable to comply with its domestic or international financial obligations.[1] On the other hand, credit market segmentation refers to the fact related to the impossibility faced by domestic residents to borrow from the rest of the world. They might lower their foreign asset holdings, initially

[1] It does not mean insolvency, or the country's inability to pay.

originated after a boom in domestic consumption, which follows a real exchange rate appreciation. The implications of the external constraint are threefold: [1] i) bond financing tackles any fiscal difficulties by avoiding any reserves hindrance; ii) the Central Bank is able to sterilise any reserve losses on the money supply; and iii) with an active interest policy, the Central Bank refrains to abandon the peg and prevent bank runs. The situation works with the following mechanisms:

i) Increasing the availability of capital in the individual economies and allowing domestic agents to smooth out their consumption overtime. Investors react to changes in the profitability.

ii) Capital inflows associated with a marked appreciation of real exchange rate.

iii) Capital inflows have an impact on domestic policy making the Central Bank intervene.

iv) Capital inflows signal the participants in the financial markets.

A particular issue relevant to many emerging and developing economies is that they may be unable to borrow abroad in their domestic currency, long term and with fixed interest rates. Eichengreen et al. (2003) used the term "original sin" when referring to this situation. The use of the term goes back to Eichengreen and Hausmann (1999). In fact, they claimed that almost all of the countries (except the United States, the Euro Zone countries, Japan, the United Kingdom, and Switzerland) have suffered from (international) original sin at some point in time.

Although it is understandable that international investors may wish to avoid the exchange risk that buying bonds denominated in a foreign currency would involve, the currency-mismatch that this engenders for the borrowing government means that macroeconomic instability is unavoidable. From this perspective it is

[1] This situation does not mean extreme insolvency; instead, it refers to the country's inability to pay. Chapter 3 presents a model outlining this situation.

desirable to facilitate a counter-cyclical fiscal policy; however the credit market imperfection and the original sin situation are clearly detrimental, causing the pro-cyclical bias.

2.1.1.1 When it rains, it pours phenomenon

In developing and emerging countries, capital flows cycles and business cycles reinforce each other. In the case of fiscal policies, these might expand when there are positive capital flows and the converse in the case of negative capital flows. This situation is known as the "when it rains, it pours" phenomenon in the literature (Kaminsky et al. (2005)). During economic booms, developing and emerging economies are recipients of capital flows, which originate expansive monetary and fiscal policies, and the opposite during recessions. This situation contrasts with the Keynesian and neo-classical perspective of expanding policy in recessions and contracting it during economic booms.

Credit market imperfections were found to be the main culprit in generating pro-cyclical fiscal policy in Aizenman et al. (1996), and Gavin et al. (1996). In consequence, countries with incomplete creditworthiness lack the access to finance deficit during recessions.

In order to measure the credit market imperfections, chapter 5 introduces an econometric model measuring the determinants of financial markets access in developing and emerging economies. The approach follows that of Gelos et al. (2011) and Lensink and VanBergeijk (1991) defining a binary variable that proxies the access to international financial markets over a set of macroeconomic and institutional indicator variables.

2.1.2 Political distortions

It should be evident that justifications for pro-cyclical fiscal policy based on countries' restricted ability to access credit markets are incomplete. In the words of Alesina et al. (2008) this situation poses two critical questions:

"First, why don't these countries self-insure by accumulating reserves in good times, so that they are less likely to face binding credit constraints in recessions? Second, why would lenders not provide funds to countries, even in recessions, if they were convinced that the borrowing would optimally smooth out the cycle?" Alesina et al. (2008, p.1007).

For these reasons, they consider arguments that relate to the political arena. The key papers in the existing literature that rely on political distortions to explain the pro-cyclical bias of fiscal policy include Alesina et al. (2008), Talvi and Végh (2005) and Tornell and Lane (1999).

Countries in an environment of political distortions show a tendency to enact a pro-cyclical fiscal policy. On one side, this fiscal behaviour is explained by a political agency problem that involves the voters and the rent-seeking government. The outlay of this scenario consists of rational voters demanding policies that subject the government to probable re-election. Hence, the problem involves finding a second-best solution with existing corruption and information asymmetries.

Direct appropriation of tax revenues or favours paid by government officials to interest groups is perceived as a rent-seeking behaviour. For instance, during good times governments may act pro-cyclically by borrowing too much. Voters cannot observe the government's attitudes to borrowing and they will demand tax reductions or improved public services. This situation - coined as "Starve the Leviathan" (Alesina et al. (2008)) - induces governments to adopt a pro-

cyclical fiscal policy bias. How do the electoral process and the political structure influence this political agency problem? Certainly, the government will attempt to meet all voters' demands as they can replace governments but cannot lower rents to zero (Persson and Tabellini (2004)).

The political framework influences the rent-seeking behaviour of the government. The politico-economical matter involves a presidential regime with a tendency to form a smaller government than parliamentary democracies (Barro (1973)). One point worth taking into account is the role of political parties on the political structure of the government. Political parties can serve as a control on office-holders who are about to leave office without the chance of re-election. These last, with shorter political life horizons than other individuals, provide of what is known as a brand-name effect, which involves party endorsements for different public offices. Parties, as such, are specialists in political contacts and procedures, and would tend to be more efficient in the collection of political income and the distribution of political favours.

A common practice of governments, prior to elections, is to bring forward expenditures and delay necessary tax hikes. With such trend, transfers are increased and consequently government spending increases, too. On the other hand, during economic booms, government consumption increases and taxes fall, whereas the converse is true during recessions. Fragmentation of political power implies that no individual group has overall influence on fiscal policy (Tornell and Lane (1998)). Another argument follows from the observation that some government activities are not cost-effective such as deadweight-loss investment projects allowing the fiscal claimant to appropriate public assets.

The voracity effect and political fragmentation

Another cause of pro-cyclical behaviour is a phenomenon coined as "voracity effect" in the literature. Political agency problems are the underlying causes for a pro-cyclical policy behaviour, and the voracity effect is defined as the intense competition for funds by ministries or provincial governments (Tornell and Lane (1999)). In economies without a strong institutional framework, the competition for shares of redistributive expenditure generates a more than proportional increase in expenditures (Manasse (2006)). Hence, the voracity effect offsets consumption smoothing and generates anomalies in fiscal policies.

More specifically, the voracity effect refers to a situation where powerful political groups exercise their influence over a discretionary fiscal redistribution within a country (be that an advanced, developing or emerging country). These political groups follow a rent-seeking pattern, their objective being to obtain benefits for themselves (subsidies, bailouts, specific kinds of government spending or tax concessions) by manipulating the political environment. It may be that this behaviour arises from a large number of distinct ministries exercising their power over the allocation of the fiscal budget.

For instance, Tornell and Lane (1998) find empirical results corroborating this story. The evidence suggests that windfalls following booms in resource exports in several developing and emerging economies led to increases in government expenditures with notable signs of the voracity effect.[1] In fact, these findings support the precept that in these countries a high level of power fragmentation leads to more pro-cyclical fiscal policies.

In order to address the impacts of political fragmentation in fiscal policy pro-

[1] The evidence is purported for Costa Rica, Cote d'Ivoire, and Kenya following the coffee shock in 1975-79 and for Nigeria and Mexico in the aftermath of the oil shock near the end of the 1970s and beginning of the early 1980s.

cyclicality, Perotti and Kontopoulos (2002) identify the number of policy makers and the structure of the process in which they interact.[1] In consequence, contrasting with non-fragmented political decisions, individual groups might benefit from specific types of expenditures, let alone the final policy-making party which is the entity involving the decision taking about government spending.

On the other hand, more fragmented governments tend to have higher deficits, (Volkerink and Haan (2001)). Conversely, governments that dispose of excess seats in parliament tend to have a lower budget deficit. [2] Furthermore, an increased number of parties with a consequently larger degree of political fragmentation generates a larger deficit bias. This means that for a given level of taxes, and an ample number of decision takers, the deficit will vastly oversize that under reduced political fragmentation.

Governments with larger budget deficits are those with increased political fragmentation at times when macroeconomic adjustments are deemed necessary, (Stein et al. (1998)).[3] The upshot of their analysis indicates that a higher degree of political fragmentation in developing and emerging countries is sufficient to generate a more pro-cyclical response to the business cycle.

Chapter 5 includes an empirical model testing the effects of government effectiveness. This indicator measures the response on the quality of service provision, quality of bureaucracy, competence of civil servants, the independence of civil service from political pressures and the credibility of the governments' commitment to fiscal policy cyclicality in a cross-country setting. The contribution of this analysis is to test the effects of the political environment that otherwise would

[1] The individual fiscal policy makers can explain the concept of political fragmentation as the internalisation of the unitary costs of aggregate expenditures. The political fragmentation is related to the number of policy makers.

[2] Thus, the count of ministries is stronger and more robust than the effective number of parties in government.

[3] Political fragmentation is, for example, evident in governments with short tenures and large number of political parties involved within the coalition government.

generate a voracity effect into the determination of fiscal policies.

In the new work presented, the effects of political fragmentation on fiscal pro-cyclicality are captured by adding a proxy variable *political fragmentation* which is constructed from data provided in Jaap Woldendorp et al. (2011) following the definitions of Volkerink and Haan (2001) and Perotti and Kontopoulos (2002).[1]

2.1.2.1 Macroeconomic Volatility

The existence of macroeconomic volatility can generate a pro-cyclical fiscal policy bias in developing and emerging economies due to a sudden interruption on the flows of international finance which triggers a highly destabilising fiscal response (Gavin et al. (1996)). The adverse effects of fiscal policy in international finance are largely generated by pro-cyclicality. In such case, creditworthiness ought to be increased in order to reduce the macroeconomic volatility.

The effects of a foreign shock, i.e., a commodity boom, on the fiscal policy follow two channels: i) the spending effect, short-lived booms with higher level of domestic spending on both tradable and non-tradables as boom raises domestic wealth. ii) causing an appreciation of the real exchange rate, the relative price of non-tradables rises in terms of non-booming tradables. Thus, the booms results in a contraction of non-booming tradables as relative prices adjust with a process

[1] The variable includes data from the Party government data set for 40 countries from 1960 till 2008, and accounts for the political fragmentation, or the degree to which political parties in the ruling coalition have different ideologies. The proxy for political fragmentation is calculated using the relative number of seats from certain political parties represented in the government as weighing factors, and the ideological complexion of the government. An index variable is constructed as the sum (for all parties involved) of the standard deviation of the complexion to the ideological complexion with the weighing factors in the given country. For instance, leftist governments tend to spend more and have higher deficits, (although there is no ample empirical support for this assertion.) The ideological complexion ranges from 1 (right-wing) to 5 (left-wing.)

of de-industrialisation.

Chapter 3

The theoretical framework

3.1 Government spending

The main theoretical issue is related to the macroeconomic effects of government spending on output, the business cycle, credit market imperfections and political distortions. The literature surveys the effects of temporary changes in government spending and distinguish these shifts from the effects of permanent changes. [1] The theory explores the relevance of the financing decision in determining the effects of changes in government spending. This also explains the role of credit market imperfections, in the case of a Balance of Payments (BoP) crisis and the effects of political distortions, and more specifically the voracity effect on the economy.

[1] Seminal contributions to the analysis of business cycles are the studies published by Kydland and Prescott (1982), Aiyagari et al. (1992) and King et al. (1998).

3.1.1 Changes in government spending and business cycles

This chapter is based on the contribution of Baxter and King (1993). The model is limited to a scenario of one sector with variable labour and endogenous capital accumulation. In equilibrium, both labour and capital react strongly to most policy shocks, and with the presence of strong dynamic interaction effects modifying the standard neoclassical assumptions. The initial setup of the problem involves maximising the agent's lifetime utility function:

$$U = E \sum \beta^t u_t \tag{3.1}$$

where $u_t = \frac{C_t^{1-\sigma}-1}{1-\sigma} - \varepsilon_b \frac{L_t^{1+\eta}}{1+\eta}$ with $\sigma = 0$, C_t is the private consumption, L_t is the agent's labour supply. For simplification, the utility can be represented as: $u_t = ln\ C_t + \theta\ \ln L_t$. The output is the Cobb-Douglas production function $Y_t = F(K_t, K_t^G, L_t) = AK_t^{\theta_K} L_t^{\theta_N} (K_t^G)^{\theta_G}$ where K_t is the private capital stock, K_t^G is the public capital stock and L_t is the labour input. [1]

Constraints.The constraints of the model are those related to labour and leisure (N) substitution ($L_t + N_t \leq 1$), the agent's budget constraint ($C_t + I_t \leq (1 - \tau_t)Y_t + Tr_t$) where Tr_t are the transfer payments and τ_t is the tax rate. The government accounting identity is ($G_t = G_t^B + I_t^G$) and the economy constraint is $C_t + I_t + G_t \leq Y_t$. The flow government budget constraint is $\tau_t Y_t = G_t + Tr_t$. For simplicity, it omits government debt.

The macroeconomic equilibrium. The steady-state in the long-run for the modelled economy is only determined by supply-side and relative prices and ratios are independent of the labour. The supply side also determines the wage rate $w(\kappa)$ and the rental rate $q(\kappa)$ where κ is the capital/labour ratio. In addition, it also

[1] The model assumes constant returns of scale for private inputs: $\theta_L + \theta_K$.

determines the average product of labour $\alpha \equiv Y/L = F(\kappa, 1)$and the share of capital and labour in national income $s_\kappa = qK/Y = (\kappa/\alpha)q(\kappa)$where$s_N = 1-s_K$, and the allocation between consumption and investments$_I = (I/K)(K/L)/(Y/L)$.

Macroeconomic effects of permanent government purchases. A permanent increase in government purchases poses a negative wealth effect on private individuals decreasing their full income. The long-run multiplier for the steady-state of the dynamic model, a natural definition of non-wage income is capital income less the sum of investment and government purchases, thus $\Pi = qK - IG$. The steady state of capital income net of gross investment is proportional to labour input $Y^f = w + qK - I - G = w + \alpha(s_K - s_I)L - G$ yielding:

$$\frac{\Delta Y}{\Delta G} = \frac{{s_L}^f \eta_L / s_N}{1 + (s_K - s_I)({s_L}^f \eta_L / s_N)} \tag{3.2}$$

where η_L is the full income elasticity of leisure demand. The numerator is the direct labour-supply effect with amplification effect of capital account, since $1/s_N = \alpha/w$, and the denominator mitigates the influence of accumulating on labour supply due to net income from capital $qK - I$. The steady-state of full income is adjusted as follows: $Y^f = (1-\tau_w)w + (1-\tau_q)qK + Tr - I = (1-\tau_w)w + qK + \tau_w wN - I - G$ using the steady-state government budget constraint, where τ_q is the tax on the rental rate and τ_w is the tax on wage. [1] The share of leisure expenditure in full income becomes: $(1-\tau_w)wL/Y^f$ transforming to $\frac{1-\tau_w(L/N)s_N}{1-\tau_w(s_N/N)+\tau_w s_N+s_K-s_I-s_G}$ and in the consequence the multiplier becomes:

$$\frac{\Delta Y}{\Delta G} = \frac{{s_L}^f \eta_L / s_N (1-\tau_w)}{(1 + {s_L}^f \eta_L)[s_K - s_I + \tau_w s_N]/[s_N(1-\tau_w)]} \tag{3.3}$$

The macroeconomic effects of government spending. The effects of government spending can be explained by the following mechanism: an increase in government spending requires an increase in lump-sum taxes as they are the only source of finance. Such augment implies an increase in the tax rates with a consequential

[1] τ_q affects the quantities and τ_w has a direct effect since it influences the valuation of leisure endowment.

negative effect on the incentives to work and invest. The tax base decreases and the hike of the tax rate should increase by more than $\Delta G/Y$. The supply side multiplier implies an increase in government spending with a corresponding hike in the tax rate and a slump in output which requires an increase in the tax rate. Thus, the fiscal constraint allows to find $\Delta Y = -\left(\frac{\theta_K}{\theta_N - \tau}\right)\Delta G < 0$ and to balance a necessary tax change equivalent to $\Delta\tau = (1-\tau)\left(\frac{\theta_N}{\theta_N - \tau}\right)(\Delta G/Y)$.

3.1.2 Credit market imperfections

This section outlines the role of credit market imperfections discussed in the literature and their impact on the government accounts. It also assesses the situation under a Balance of Payments crisis on the national accounts.

3.2 The role of credit market segmentation

Definition 1: *There are two types of borrowers, type I with perfect access to international capital markets and type II, those only able to borrow domestically, in domestic currency, with constant interest rate and with constant stream of nominal repayments. BoP crises imply a mismatch between the liquidity of financial obligations and that of government financial assets.*

If $p(t,v)$ is the output price of a given asset at time t if the asset was placed at time $v \leq t$on the market, then the asset is perfectly liquid if $p(t,t) = p(t,v)\ \forall\ t,v$. If $p(t,t) < p(t,v)$ assets display illiquidity. The assets' degree of liquidity could be measured by the ratio $\xi(t,v) = \frac{p(t,t)}{p(t,v)}$. A BoP crisis would take place if the

liabilities that the government must service at time t exceed the stock of liquid assets.

3.3 A BoP crisis model

The model was first introduced by Krugman (1979). In the model, goods are fully tradable, and the representative individual is endowed with a constant flow of tradable goods per unit of time t. The lifetime utility is:

$$\int_0^\infty \left[v(c_t^T) + z(m_t)\right] e^{-\beta t} dt \tag{3.4}$$

where $\beta > 0$ is the rate of time preference and v and z are strictly increasing and concave. The country is fully integrated in goods and capital markets and a constant international price of the tradable good and constant real interest rate r, equal to the subjective discount rate.

The lifetime constraint is:

$$b_0 + m_0 + \int_0^\infty (y_t^T + \frac{y_t^N}{e_t} + \tau_t)\, e^{-rt} dt = + \int_0^\infty (c_t^T + \frac{c_t^N}{e_t} + i_t m_t)\, e^{-rt} dt \tag{3.5}$$

where c_t^T is the tradable good, assuming that the law of one price holds, m is

the real monetary balances in terms of tradables, e_t is the real exchange rate, relative price of tradable goods in terms of non-tradable goods. it is the nominal interest rate and τ are the government lump-sum transfers. Perfect capital mobility implies $i_t = r + \varepsilon_t$ where ε_t is the rate of devaluation and the government lifetime budget constraint where the present value of transfers must equal the initial stock of government held foreign assets (reserves R_0) and revenues from money creation, hence,

$$\int_0^\infty \tau_t \, e^{-rt} dt = R_0 + \int_0^\infty (\dot{m}_t + \varepsilon_t + m_t) \, e^{-rt} dt \tag{3.6}$$

which are combined with the transversality condition $t \to 0, \lim \; m_t e^{-rt} = 0$, hence:

$$k_0 + \frac{y_t^N}{r} + \int_0^\infty c_t^T \, e^{-rt} dt \tag{3.7}$$

where $k{=}b{+}R$ which is the economy's net stock of foreign assets. The first-order conditions to this problem are:

$$v'(c_t^T) = \lambda \tag{3.8}$$

$$z'(m_t) = \lambda \, i_t \tag{3.9}$$

where λ is the Lagrangian multiplier. The expression 3.8 implies that prefect

foresight consumption is constant. Assuming that the Central Bank transfers net profits to the fiscal budget means that the capital is constant. From the Central Bank's balance sheet, one could infer that $\dot{M}_t = E_t\dot{R}_t + N\dot{D}A$

The government only source of expenditures are lump-sum transfers to households financed exogenously for given level of transfers τ, with a credit of the Central Bank and proceeds from international reserves *(R)*.Thus,

$$E_t\tau = N\dot{D}A + rE_tR_t \tag{3.10}$$

since $i_t = r$ demand for money is constant, $\dot{M}_t$, $\dot{R}_t = -\tau - rR_t$,

Hence, the loss of international reserves equals the budget deficit, given the government transfers minus the interest revenues from international reserves, assuming that the initial fiscal deficit is positive, $\tau - rR_t > 0$. The fact supports the assertion that governments might use international reserves to balance the budget and enact a counter-cyclical fiscal policy in recessions when there is a lack of access to international financial markets.

3.4 The voracity effect and the macroeconomic effects of political fragmentation

3.4.1 Political distortions

In order to address the effects of political fragmentation and the voracity effect defined in section 2.1.2.1, a model that determines the effect of a windfall on the public resources is outlined next. The windfall can be due to the improved access to financial markets or a foreign positive shock, i.e. an improvement in the terms of trade due to increased prices of exports or resource booms. The model was introduced by Tornell and Lane (1998). This setting is focused on the government sector of a small economy with an importable and exportable good, and the groups conforming the governing coalition in a rent-seeking pattern as described in section 2.1.2.

3.4.2 The model

Initially, suppose that there are n groups with the power to appropriate the public resources. Each group derives utility from the expenditure of public resources it appropriates, $g_i(t)$, consisting of public goods and services, payrolls, or production subsidies. The objective function of group i is

$$\int_0^\infty \frac{\sigma}{\sigma+1} g_i(t)^{\frac{\sigma-1}{\sigma}} e^{-\delta t} dt \tag{3.11}$$

where σ is the elasticity of intertemporal substitution and δ is the discount rate.

The objective function reflects the benefits reported to a powerful group that provides transfers to its constituents, and does not depend on what other groups appropriate. The fiscal appropriation of group i is then $k_i(t)$ which, might not be necessarily equal to $g_i(t)$, if $k_i(t) > g_i(t)$. If $k_i(t) > g_i(t)$ it can be stored for a next period, then the budget constraint faced by each group becomes:

$$\dot{A}(t) = \alpha A(t) + T(t) - \sum_{i=1}^{N} k_i(t) \tag{3.12}$$

here *A(t)* represents the stock of common assets held by the government, consisting of foreign assets, α is the rate of return in terms of the importable good, set to the world interest rate, *T(t)* are the tax revenues in terms of the importable good, which is the aggregate government sector constraint, and the groups closed access accumulation equation is:

$$\dot{B}(t) = \beta B_i(t) + k_i(t) - g_i(t) \tag{3.13}$$

and $B_i(t)$ are the closed-access assets held by group i that no other group can access. $B_i(t)$ represents the inefficient investment in assets of a socially inefficient transfer of public assets to the private sector. The condition $0 < \beta < \alpha$ holds. [1]

[1] If there is only a powerful group that assigns the appropriation to n groups the appropriation would be set equal to the expenditure period by period.

3.4.2.1 The case of a divided government.

Groups cannot coordinate or attain the efficient outcome which is not to use the private constraint 3.13, as the Coase theorem would suggest. Instead, the groups choose their appropriations in a non-cooperative manner.

To find the equilibrium the strategy consists in finding the *Markov Perfect Equilibrium* in the setup.

Definition.- *A strategy is Markov if it is a function solely of the realisation of the state. A n-tuple of strategies forms a Markov Perfect Equilibrium (MPE) if they are the best response to each other at every realisation of the state. It has* $n+2$ *elements* $\{p(t), A(t), B_1(t), ...B_n(t)\}$

The constraint 3.12 becomes $A(t) = r(p(t))A(t) - \sum k_i(t)$ and $r(p(t)) = \alpha + p(t)\theta - \frac{\alpha\theta}{1-\omega} > \beta$ where *r(p(t))* is the total rate of return obtained by the government, and $0 < \theta < 1$ is factor on assets *A(t)* that the government imposes on the private sector if contracted foreign debt is defaulted.[1]

The terms of trade are given by:

$$p(t) = \begin{cases} p & for\ t < t_1\ and\ t \geqslant t_2 \\ p + \epsilon & for\ \ t \in [t_1, t_2) \end{cases}$$

[1] The private sector only plays a minor role here; it borrows capital from a foreign lender.

in order to avoid appropriations at infinite rates, the following restriction must be imposed:

$$0 \leq b_i(t) = \bar{x}A(t), \quad r(p) + \frac{\theta\epsilon - \beta}{n-1} < \bar{x} < \infty \tag{3.14}$$

with $\bar{x}A(t)$ as the upper bound on the appropriation each group can make. There are two types of MPE: interior, where $b_i(t) < \bar{x}A(t) \; \forall \; i, t$ and extreme, where the inequality does not hold. The interior equilibrium restrict strategies to be piece-wise continuous function of state variables. There is a unique MPE in this setting. First, imposing the restriction on parameters for a MPE to exist, $z(\beta) > 0$, the propensity of fiscal groups to consume out of their stock of assets and $z(r(p+\epsilon)) > 0$ where $z(X) \equiv X\left[1-\sigma\right] + \delta\sigma$ (if $\sigma = 1 \Rightarrow \delta > 0$). Second, assume that is a necessary and sufficient condition for $B_i(t)$ to be increasing along the equilibrium path. Nonnegativity implies that constraint $A_i(t) \geq 0$ *and* $B_i(t) \geq 0$ is not binding along the equilibrium path.

Solving for the strategy of group i implies that appropriation policy of each group $j \neq i$ is given by $k_i^*(t) = x_j^*(p(t))A(t)$ with $x_j^*(p(t))$ as an unknown piece-wise continuous function of $A(t)$ and $Bi(t)$. The best response is given by $k_i^*(t) = x_j^*(p(t))A(t)$. The only fix point is $x_j^*(p(t)) = \left[r(p(t)) - \beta\right]/(n-1) \; \forall \, j$. There is a unique interior MPE. The equilibrium is given by:

$$k_i^*(t) = x^*(r(p(t)))A(t) = \frac{r(p(t)) - \beta}{n-1}A(t) \tag{3.15}$$

$$g_i^*(t) = z(\beta)\left[A(t) + B_i(t)\right] \tag{3.16}$$

$$A^*(t) = \begin{cases} (0)\, e^{\left(\frac{n\beta - r(p)}{n-1} t\right)} & t < t_1 \\ A(t_1)\, e^{\left(\frac{n\beta - r(p) - \theta\epsilon}{n-1}[t - t_1]\right)} & t \in [t_1, t_2) \\ A(t_2)\, e^{\left(\frac{n\beta - r(p)t}{n-1}[t - t_2]\right)} & t \geq t_2 \end{cases} \tag{3.17}$$

$$B_i^*(t) = \begin{cases} [a(0) + b_i(0)\, e^{\sigma[\beta - \delta]t} - A(t) & t < t_1 \\ [A(t_1) + B_i(t_1)]\; e^{\sigma[\beta-\delta](t-t_1)} - A(t)\; t \in [t_1, t_2) \\ [A(t_2) + B_i(t_2)]\; e^{\sigma[\beta-\delta](t-t_2)} - A(t)\; t > t_2 \end{cases} \tag{3.18}$$

The intuition behind these equations is that the rate of return perceived by group i on the common assets *A(t)* is not *r(p(t))*, but instead is *r(p(t))* minus the appropriation of the other *n-1* groups, $r\left(p\left(t\right)\right) - \sum_{j \neq i} x_j r\left(p\left(t\right)\right)$. Each instant group i must decide how to allocate its wealth, between *A(t)* and $B_i(t)$. The interior equilibrium implies that every group sets its appropriation rate within the bounds of and requires that for every i the rate of return on i's private technology β be equal to the i's rate of return on *A(t)* after appropriation by other groups, meaning that the following n conditions must hold in an interior equilibrium.

$$\beta = r\left(p\left(t\right)\right) - \sum\nolimits_{j \neq i} x_j r\left(p\left(t\right)\right), \;\; i = 1, ..., n \tag{3.19}$$

and a unique solution is that all x_js be identical to $x_j^*(r(p(t)))$ in 3.15 . $g_i(t)$ does not depend on the path of the terms of trade, because *p(t)* leads to a greater appropriation rate by fiscal groups.

3.4.3 The voracity effect: the effects of a shock in terms of trade on the equilibrium of fiscal appropriations.

Following the described scenarios, there are two conflicting effects:

- Increase in the raw growth rate of government foreign assets, and,
- Increases in the equilibrium appropriation rates by fiscal groups out of the stock of the held government foreign assets.

The key result is an interior MPE. The second effect must dominate, then a positive shock to the terms of trade whether expected or unexpected must reduce the growth rate of government foreign assets.

$$\frac{\partial \dot{A}(t)/A(t)}{\partial \epsilon} = -\frac{\theta}{n-1} < 0 \;\; t_1 \leq t \leq t_2 \tag{3.20}$$

Not only does the growth rate of *A(t)* fall but for sufficiently large ϵ it becomes negative during the period $[t_1, t_2)$.

The voracity effect is a more than proportional change in the aggregate appropriation in response to shock in terms of trade. The intuition is as follows, a higher *r(p(t))* leads to an increase in the raw growth rate of net public assets (before the appropriation of other groups.) As *r(p(t))* goes up each group can afford to be more voracious and still leave the other groups with a post-appropriation rate of return of net public assets equal to β, leading to a greater increase in the appropriation rate than the original increase in fiscal revenue. This situation implies a dynamic externality in a common pool context. *Ex-post*, the positive shock leaves the government finances worse off.

The mechanism works as follows, the raw (pre-appropriation) rate of return increases by $\Delta r(t_1) = \theta\epsilon$ when the shock occurs, representing an opportunity for some groups to increase its appropriation rate without reducing below β the post-appropriation rate or return faced by other groups. In equilibrium, every group increases its appropriation rate by this reasoning and the size of the individual increase is given by $\Delta(r(p(t))(1/n - 1)$. This lack of coordination implies that the aggregate appropriation rate increases by $\Delta(r(p(t_1))(n/n-1) > \Delta r(p(t))$, the growth rate of net public assets falls, $\Delta\dot{A}/A = \Delta r - \Delta rn/(n-1) = -\theta\epsilon/(n-1)$, implying that a positive shock results in a deterioration of the public finances.

Chapter 4

Data and empirical analysis

The aim of this chapter is to answer the questions - what are the determinants of 'pro-cyclicality' and access to international financial markets, and *if* these determinants are institutional and macroeconomic factors. A feature of some emerging economies is that they are able to '*graduate'* from 'pro-cyclicality' and fund their budget deficits by accessing international credit markets.

Two possible scenarios are analysed. Firstly, the improvement in the quality of governance and institutions resulted in a consequent 'graduation' from 'pro-cyclicality'. Secondly, economies with improved access to financial markets ought to have counter-cyclical fiscal policies. This evidence contributes the understanding of the underlying causes of pro-cyclical fiscal policy in developing and emerging countries in stark contrast to advanced economies. It also contributes to the analysis of the drivers of 'graduation' from 'pro-cyclicality' and access to international financial markets for developing and emerging countries, given the limited scope of the existent literature on these economies.

In first place, an empirical analysis of macroeconomic and qualitative data in a panel of 184 advanced, developing and emerging economies for the time-period from 1960 to 2010 is performed. The analysis relies on the calculation of a panel-

based Pooled Mean Group (PMG) coefficients estimated between fiscal variables and the output gap. Sequentially, a country-by-country time-series regression analysis allows to verify the existence of possible structural breaks. Due to concerns of heteroskedasticity and autocorrelation, robust errors are used throughout the analysis.

The data series used in this stage of the empirical analysis are obtained from Penn World Table PWT 7.1 (Heston et al. (2012)). The series analysed are government consumption (as share of GDP), GDP in current prices, and include transformations by using the GDP and the government consumption deflators, with temporal transformations by employing Hodrick-Prescott, Baxter-King and First-difference filtering.

4.1 Empirical methodology

This section outlines the core specification used in the existing literature to estimate the degree of pro-, a- or counter-cyclicality of fiscal policy in developing, emerging markets and advanced economies. The empirical strategy follows similar specifications estimated by Akitoby and Stratmann (2008), Ilzetzki and Vegh (2008), and Calderón et al. (2012). The estimation of the specification does not yield a fiscal multiplier; instead, it estimates a cyclical coefficient because a multiplier would capture the reaction of input to the fiscal variable. Hence, the empirical analysis consists in the estimation of the following expression:

$$F_t = \alpha + \beta OG_t + \varepsilon_t \tag{4.1}$$

where the fiscal variable Ft is defined as the detrended log of real government consumption, ie. $\ln(\textit{real government consumption}) - \ln[\tau_t(\textit{real government consumption})]$,

where τ_t, the trend component is obtained by applying the Hodrick-Prescott filter and OGt is the output gap defined as $OG_t = \ln(real\,GDP) - \ln[\tau_t\,(real\,GDP)]$. The chosen fiscal variable is the real government consumption based on two main assumptions: i) the real government consumption, as compared to the real fiscal balance ought to be independent from the business cycle,[1] and ii) its relevance as a policy variable.[2] The Hodrick-Prescott (H-P) filter removes a cyclical trend τ_t of a seasonal F_t series by minimising:

$$\min_{\tau} \sum_{t=1}^{T} \left[(F_t - \tau_t) + \lambda[(\tau_{t+1} - \tau_t) - (\tau_t - \tau_{t-1})]^2\right] (4.2)$$

where $\lambda = \frac{\sigma_c^2}{\sigma^2_{\Delta^2_{\tau_t}}}$ and $y_t - \tau_t$ is the business cycle, c_t .[3] The real government expenditures and the output gap are in levels, and subsequently deflated by the GDP deflator.

4.1.1 Alternative filtering: Symmetric Moving Average (SMA) approach

For robustness purposes, τ_t , the trend component, is obtained by applying the Baxter-King band-pass filter, which, similarly to the Hodrick-Prescott separates the times series into trend and cyclical components. The Baxter-King SMA filter is widely used in similar studies. See for instance, Kaminsky et al. (2005) and

[1] The explanation is also valid for the government revenues, which consist of the tax base and the tax rates. The former ought to be pro-cyclical, because during economic booms the tax base expands and the opposite during recessions, (Calderón et al. (2012).)

[2] Although the analysis excludes transfers to the private sector, this is another relevant component of the government spending. Limitations on transfers' data for developing countries make this effort unattainable. Government spending comprises: government consumption, government investment, transfers, and debt service, or $GS = GC + I + Tr + debt\ service$.

[3] The ratio of the two variances, or smoothing parameter λ , is adjusted to $\lambda = 1600/4^4 = 6.25$ for annual observations (Ravn and Uhlig (2002)). The advantages of using H-P filters with macroeconomic data are discussed in detail by King and Rebelo (1993).

Calderón et al. (2012). The cyclical component is obtained by the infinite-order, ideal band-pass filter calculating[1]

$$c_t = \sum_{j=-\infty}^{\infty} b_j F_{t-j} \tag{4.3}$$

The modified weights for a finite SMA filter with coefficients summing zero are estimated by $c_t = \sum_{j=-q}^{+q} \widehat{b}_j F_{t-j}$, with coefficients $\widehat{b_j}$ equal to $\widehat{b_j} = b_j - \bar{b}_q$, where $\widehat{b_{-j}} = \hat{b}_j$ and $\bar{b}_q$ is the mean of the ideal coefficients truncated at $\pm q$, with $\bar{b}_q = (2q+1)^{-1} \sum_{j=-q}^{q} b_j$, and their sum converging to zero.[2]

4.1.2 First differenced variables

An alternative specification relies on the use of the first-difference variable $Fb_t = \Delta \ln(\textit{real government consumption})$. These two alternatives are used extensively in the existing literature, see for example Alesina et al. (2008) and Ilzetzki and Vegh (2008). Erbil (2011) also employs a similar definition of a first-differenced log-linearised fiscal variable regressed on the non-oil revenues of oil-producing countries. The estimation is computed individually for each country in the sample, in order to obtain the parameter β which is the cyclicality coefficient. A positive β parameter corresponds to a pro-cyclical fiscal policy, whilst a negative parameter represents a counter-cyclical fiscal policy.

[1]The data transformation is $F_t^* = \sum_{j=-q}^{q} \alpha_j F_{t-j}$. For a symmetric moving average, q is the order of the filter. The filtered series has $T\text{-}2q$ observations and $j \in \{-q, ..., q\}$. If p_l, and p_h are the minimum and the maximum periods of a stochastic cycle, the weights b_j are given by: $b_j = \begin{cases} \pi^{-1}(\omega_h - \omega_l) & if\ j = 0 \\ (j\pi)^{-1}\{\sin(j\omega_h) - \sin(j\omega_l)\} & if\ j \neq 0 \end{cases}$ where $\omega_l = \frac{2\pi}{p_l}$ and $\omega_h = \frac{2\pi}{p_h}$ are the lower and higher cut-off frequencies, respectively.

[2] The first and last q values of the cyclical components cannot be estimated.

4.2 Is government spending pro- or counter-cyclical on average in each country?

Constructing the series real government consumption and real GDP is performed by taking the logs of these series detrended using Hodrick-Prescott filters which allow the calculation of the output gap (OG) (the deviation in *ln(GDP)* from trend) and the detrended log of real government consumption *(F)*. The series are constructed for all countries in the sample, (n=184), and cover the period from 1960 to 2010.

4.2.1 A panel constrained model- the pooled mean group (PMG) estimator

A transformation to expression (4.1) is initially estimated relying on a pooled mean group estimator addressing any concerns for possible non-stationarity in the panels, where N is the number of countries, and T, the number of years in the panel are large. The advantages of a constrained model are related to identical long-run but short-run coefficients and error variances differing across countries. The approach is based on the contribution of Pesaran et al. (1999). For purposes of estimation, three separate groups of countries are estimated, emerging markets, high-income OECD and high-income non-OECD economies. [1]

Assuming that the number of countries I in the panel is N, for a number of periods $t=1,2,...T.$, then a dynamic panel specification of an autoregressive distributive lag (ARDL) $(p,q,q,q,...q)$ model is,

$$F_{it} = \sum_{j=1}^{p} \lambda_{ij} F_{i,t-j} + \sum_{j=0}^{q} \delta'_{ij} OG_{i,t-j} + \mu_i + \nu_{it} \tag{4.4}$$

[1] Developing countries are not included due to the large number, and relative smaller T.

The dependent fiscal variable F_{it} and the vector of explanatory variables, output gap $OG_{i,t-j}$ are a $k \times 1$ dimension, δ'_{ij} is a $k \times 1$ coefficient vector, λ_{ij} are scalars and μ_i are the group-specific effects.[1] For instance, cointegration implies a responsiveness to any deviation from the long-run equilibrium, and an error correction model in which the short-run dynamics of the variables are affected by this deviation from equilibrium. In such sense, the error correction model is,

$$\Delta F_{it} = \phi_i(F_{i,t-1} - \beta'_i OG_{it}) + \sum_{j=1}^{p-1} \lambda^*{}_{ij} \Delta F_{i,t-j} + \sum_{j=0}^{q-1} \delta'^*_{ij} \Delta OG_{i,t-j} + \mu_i + \nu_{it} \quad (4.5)$$

where the error-correcting speed parameter is $\phi_i = -(1 - \sum_{j=1}^{p} \lambda_{ij})$, $\beta_i = \frac{\sum_{j=0}^{q} \delta_{ij}}{1 - \sum_k \lambda_{ik}}$, Hence, $\lambda_{ij}{}^* = -\sum_{m=j+1}^{p} \lambda_{im}$ for *j=1,2...p-1* and , $\delta_{ij}{}^* = -\sum_{m=j+1}^{q} \delta_{im}$ for *j=1,2,...q-1* are estimated.[2] The estimated parameters are shown in the following table,

where an ARDL (1,1,1) model is used estimated by a Maximum Likelihood (ML) approach.[3] For the specification $F_{it} = \beta_{0t} + \beta_{1t} OG_{it} + \mu_i + \varepsilon_{it}$, the ARDL expression is:

$$F_{it} = \delta_{10i} OG_{it} + \delta_{11i} OG_{i,t-1} + \lambda_i F_{i,t-1} \mu_i + \nu_{it} \quad (4.6)$$

And the error correction expression is:

$$\Delta F_{it} = \phi_i(F_{i,t-1} - \beta_{0i} - \beta_{1i} OG_{it}) + \delta_{11i} \Delta OG_{it} + \nu_{it} \quad (4.7)$$

[1] The number of years, T must be large enough to allow for the model to fit each group separately.

[2] If $\phi_i = 0$ there is no evidence of a long-run relationship. The vector $\beta_i{}'$ contains the long-run relationship between the variables.

[3] The approach estimates the following expression using ML: $\ell_T(\beta', \varphi', \sigma') = -\frac{T}{2} \sum_{i=1}^{N} \ln 2\pi {\sigma_i}^2 - \frac{1}{2} \sum_{i=1}^{N} \frac{1}{{\sigma_1}^2} M' H_i M$ with the matrix $M = \Delta F_i - \phi_i \xi_i(\beta)$ for *i=1,...,N* and $\xi_i(\beta) = F_{i,t-1} - OG_i \beta_i$ and $H_i = I_T - W_i(W_i{}' W_i) W_i$, I_T is an identity matrix of order T, and $W_i = (\Delta F_{i,t-1}, ...\Delta F_{i,t}, \Delta OG_i, \Delta OG_{i,t-1}, ..., \Delta OG_{i,t})$.

where $\phi_i = -(1-\lambda_i)$, $\beta_{0i} = \frac{\mu_i}{1-\lambda_i}$ and $\beta_{1i} = \frac{\delta_{10i}+\delta_{11i}}{1-\lambda_i}$.[1]

For most emerging market economies, the parameters are positive and significant, ruling out a counter-cyclical fiscal policy with greater statistical significance. In some countries a-cyclicality cannot be ruled out, as the null hypothesis indicating that the coefficient is equal to zero is not rejected. On the other hand, high-income OECD countries exhibit mixed results, the United States fiscal policy is clearly counter-cyclical, but for most European economies and Japan, the fiscal policy is a-cyclical with some exceptions. Estimates for Germany, Iceland, Israel, Italy, Korea, Portugal, Spain and Sweden, yield a positive parameter with a consequent pro-cyclical fiscal policy.

High-income non-OECD economies like Croatia and oil producing countries like Kuwait, Saudi Arabia and Trinidad and Tobago portray a sound counter-cyclical behaviour with negative and highly significant parameters. Robustness to these results are checked by running estimations with variables using Baxter-King and First-Difference filters. The results do not present a significant difference.

4.3 Time series approach

4.3.1 Granger-Causality and VAR estimates

Calculation of the cyclicality coefficients is performed under the assumption that causality goes from the business cycle (the output gap) to the fiscal variable. A Granger causality test (Granger (1969)) enables confirmation of the direction of causality but also allows to check for reverse causality. The central purpose of performing this check is to find out if past government consumption, and

[1] The Stata package xtpmg (Blackburne and Frank (2007)) presents pooled mean group estimates for dynamic heterogeneous panels.

Table 4.1: Pooled mean group estimator for emerging markets, high-income OECD and high-income non-OECD economies (1960-2010)

Emerging Market economies				**High-income OECD**				**High-income non-OECD**			
	Coef.	**P-value**			**Coef.**	**P-value**			**Coef.**	**P-value**	
Long-run coefficient	**1.010145**	**0.0000**		**Long-run coefficient**	**1.005695**	**0.0000**		**Long-run coefficient**	**0.9916438**	**0.0000**	
Group-specific short-run coefficients				**Group-specific short-run coefficients**				**Group-specific short-run coefficients**			
Country	**Coef.**	**P-value**	**Sig**	**Country**	**Coef.**	**P-value**	**Sig**	**Country**	**Coef.**	**P-value**	**Sig**
Argentina	0.4831673	0.0000	***	Australia	0.0196211	0.8900		Bahamas, The	-0.0686171	0.6410	
Brazil	0.1958263	0.0740		Austria	0.1990779	0.1570		Bahrain	-0.0797002	0.5100	
Bulgaria	0.5645532	0.0010	***	Belgium	0.1396628	0.3330		Barbados	-0.1428005	0.6580	
Chile	0.581939	0.0000	***	Canada	0.1945143	0.2630		Brunei Darussalam	-0.0894941	0.5960	
China	0.3502208	0.0220	*	Czech Republic	0.2973206	0.2170		Croatia	-0.4562039	0.0170	*
Colombia	0.0353002	0.8090		Denmark	-0.0603291	0.6770		Cyprus	0.2721969	0.0500	
Hungary	0.0577902	0.7280		Estonia	-0.5242791	0.0000	***	Equatorial Guinea	0.054848	0.7400	
India	0.1210288	0.3400		Finland	0.1832368	0.1980		Kuwait	-0.8516049	0.0090	***
Indonesia	0.3804232	0.0030	***	France	0.1159207	0.4080		Malta	-0.0531387	0.7320	
Latvia	-0.0845627	0.6990		Germany	0.4285234	0.0020	***	Oman	-0.2418323	0.1330	
Lithuania	0.0252153	0.9110		Greece	0.148227	0.3230		Qatar	-0.2109405	0.1340	
Malaysia	0.0499994	0.7710		Iceland	0.4588078	0.0010	***	Saudi Arabia	-0.4402794	0.0130	* [a]
Mexico	0.5081433	0.0000	***	Ireland	0.141164	0.3100		Singapore	-0.0238122	0.9030	
Pakistan	-0.2000964	0.1830		Israel	0.5249272	0.0000	***	Trinidad and Tobago	-0.2771277	0.0760	
Peru	0.2673563	0.0020	***	Italy	0.273329	0.0480	*	United Arab Emirates	0.3474004	0.4770	
Philippines	0.1945271	0.1560		Japan	0.1410466	0.3120					
Poland	0.1378637	0.3120		Korea, Rep.	0.3343229	0.0050	***				
Romania	0.5009796	0.0000	***	Luxembourg	0.1988653	0.1880					
Russian Federation	0.1989277	0.0800		Netherlands	-0.1228546	0.3760					
South Africa	0.0572065	0.7010		New Zealand	0.1161174	0.3940					
Thailand	0.2695844	0.1790		Norway	0.0637385	0.6530					
Turkey	-0.360894	0.0770		Portugal	0.5855852	0.0000	***				
Ukraine	0.2233405	0.3310		Slovak Republic	-0.0790758	0.7980					
Venezuela, RB	0.8274993	0.0000	***	Slovenia	0.1867728	0.4390					
				Spain	0.2761815	0.0440	*				
				Sweden	0.2278855	0.0770					
				Switzerland	0.0155721	0.9130					
				United Kingdom	0.2015976	0.1930					
				United States	-0.9140233	0.0010	***				

[a] Significance levels: 5% *, 1% ** , 0.1% ***.

its deviations from trend caused changes in the output gap (existence of fiscal multipliers). Therefore, it tests the existence of causality of the output gap on the fiscal variable F contemporaneously and not of F on the output gap (as the transmission is supposed to take additional periods to feed back.) The test also presents motivation for testing the existence of simultaneity bias in ordinary least squares (OLS) estimates and the consequent need to instrument the output gap.

Granger causality tests are performed following VAR estimations on lags of the fiscal variable and output gap with two lags *(p=2)* and specifying a small-sample degrees of freedom adjustment for estimating the variance-covariance matrix while reporting small-sample t and F-statistics in place of chi-squared statistics. Two lags are selected following the Akaike, Schwarz's Bayesian and Hannan and Quinn information criterion as part of p lag-order selection criteria.[1] Following a similar approach by Blanchard and Perotti (2002) and Ramey (2011), the VAR specification is:

$$\begin{aligned} \mathbf{F_t} &= v_1 + \mathbf{A}_1\mathbf{F}_{t-1} + \mathbf{A}_2\mathbf{F}_{t-2} + \mathbf{B}_1\mathbf{OG_{t-1}} + \mathbf{B}_2\mathbf{OG}_{t-2} + \varepsilon_{\mathbf{1t}} \\ \mathbf{OG_t} &= v_2 + \mathbf{A}_1\mathbf{F}_{t-1} + \mathbf{A}_2\mathbf{F}_{t-2} + \mathbf{B}_1\mathbf{OG_{t-1}} + \mathbf{B}_2\mathbf{OG}_{t-2} + \varepsilon_{\mathbf{2t}} \end{aligned} \tag{4.8}$$

where $\mathbf{F}_t$ is a K $\times$ 1 vector of endogenous variables, **OGt** is a M x 1 vector of exogenous variables, **A1-A2** are a matrices of K x K parameters,**B1-B2** are K x M matrices of coefficients, and $\varepsilon_{1,2\mathbf{t}}$ is a white-noise error.[2]

The objective of performing pairwise Granger causality tests post-VAR estimation of expression 4.8 is to test the hypothesis whether the output gap Granger-causes

[1] The criterion is checked on a country-by-country basis. The criterion minimises the forecast error, and bases the VAR order choice on the appropriate first-step ahead forecast given by $\mathbf{\Sigma}\hat{\mathbf{F}}_1 = \frac{t+kp+1}{t}\mathbf{\Sigma}\varepsilon_{\mathbf{1}}$ where $\mathbf{\Sigma}\varepsilon_{\mathbf{1}}$ is a white-noise covariance matrix , and t is the sample size and the k time-series dimension. The appendix shows the exact definition of the three-information criterion.

[2] The general representation of the 2$^{\text{nd}}$-order VAR is: $\overrightarrow{\mathbf{F_t}} = \nu + \mathbf{A}_1\overrightarrow{\mathbf{F_{t-1}}} + \mathbf{A_2}\overrightarrow{\mathbf{F_{t-2}}} + \overrightarrow{\varepsilon_t}$, with $\overrightarrow{\mathbf{F_t}} = (\mathbf{F_t}, \mathbf{OG_t})'$ and $\overrightarrow{\varepsilon_t} = (\varepsilon_{\mathbf{1t}}, \varepsilon_{\mathbf{2t}})'$.

the fiscal variable, or the null hypothesis $H_0 : \mathbf{B_1} = \mathbf{B_2} = 0$ in the first expression of equation 4.8 and $H_0 : \mathbf{A_1}{=}\mathbf{A_2} = 0$ in the second. Failing to reject the null hypothesis implies that the output gap does not Granger-cause the fiscal variable. Such situation indicates the existence of reverse causality, and other estimation methods shall be used.

The null hypothesis that the OG does not Granger-cause F is rejected in several developing and emerging countries but is not rejected in any of the advanced economies. Put differently, it indicates that the F-tests of coefficients on all lags of endogenous variables are not jointly zero, implying the Granger non-causality of the dependent variable in the equation. Reverse causality in the model is verified, as there are cases, such as the United States, where the null hypothesis that F does not Granger-cause OG is rejected at the 5 per cent level of significance (P-value=0.018). Nevertheless, failing to reject the null hypothesis occurs in several occasions for many countries, as shown in 4.2. An extension to the analysis explores beyond for the existence of heteroskedasticity and serial correlation in the errors.

4.3.2 Calculating the cyclicality coefficients for real government consumption

The pro- or counter-cyclicality of government consumption is calculated for each country. The appendix reports the estimated bivariate correlations, the cyclicality coefficients for the real government consumption relying on the log-deviation and first-difference of the dependent variable. The argument about why regression estimates are preferable to bivariate correlations resides in the possibility of performing additional hypotheses individual or joint tests on the significance of the estimated parameters. Both cases include the level of significance p-values, which are also reported in the appendix. In addition, the table includes two columns

Table 4.2: Granger causality test

Countries for which $H_0 : \mathbf{B_1} = \mathbf{B_2} = 0$ is rejected				
Afghanistan	Congo, Rep.	Iraq	Oman	Sweden
Albania	Costa Rica	Ireland	Pakistan	Tonga
Armenia	Cyprus	Jamaica	Papua New Guinea	Trinidad and Tobago
Azerbaijan	Denmark	Korea, Rep.	Paraguay	Turkey
Bangladesh	Dominican Republic	Madagascar	Portugal	Uganda
Benin	El Salvador	Malta	Russian Federation	United States
Bhutan	Estonia	Mexico	Saudi Arabia	Uruguay
Botswana	Gambia, The	Mongolia	Serbia	Uzbekistan
Bulgaria	Georgia	Morocco	Sierra Leone	Venezuela
Cameroon	Germany	Netherlands	Spain	Vietnam
Central African Republic	Guinea	Nicaragua	Sri Lanka	Yemen, Rep.
Chile	Guyana	Niger	St. Kitts and Nevis	Zambia
Congo, Dem. Rep.	Iran, Islamic Rep.	Norway	Swaziland	
Countries for which $H_0 : \mathbf{B_1} = \mathbf{B_2} = 0$ fails to reject				
Algeria	Comoros	Iceland	Mali	Singapore
Angola	Cote d'Ivoire	India	Marshall Islands	Slovak Republic
Antigua and Barbuda	Croatia	Indonesia	Mauritania	Slovenia
Argentina	Cuba	Israel	Mauritius	Solomon Islands
Australia	Czech Republic	Italy	Micronesia	Somalia
Austria	Djibouti	Japan	Moldova	South Africa
Bahamas, The	Dominica	Jordan	Montenegro	St. Lucia
Bahrain	Ecuador	Kazakhstan	Mozambique	St. Vincent and the Grenadines
Barbados	Egypt, Arab Rep.	Kenya	Namibia	Sudan
Belarus	Equatorial Guinea	Kiribati	Nepal	Suriname
Belgium	Eritrea	Kuwait	New Zealand	Switzerland
Belize	Ethiopia	Kyrgyz Republic	Nigeria	Syrian Arab Republic
Bolivia	Fiji	Lao	Palau	Tajikistan
Bosnia and Herzegovina	Finland	Latvia	Panama	Tanzania
Brazil	France	Lebanon	Peru	Thailand
Brunei Darussalam	Gabon	Lesotho	Philippines	Timor-Leste
Burkina Faso	Ghana	Liberia	Poland	Togo
Burundi	Greece	Libya	Qatar	Tunisia
Cambodia	Grenada	Lithuania	Romania	Turkmenistan
Canada	Guatemala	Luxembourg	Rwanda	Ukraine
Cape Verde	Guinea-Bissau	Macedonia	Samoa	United Arab Emirates
Chad	Haiti	Malawi	Sao Tome and Principe	United Kingdom
China	Honduras	Malaysia	Senegal	Vanuatu
Colombia	Hungary	Maldives	Seychelles	Zimbabwe

[a]

[a] Note.- The null hypothesis is rejected at 10% level of significance.

outlining Frankel et al. (2012) country correlations for the period 1960-2010 and Alesina et al. (2008) estimates 1960-2003 for comparison. Although there are differences with previous estimates, some of the coefficients predict the degree of policy cyclicality with increased accuracy. The reasons for the differences are primarily due to a different period under analysis, the frequency of the data (this dataset contains annual observations instead of quarterly data) and the different approach taken, ie. Frankel et al. (2012) resorts to correlations and Alesina et al. (2008) to regressions.

4.3.3 Heteroskedasticity and autocorrelation robust results

The analysis must take into account the existence of heteroskedasticity in the regression residuals. In consequence, the null hypothesis tested is $H_0 : Var\left[\varepsilon|\mathbf{OG}\right] = {\sigma_\varepsilon}^2$ where the conditional variance on the errors is non-dependent on the explanatory variable, the output gap. The Breusch-Pagan (B-P) test (Breusch and Pagan (1979)) allows to test the existence of heteroskedasticity, performing a likelihood multiplier (LM) test.[1] Serial correlation is also a concern and is tested relying on the Breusch-Godfrey (B-G) and a variant, the Q test of Box and Pierce. [2] The *p-value* of each statistic testing the null hypothesis of constant variance (B-P) and no serial correlation (B-G and Q) which are reported in the appendix.The results indicate that heteroskedasticity is present, as well as serial correlation in the errors.

[1] The test regresses an auxiliary regression on the squared residuals on a set of regressors **z.** The LM statistic is distributed as ${\chi_k}^2$ with k the number of regressors in the auxiliary regression.

[2] This test checks the first p sample serial correlation of the residuals: $Q = T(T+2)\sum_{j=1}^{p} \frac{{r_j}^2}{T-j}$ with ${r_j}^2$ as the *jth* autocorrelation of the residual series, distributed as $\chi^2(p)$.

4.3.4 The estimated coefficients

Rankings and categorical variables are generated and based on the two types of cyclical coefficients estimated. In line with the existing literature, the results show that developing and emerging economies are more likely to exhibit significant pro-cyclicality, while advanced economies exhibit a-cyclical behaviour (Table 3 in the appendix). The model accounts for heteroskedasticity and autocorrelation in the errors that are typical in this type of country-level data.

4.3.5 A retrospective: the cyclical policy behaviour in selected countries.

This part aims at describing the economic and political events that shaped the behaviour of fiscal policies in selected countries or geographic regions across the sample. The analysis consists in a retrospective narrative of the main drivers of fiscal policy and access to financial market in each country.

4.3.5.1 Europe

Belgium

A switch from a central to a federal state shaped the Belgian fiscal behaviour in the 1980s. Several reforms undertaken in the 1990s ensured that overall budget discipline be fundamentally achieved and organisations were built in order to supervise the budgets across the different levels of government. Automatic stabilisers triggered an increase in public expenditures, and an overall deficit at the same time. The magnitude of the increase in public expenditures reached almost 30 percent of GDP, from 24 percent in the 1960s, and to 54 percent in the 1980s.

Germany and Switzerland

The fiscal variables in Germany experienced a growth since the 1960s, from 14 to 31 percent of GDP by the decade of the eighties (for government spending). On the other hand, revenues rose from 13 percent to 29 percent of GDP in the same period. The panorama of the Swiss fiscal policy, is far more stable. For instance, in the 1960s, government spending reached only a 9 percent of GDP, a constant proportion kept until 1987. Similarly, tax revenues only rose by 1 point in this period, from 8 to 9 percent of GDP. Fiscal budget balance over the cycle is a must for the Swiss authorities, and surpluses or deficits are credited on to an account, meaning that the latter must be compensated by the former, thus avoiding pro-cyclicality. The Swiss fiscal policy has benefited over the years, for being closely integrated with other European fiscal policies, especially during economic expansions.

Netherlands

The fiscal policy of the Netherlands has been characterised for increased government expenditures, which, grew from 25 percent of GDP in the decade of the 1960s to 57 percent by the end of the 1980s. This path has also been followed by tax revenues increasing from 25 to 51 percent of GDP. Actually, the Netherlands fiscal policy has performed better than of the other European economies and public debt has been reduced. Although much of the improvement is related to the revenues from the sale of assets and non-renewable natural resources. In spite of these facts, fiscal discipline has played a significant role in the fiscal behaviour of the country in the advent of the Euro. In consequence, the Dutch fiscal policy has converged to the path of those fiscal policies of all countries that joined the single currency. (Balassone et al. (2010); Wyplosz (2011)).

United Kingdom

The fiscal policy behaviour in the United Kingdom is characterised by a steadily

grown fiscal spending, that increased from 28 percent in the 1960s to 40 percent in the 1980s, while revenues rose from 31 to 37 percent of GDP in the same period. The fiscal policy was governed by two rules, namely, the possibility that the budget deficit ought to only finance public investment (the so called Golden Rule), and a restraint on the debt to GDP ratio, which should not to exceed 40 percent. The application of both rules aim at cyclically adjusting the budget. [1]

4.3.5.2 North America

United States

The United States has intended to maintain a counter-cyclical fiscal policy for more than four decades. While government expenditures increased from 18 percent of GNP in the 1960s to 24 percent in the 1980s, revenues growth was scant, from 18 percent to 20 percent of GNP, for the same period. For instance, federal spending is equivalent in size to sub-central spending and include important federal transfers. There are a set of balance budget rules, subject to a debt ceiling, and the budget behaviour has been notoriously counter-cyclical whilst central transfers ameliorated the pressure on state governments.

Canada

With a similar history to that of the United States, Canadian public expenditures increased from 16 percent in the 1960s to 24 percent of GDP in the 1980s. Tax revenue only rose by four points, from 16 percent to 24 percent of GDP. Starting on 1992 to 1996, federal spending limits were adopted as well as balanced budget rules, while surpluses from resource -rich provinces compensated deficits in other provinces, and thus balanced the budget.

[1] The inception of the Office for Budget Responsibility (OBR), in charge of running forecasts that were previously carried out by the Treasury for government policy variables was intended to deter misleading measures.

4.3.5.3 Latin America

Argentina, Brazil, Colombia, and Mexico

Fiscal policies in these countries have been closely linked to the evolution of natural resource prices. In general, fiscal policies have maintained a pro-cyclical bias, in some cases for stabilisation purposes, but with the exception of Chile, efforts to maintain a counter-cyclical fiscal policy have been limited. For instance, Argentina and Uruguay, induced a pro-cyclical fiscal policy following the 2002 crisis, similarly to Mexico, following the Tequila crisis. In a reduced number of countries like Colombia and Peru, the fiscal policy has kept a neutral stance.

Chile

Chile's government revenues have heavily relied on the prices of copper, representing up to quarter of total government revenue. The country adopted a fiscal rule (converted to law) in 2006. The law establishes a primary budget surplus, but with changing ceilings, 1 percent of GDP which was later reduced to 0 percent, aiming at a counter-cyclical response to the financial crisis. Once cyclically adjusted government revenues are estimated, the process allows for a maximum spending calculation. (Daude et al. (2010), Gavin and Perotti (1997), Wyplosz (2012)).

Peru

Fiscal policies in Peru have been subject to serious imbalances. In the 1970s, expansionary fiscal policies were brought up by favourable terms of trade, fuelled by soaring commodity prices. However, the scenario suffered a radical transformation in the decade of the 1980s, which led to a deterioration of the fiscal stance. Along with other symptoms like currency revaluation, the Peruvian economy was submerged into a recession by the end of the 1980s that provoked a spiralling hyperinflation. Nevertheless, structural reforms such as the implementation of

a stabilisation programme and a public sector reform in the 1990s induced an economic recovery that was coupled with a tighter fiscal policy and helped to achieve the macroeconomic stability.

Venezuela

Notably, vast oil revenues did not imply achieving a sound and sustainable fiscal stance in Venezuela. As a matter of fact, increased oil prices and macroeconomic instability lead to a deterioration in the economic performance. In the 1980s, the country was subject to the adversity of the international financial conditions, a situation that worsened in the next decade with declining oil prices, political unrest, and a banking crisis. By the mid-1990s, an oil price surge and the signature of a stand-by agreement with the IMF helped to improve the economy.

4.3.5.4 Africa

In retrospect, fiscal policies in African economies have been distinguished by being pro-cyclical and at best a-cyclical. The only exception is perhaps, Guinea-Bissau, a country that carried out efforts to enact a counter-cyclical fiscal policy. (Carmignani (2008), Lledó et al. (2009)).

South Africa

The fiscal policy in South Africa is distinguished by a fiscal policy heavily influenced by commodity prices, primarily from gold mining, and increased government expenditures paired with high revenues since the 1980s, due to a larger participation of the government in the economy. This situation changed in the 1990s, given the reforms undertaken securing the fiscal position and reducing the deficit. Expenditures were targeted and consequently, given the gained revenue authority independence in 1997, tax revenue collection improved its efficiency.

Algeria, Botswana, Madagascar, Morocco, Rwanda and Senegal

These African nations pursued a weakly pro-cyclical fiscal policy in the period under analysis, with limited efforts to attain at best an a-cyclical fiscal policy. The factors influencing this situation are related to the fluctuation of the international commodity prices and poor socio-political conditions. Additionally, reduced tax bases, with increased evasion and large informal markets whilst depending largely on external financing took a toll on the efforts of gaining a counter-cyclical fiscal policy. Similarly, a restricted use of automatic stabilisers exacerbated the critical situation.

4.3.5.5 Asia

Government spending in Asian countries was increasingly volatile, even overtaking the volatility of output. Only taking government expenditures into account, volatility is somehow similar. Fiscal policies in Asian countries are pro-cyclical except in Indonesia and Thailand where the fiscal policy has been counter-cyclical. (Kim et al. (2003), Sanchez-Fung and Ghatak (2006)).

The Philippines

During the 1960s the country implemented an industrialisation strategy, notwithstanding a process of inflation and economic instability in the 1970s and 1980s. Central banking independence and the signature of an IMF stabilisation-programme in 1994, became the backbone of a macroeconomic reform. The implemented policy permitted to achieve a sound fiscal policy stance with the inception of tax reforms including the privatisation of government-owned enterprises.

Thailand

Following a strong industrialisation carried out in the 1960s, the economy floun-

dered in the decade of the 1970s following the oil price shock. In consequence, Thailand resorted to the IMF for assistance and embarked on a series of structural reforms, including trade liberalisation, privatisation, and macroeconomic policy reforms. The fiscal deficit was gradually reduced and the economy was in surplus in the decade of the 1980s. The scenario changed by the end of the 1990s as the Asian crisis battered the country's fiscal balance. However, having a favourable fiscal stance in the period prior to the crisis somehow represented some support for overcoming the adverse effects of the Asian crisis.

4.4 Time variation in coefficients

Motivation

Not surprisingly there are abundant exercises in the literature estimating the cyclicality coefficients in developing, emerging and advanced economies. See, for instance, Frankel et al. (2012), Alesina et al. (2008) and Gavin et al. (1996). While every endeavour allowed for the collection and comparison of the evidence of fiscal policy pro-cyclicality it is a static approach that lacks the extent required to explain time variation of coefficients. In that verge, a more dynamic outlay is carried out involving the use of time series analysis on a country basis aiming to seek appraisal to the evolution of the cyclicality coefficients.

The analysis herein aims at exploring the existence of structural breaks in the estimated coefficients. Unlike the fiscal policy literature, the study investigates whether there are multiple structural breaks and the behaviour of fiscal policies in a time-varying framework. Hence, this part is motivated by the fact that fiscal policy is variable over time. This analysis contributes to the literature by defining multiple structural breaks in the studied specification.

The analysis involves two steps. Initially, the analysis begins with studying the

stability of the estimated cyclicality coefficients over time, distinguishing between pro-, a- or counter-cyclical behaviour during economic booms (good times) and recessions (bad times). The next step is to analyse the stability of cyclicality coefficients by setting dates following the approach of Frankel et al. (2012) and Alesina et al. (2008) and to verify if there is a 'graduation' from pro-cyclicality in developing and emerging economies.

4.4.1 β country-estimates stability over time

In order to evaluate the pattern of stability of the estimated cyclicality coefficients over time, the analysis makes use of country annual data for 1960 to 2010 (T=*51*) for 166 developing, emerging and advanced economies.[1] There are several reasons why the existing literature has suggested that the estimated cyclicality of fiscal policy may change within countries over time. For instance, Mendoza and Terrones (2008) and Reinhart and Reinhart (2008) have pointed to changes related to the magnitude of buoyant revenues in countries that were able to attract foreign purchasers of government bonds. On the other hand, Gavin and Perotti (1997), point out to the lack of capital market access during recessions and periods of financial crisis. In this strand, analysing the estimated coefficients stability over time on a country-basis is worth pursuing. The section focuses on identifying which countries exhibited such instability and then explain the evolution of the coefficients.

[1] Due to concerns of non-stationarity in the panels, 18 countries are excluded from the sample. The excluded countries are: Belarus, Bolivia, Bulgaria, Cambodia, Congo, Dem. Rep., Iraq, Israel, Kyrgyz Republic, Libya, Mongolia, Serbia, Sudan, Turkey, Uganda, Uzbekistan, Vietnam, Yemen, Rep. and Zambia.

4.4.2 Regime switches: fiscal behaviour during economic booms

The initial step in evaluating the stability of the cyclicality coefficients involves analysing the fiscal behaviour during economic booms and recessions. The framework explained by Riascos and Vegh (2003) and Ilzetzki (2011) is followed, whereby governments tend to increase expenditures in good times and avoid generating surpluses that would accrue to their successors. Frankel et al. (2012) assert that the lack of access to credit markets in bad times opens up the path for the government to behave pro-cyclically, at least in developing countries. To estimate this framework, the included explanatory variable good times is an *indicator* taking the value of one for the year when the output gap is positive and zero otherwise. Allowing to check robustness, a second variable is also constructed using the mean and standard deviation of the GDP growth rate, taking the value of *one* when this value is larger than the mean minus one standard deviation and *zero* otherwise.[1] Thus, the specification tested is:

$$F_t = \alpha + \beta_1 OG_t + \beta_2 D_{B,G_i} + \beta_3 (D_{B,G_i} \times OG_t) + \varepsilon_t \tag{4.9}$$

where F_t is the cyclical component of the fiscal variable, or real government expenditures in year t; OG_t is the output gap in year t, D_{B,G_i} is the indicator variable, with the parameter β_3 allowing for interaction effects.

As part of the post-estimation testing of equation by OLS, a t-test is computed to verify the linear hypothesis that the parameter β_3 is positive and significant,

[1] The *indicator* value in the former (i=1) is defined as: $D_{G1} = \begin{cases} 1 \; if \; OG_t > 0 \\ \\ 0 \; otherwise \end{cases}$, where OGt is the output gap in year t. Similarly, the latter (i=2) is defined as: $D_{G2} = \begin{cases} 1 \; if \; y_t > \bar{y} - \sigma_y \\ \\ 0 \; otherwise \end{cases}$, where y_t is the GDP's growth rate, $\bar{y}$ is the mean and $\sigma_y$its standard deviation.

or equivalently, by rejecting $H_0 : \beta_3 = 0$.[1]

Consequently, being able to reject the null hypothesis implies that a parameter different from zero is consistent with the fact that there is significant difference between fiscal policy in good and bad times. If this is the case, testing the hypothesis that $\beta_2 + \beta_3$ is significantly different from zero allow to conclude if there is significant difference in the cyclicality coefficients in good and bad times.

4.4.3 Expected impact on the fiscal cyclicality coefficients

The expected impacts on the fiscal cyclicality variables shall follow the patterns of the surveyed literature. Initially, how might the estimated fiscal policy react depending on the situation of the business cycle? For instance, during good times, all pro-cyclical fiscal variables might have a positive correlation with net capital inflows including central government debt, because a pro-cyclical economy might borrow from abroad.

On the other hand, the impact can be negative, even if, in the case of a counter-cyclical economy, the net capital inflows are negative, because, the business cycle is booming. However, in case of a-cyclicality, the impact is not clear-cut. In consequence, short or long term debt stocks, will follow the cyclical behaviour of net capital flows.

In such case, during good times, pro-cyclical economies increase debt stocks

[1]The hypothesis test relies on the point and variance-covariance matrix of the estimates on the unrestricted specification, or loosely, a set of linear restrictions $\mathbf{R}\beta = \mathbf{r}$, with $\mathbf{R}$, a 1×3 matrix and $\mathbf{r}$ a single-column element vector, with the restriction on the equation $F_t = \alpha + \beta_1 OG_t + \beta_2 D_{B,G} + \beta_3 (D_{B,G_i} \times OG_t) + \varepsilon_t$, or more specifically, $\mathbf{R} = (\,0\ \ 0\ \ 1\,)$ and $\mathbf{r} = (\,0\,)$. The Wald statistic is: $W = \left(\mathbf{R}\hat{\beta} - \mathbf{r}\right)^T \left\{\mathbf{R}(\hat{V})^{-1}\mathbf{R}^T\right\}^{-1} (\mathbf{R}\hat{\beta} - \mathbf{r})$, with a large-normal distribution which is best approximated by a Student t distribution with df=49. Wald tests are also a preferred alternative as these can involve linear combinations of parameters.

because access to resources is plentiful, with the opposite during bad times. This situation will originate a virtuous circle with increased revenues during economic booms. Furthermore, government expenditures will increase in such times, thereby reflecting a positive correlation with the cycle. This case is typically observed in developing and emerging economies facing international financial constraints in bad times.

The situation contrasts with a counter-cyclical fiscal policy during economic booms and pro-cyclical during bad times. In this scenario, more advanced countries not facing financial restraints are able to resort to automatic stabilisers, increasing expenditures and transfers to the private sector in bad times and the opposite in good times. Hence, transfers and access to deficit financing are paramount in order to enact a counter-cyclical fiscal policy.

Nevertheless, this would be a vague assertion pointing to a static fiscal policy cyclicality. Fiscal policy is time-varying, (Alesina et al. 2008, and Frankel et al. (2012)) and there is the need to test the hypothesis that pro-cyclical fiscal policy in good and bad times varies but also for countries with counter-cyclical fiscal policies. In consequence, estimating equation (4.9) supports testing the hypothesis that countries with a pro-cyclical fiscal policy increasing expenditures in good times maintain their fiscal behaviour during bad times.

Fiscal behaviour during economic booms or good times.

Country	β_1	$\beta_1 + \beta_3$	β_3	P-value	$\beta_2 + \beta_3$
Barbados	14.57802	-4.361369	-18.93939	.0001211	-19.16092
Brunei Darussalam	.8867558	-.9989055	-1.885661	.0090369	-1.850286
Central African Republic	-.1223218	6.815172	6.937493	.0009801	6.586582
Dominican Republic	2.088317	.4144332	-1.673884	6.11e-06	-1.698145
El Salvador	9.306876	-6.489578	-15.79645	.0002537	-15.83746
Guinea	4.817088	-8.447136	-13.26422	.0001985	-12.98242
Guinea-Bissau	.5746185	-7.196391	-7.771009	.0055724	-7.329024
Hungary	2.056927	.3849192	-1.672008	.0060695	-1.7259
Lesotho	3.466724	-1.017836	-4.48456	.0003095	-4.589328
Madagascar	1.802834	-7.003547	-8.806381	.0037422	-8.625824
New Zealand	1.689675	.9667538	-.7229209	.0036531	-.7357342
Palau	-4.315157	.1457586	4.460916	.0085828	4.57038
Singapore	3.36598	-2.638801	-6.004781	9.19e-06	-5.964957
Spain	1.010484	.7900807	-.2204028	6.00e-06	-.2099892
St. Lucia	2.247323	-1.759963	-4.007286	.0038276	-3.933982
United States	10.97013	-11.12855	-22.09869	.0031836	-22.10115

Note.- The test measures the significance of the regression parameters and t- test statistic for the null hypothesis $H_0 : \beta_3 = 0$ indicating that a positive parameter is consistent with the fact that pro-cyclicality is dominated by behaviour during good times.

The table tabulates the countries with parameter estimates satisfying this condition for the period under analysis and the P-values with a level of significance of at least 1 per cent, and the sum of parameters in the last column, significantly different from zero. The $\beta_1 + \beta_3$ column shows the cyclicality coefficient in good times, whereas the first column, β_1 shows the cyclicality coefficient in bad times.[1] In consequence, the test indicates that this group of developing, emerging and advanced economies exhibit pro-cyclical fiscal behaviour during good times. De-

[1] Developing countries with significant parameters for pro-cyclicality in good times are Central African Republic, Dominican Republic, Palau and one eastern European economy, Hungary.

veloping countries, El Salvador, Guinea, Guinea-Bissau, Lesotho, Madagascar, and St. Lucia switched their fiscal policy behaviour from counter-cyclical during good times to pro-cyclical during bad times; this is explained due to financial constraints. Remarkably, even more advanced economies like Barbados, Brunei Darussalam, Singapore and the United States were counter-cyclical during good times switched to pro-cyclicality during bad times.

4.4.3.1 Sensitivity analysis

As part of checking robustness, regressions relying on the alternate definition of the *indicator* variable D_{Gi} for *i=2* are computed for equation 4.9 . Following a similar criterion, a t-test rejecting the null hypothesis $H_0 : \beta_3 = 0$ indicates a pro-cyclical fiscal behaviour during good times, if the parameter is positive and significant with a level of significance of 1 per cent. The $\beta_1 + \beta_3$ column shows the cyclicality coefficient in good times, whereas the first column β_1, shows the cyclicality coefficient in bad times. The estimates show that developing countries: Ecuador and El Salvador switched to counter-cyclical fiscal policy during good times ($D_G = 1$) from a pro-cyclical fiscal policy during bad times ($D_G = 0$). Likewise, Trinidad and Tobago is one of the emerging economies switching to a counter-cyclical fiscal policy during good times from a pro-cyclical fiscal policy during bad times. Advanced economies such as Belgium, France, Luxembourg and Switzerland switched from a pro-cyclical fiscal policy during good times to a counter-cyclical fiscal policy in bad times.

Robustness: Fiscal behaviour during economic booms or good times.

Country	β_1	$\beta_1 + \beta_3$	β_3	P-value	$\beta_2 + \beta_3$
Belgium	-1.03084	.8428342	1.873674	.0094179	1.836304
Ecuador	19.93701	-2.085491	-22.0225	3.87e-07	-22.22822
El Salvador	11.38566	-.7812233	-12.16688	2.70e-06	-12.09887
France	-3.000436	.9773264	3.977762	1.94e-10	3.971073
Luxembourg	-1.102343	.9871439	2.089487	.0022981	2.145552
Switzerland	-5.702611	2.054183	7.756794	9.93e-11	7.672119
Trinidad and Tobago	35.83243	-5.427608	-41.26004	3.24e-21	-41.38031

Note.- The test measures the significance of the regression parameters and Wald statistic testing the null hypothesis $H_0 : \beta_3 = 0$ indicating that a positive parameter is consistent with the fact that pro-cyclicality is dominated by behaviour during good times.

In summary, the tests constructed and the robustness checks allows to verify that developing and emerging economies are able to 'graduate' from pro-cyclicality in fiscal policy, meaning that these countries are able to revert the path of increasing expenditures due to political factors in good times and overcome the limitation of lacking access to international financial markets during bad times. The determinants of access to international financial markets will be treated with detail in Chapter 5.

4.4.4 Alternative filtering: Baxter-King approach

Estimated coefficients for regime switching from economic booms to recessions is also performed employing Baxter-King filtered variables. The table shows that developing countries, Cameroon, Ethiopia and Paraguay switched fiscal policy regime from counter-cyclical in bad times to pro-cyclical in good times. Likewise, Barbados switched from pro-cyclical in bad times to counter-cyclical during good times.

Baxter-King filtered variables: Fiscal behaviour during economic booms or good times.

Country	β_1	$\beta_1 + \beta_3$	β_3	P-value	$\beta_2 + \beta_3$
Barbados	5.75455	-20.09775	-25.8523	.0025324	-25.50463
Cameroon	-.9692447	1.852345	2.82159	.0061787	2.81656
Canada	.5190286	4.461267	3.942239	.0067912	3.886222
Cape Verde	1.94286	.1616452	-1.781215	.0045095	-1.831679
Ethiopia	-7.502461	1.648296	9.150757	.0003151	9.448047
Mali	2.704289	-7.082595	-9.786883	.0001139	-9.611578
Paraguay	-.2891253	1.126131	1.415256	.0015	1.474357
Tanzania	1.104497	4.409384	3.304887	.00285	3.149529

Note.- The test measures the significance of the regression parameters and Wald statistic testing the null hypothesis $H_0 : \beta_3 = 0$ indicating that a positive parameter is consistent with the fact that pro-cyclicality is dominated by behaviour during good times.

4.4.5 Evidence of government's fiscal policy changes over time: breaks in slope coefficients

A feasible approach to the changes of pro-cyclicality in fiscal policy considers dividing the sample period in two intervals and subsequently estimating correlations or cyclicality parameters following the vein of Frankel et al. (2012). In contrast, Golinelli and Momigliano (2009) exploit a 15-year window rolling regressions spanning over the 1978-2008 period in their assessment. The disadvantages of the first approach are related to the impossibility of addressing the existence of multiple structural breaks in the country estimates, while a loss of degrees of freedom is involved in the second. The advantages are associated with the simplicity and the possibility of avoiding omitted variables issues.

For this purpose, the chosen method is to rely on indicator variables and their interaction effects. In order to garner evidence around the fiscal policy changes over time, the time-series regressions rely on the annual sample and introduce *indicator* variables which are estimated using the following specification:

$$F_t = \alpha + \beta_1 OG_t + \beta_2 D_{1985} + \beta_3 (D_{1985} \times OG_t) + \varepsilon_t \tag{4.10}$$

where F_t is the cyclical component of the fiscal variable, or real government expenditures in year t; OG_t is the output gap in year t, D_{1985} is the *indicator* variable which takes the value of 1 after t=1985, with the parameter β_3 allowing for interaction effects with the variable output gap.

This specific date is chosen for two reasons: i) following the debt crises at the beginning of the decade and an oil shock that stirred up the fiscal accounts in several developing and emerging economies and the financial crises at the beginning of the century, and ii) to present robustness to Alesina et al. (2008) and Frankel et al. (2012) results. Rejecting the null hypothesis $H_0 : \beta_3 = 0$ indicates that the particular country graduated (or, returned to school) from pro-cyclicality in the year of analysis. Under the assumption of a break in slope coefficients, the test defined in Chow (1960) is performed for testing structural changes in the specification.[1] More specifically, two tests for structural breaks are performed in years 1985 and 2000. [2]

On the other hand, the year when the *indicator* variable is defined to take a value of 1 can be shifted to t=1999 this allows for direct comparison against estimates by Frankel et al. (2011). Consequently, the significance of the regression parameters and F-test of the null hypothesis $H_0 : \beta_2 = \beta_3 = 0$ in expression 4.10 , indicates the structural change of the variable output gap on the fiscal variable (full switch,

[1] The Chow test is performed under the assumption of homoskedasticity, or the constant variance of errors, ε_t.

[2] The F-test takes the functional form: $f = \frac{\sum \hat{u}^2_{60:10} - (\sum \hat{u}^2_{60:85} + \sum \hat{u}^2_{85:10})/K}{(\sum \hat{u}^2_{60:85} + \sum \hat{u}^2_{85:10})/(N-2K)}$ where $\hat{u}^2_{t1:t2}$ is the error sum of squares for the specification ranging from dates t1 and t2, N the total number of observations and K the number of regressors in the restricted models.

Dy=0 to Dy=1).

4.4.6 Graduation from 'pro-cyclicality'

Therefore, the procedure consists in re-estimating the coefficients for those countries exhibiting breaks in the slope coefficient with a Feasible Generalised Least Squares (FGLS) procedure. The re-estimated country coefficients with breaks in 1985 and 1999 are shown below in figures 4.1 and 4.2 from data portrayed in Table 4.3.

The coefficients for each country are calculated for two separate time periods, in the first case, 1960 to 1984, and 1985 to 2010, and in the second case 1960 to 1999, and 2000 to 2010. These results are plotted in Figure 1, where all the country coefficients are displayed in four quadrants and by level of country development. The four quadrants correspond to 'Established Graduates' (EG), 'Back to School' (BS), 'Still in School' (SS) and 'Recent Graduates' (RG). The horizontal axis corresponds to the sub-period 1960-1984 or 1960-1999 and the vertical axis corresponds to the sub-period 1985-2010 or 2000-2010. Positive coefficients mean 'pro-cyclicality' whereas negative mean a counter-cyclical fiscal policy.

Data show that developing and emerging economies 'graduated' from pro-cyclicality in 2000, almost two decades after the debt crises. Developing countries remained inherently pro-cyclical during the period 1960-1985. It is noteworthy that high-income non-OECD countries, such as commodity exporting countries became counter-cyclical in the last decade.

Table 4.3: Country coefficients are displayed for the sub-period 1960-1984 and 1985-2010 and correspond to 'Established Graduates' (EG), 'Back to School'(BS), 'Still in School' (SS) and 'Recent Graduates' (RG)

Country	Code	1960-1984	1985-2010	Graduation	Country	Code	1960-1984	1985-2010	Graduation
Afghanistan	AFG	-0.781266	-0.7642338	EG	Korea, Rep.	KOR	0.2309025	1.358932	SS
Albania	ALB	1.547917	2.036396	SS	Lao PDR	LAO	1.210097	0.2350555	SS
Algeria	DZA	0.3328966	0.726453	SS	Lebanon	LBN	1.602394	-1.443839	RG
Antigua and Barbuda	ATG	1.008487	1.168198	SS	Lesotho	LSO	-3.350751	0.8142517	BS
Australia	AUS	-0.042836	1.114049	BS	Liberia	LBR	-1.755187	0.9711295	BS
Austria	AUT	1.215782	1.342012	SS	Luxembourg	LUX	1.029571	0.8728796	SS
Bahamas, The	BHS	0.51177	-1.066108	RG	Madagascar	MDG	-3.317114	0.9748814	BS
Bahrain	BHR	-0.0995392	-0.0384603	EG	Malawi	MWI	0.1207527	1.085706	SS
Bangladesh	BGD	0.6783651	0.5832668	SS	Malaysia	MYS	0.5149093	1.57192	SS
Barbados	BRB	0.6491483	-0.6910974	RG	Maldives	MDV	1.011853	1.449635	SS
Belgium	BEL	0.3841096	1.302645	SS	Mali	MLI	5.540913	0.8947189	SS
Belize	BLZ	0.5910318	-0.184933	RG	Malta	MLT	0.9009424	1.19965	SS
Benin	BEN	0.3041676	-3.57655	RG	Marshall Islands	MHL	-0.9199073	0.7739896	BS
Bhutan	BTN	0.897221	0.9197006	SS	Mauritania	MRT	0.7939249	2.125225	SS
Botswana	BWA	0.6955304	0.7447439	SS	Mauritius	MUS	-2.286147	1.173947	BS
Brunei Darussalam	BRN	0.9349759	0.0791761	SS	Mexico	MEX	1.24742	1.047645	SS
Burkina Faso	BFA	0.6766722	1.099946	SS	Micronesia, Fed. Sts.	FSM	1.17304	0.8769624	SS
Burundi	BDI	-0.2343431	1.021826	BS	Morocco	MAR	0.6635821	0.776865	SS
Cameroon	CMR	-0.9874585	0.9197105	BS	Mozambique	MOZ	1.552817	1.201869	SS
Canada	CAN	1.298733	0.718422	SS	Namibia	NAM	0.4748887	0.0491323	SS
Cape Verde	CPV	0.6546945	1.50039	SS	Nepal	NPL	0.2052076	1.617081	SS
Central African Rep.	CAF	0.4991934	-5.584938	RG	Netherlands	NLD	0.5856296	1.150237	SS
Chad	TCD	1.075616	0.9689062	SS	New Zealand	NZL	0.9838401	1.346189	SS
Chile	CHL	1.216864	1.337412	SS	Niger	NER	1.191724	0.9493226	SS
China	CHN	0.9726388	0.2771733	SS	Nigeria	NGA	3.448471	-0.9330213	RG
Colombia	COL	-2.077006	1.002067	BS	Norway	NOR	1.122881	1.101152	SS
Comoros	COM	2.807953	1.458947	SS	Oman	OMN	0.3173436	0.666609	SS
Congo, Rep.	COG	0.9162886	1.455846	SS	Pakistan	PAK	0.8361582	5.537416	SS
Costa Rica	CRI	0.6381695	2.273542	SS	Palau	PLW	3.398409	1.29913	SS
Cote d'Ivoire	CIV	0.7679709	0.9264396	SS	Panama	PAN	0.7149633	0.2460942	SS
Cuba	CUB	1.06927	1.255067	SS	Papua New Guinea	PNG	1.053741	1.151547	SS
Cyprus	CYP	0.4619018	-0.8016881	RG	Paraguay	PRY	0.9300769	-0.7710932	RG
Denmark	DNK	1.427262	1.228787	SS	Philippines	PHL	0.9286407	0.4846987	SS
Djibouti	DJI	1.202616	0.2618836	SS	Poland	POL	0.846554	-0.0752666	RG
Dominica	DMA	0.5613051	0.571672	SS	Portugal	PRT	-3.920224	2.55683	BS
Dominican Republic	DOM	0.8942214	0.6938927	SS	Romania	ROU	2.062236	1.145396	SS
Ecuador	ECU	2.075105	0.7321065	SS	Rwanda	RWA	0.9761016	1.187747	SS
Egypt, Arab Rep.	EGY	0.4409356	1.074959	SS	Samoa	WSM	0.9995341	1.150554	SS
El Salvador	SLV	1.687615	-1.088504	RG	Sao Tome and Principe	STP	-0.0317392	20.88754	BS
Equatorial Guinea	GNQ	-0.1969549	-0.2384441	EG	Senegal	SEN	-4.828859	0.8607261	BS
Ethiopia	ETH	2.061497	3.974447	SS	Seychelles	SYC	4.43846	1.779876	SS
Fiji	FJI	2.122863	0.8778232	SS	Sierra Leone	SLE	1.008516	1.258132	SS
Finland	FIN	1.274549	0.7932376	SS	Singapore	SGP	0.338034	2.823204	SS
France	FRA	0.7718319	1.070336	SS	Solomon Islands	SLB	0.722814	1.219519	SS
Gabon	GAB	0.650033	0.1587812	SS	Somalia	SOM	1.245899	0.8781468	SS
Gambia, The	GMB	0.9288114	0.5295905	SS	South Africa	ZAF	-1.45583	1.099496	BS
Germany	DEU	1.045406	1.438535	SS	Spain	ESP	0.9278933	1.168836	SS
Ghana	GHA	0.0947835	1.791762	SS	Sri Lanka	LKA	0.153786	0.8084992	SS
Greece	GRC	0.0873096	1.282506	SS	St. Kitts and Nevis	KNA	0.1928996	6.555646	SS
Grenada	GRD	0.2972301	5.981888	SS	St. Lucia	LCA	2.600135	0.8333463	SS
Guatemala	GTM	1.132554	1.57156	SS	St. Vincent and TG	VCT	1.101703	3.342148	SS
Guinea	GIN	2.072086	-0.0844435	RG	Suriname	SUR	1.158946	2.354956	SS
Guinea-Bissau	GNB	-0.2110541	2.527049	BS	Swaziland	SWZ	1.114186	0.8038839	SS
Guyana	GUY	0.6989483	-0.5702832	RG	Sweden	SWE	1.189429	1.201506	SS
Haiti	HTI	0.090027	2.912368	SS	Switzerland	CHE	2.664956	1.173861	SS
Honduras	HND	-1.145622	-0.4376082	EG	Syrian Arab Republic	SYR	0.1435872	0.7119228	SS
Hungary	HUN	1.020846	0.7702356	SS	Tanzania	TZA	1.646464	1.134228	SS
Iceland	ISL	2.04197	2.998107	SS	Thailand	THA	0.1945586	-0.5768591	RG
India	IND	0.9055069	2.394355	SS	Togo	TGO	-0.4696593	0.2013603	BS
Indonesia	IDN	0.7514793	1.054703	SS	Tonga	TON	1.003526	1.037685	SS
Iran, Islamic Rep.	IRN	0.9620664	-0.0680127	RG	Trinidad and Tobago	TTO	3.036145	1.566371	SS
Ireland	IRL	1.4191	1.271441	SS	Tunisia	TUN	1.245933	2.269153	SS
Italy	ITA	0.4870763	0.8936435	SS	United Kingdom	GBR	1.2722	1.170527	SS
Jamaica	JAM	0.8625502	0.509019	SS	United States	USA	7.612312	-2.883214	RG
Japan	JPN	1.053434	0.7879798	SS	Uruguay	URY	1.497907	0.8793957	SS
Jordan	JOR	-0.3473448	1.104444	BS	Vanuatu	VUT	0.9074033	0.200337	SS
Kenya	KEN	0.0501429	1.699362	SS	Venezuela, RB	VEN	2.287682	0.9059758	SS
Kiribati	KIR	0.0539982	0.4390817	SS	Zimbabwe	ZWE	0.9355139	-6.772958	RG

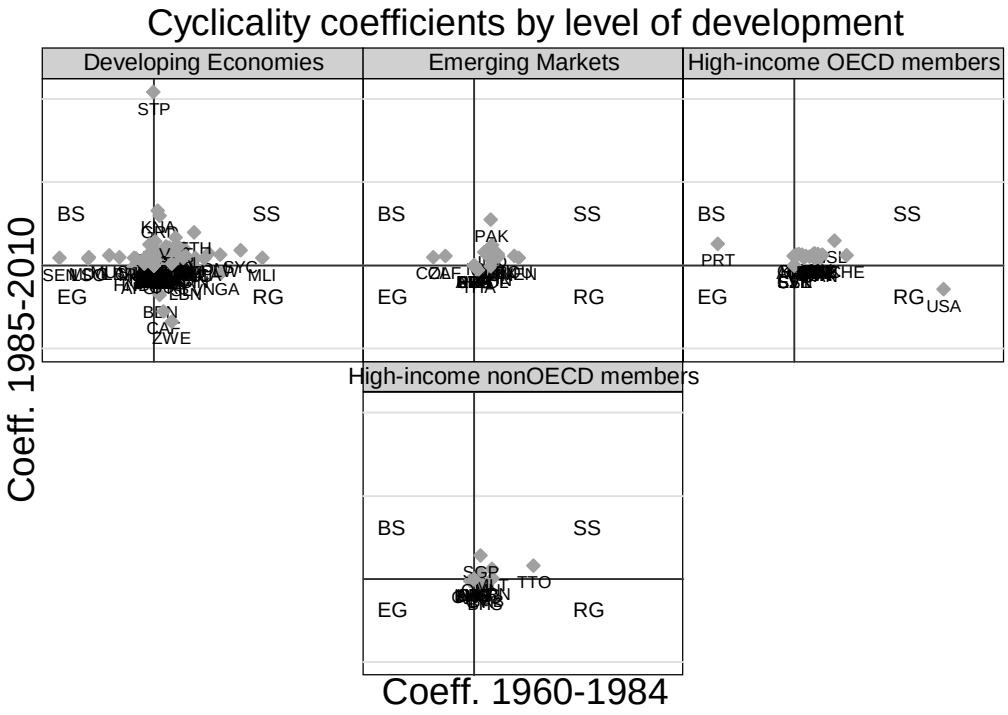

Figure 4.1: Evidence: graduation from pro-cyclicality 1960-1984, 1985-2010. The four quadrants correspond to 'Established Graduates' (EG), 'Back to School' (BS), 'Still in School' (SS) and 'Recent Graduates' (RG).

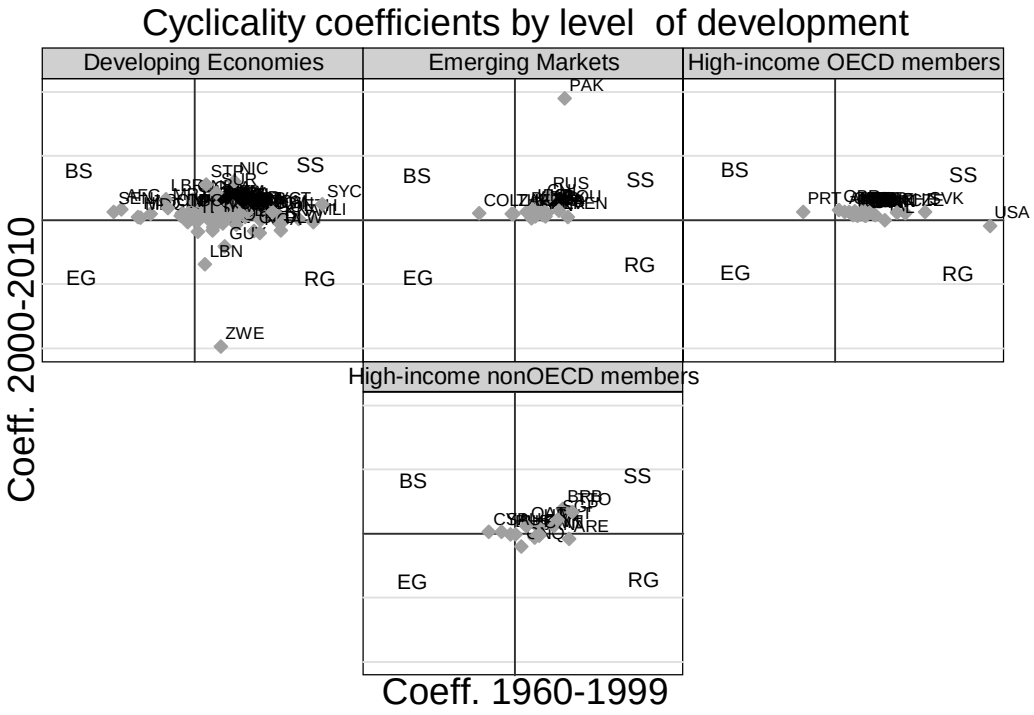

Figure 4.2: Evidence: graduation from pro-cyclicality 1960-1999, 2000-2010. The four quadrants correspond to 'Established Graduates' (EG), 'Back to School' (BS), 'Still in School' (SS) and 'Recent Graduates' (RG).

4.4.7 Indication of multiple breaks in the estimated model

A second approach analysed consists in including several potential breaks in the slope coefficient estimated in time-series equations, defining successive *indicator* variables taking the value of *one* at the beginning of every decade or every five years.[1] The estimated equation, omitting the intercept indicator variable and using centred indicators, has the following specification:

$$F_t = \alpha + \beta_1 OG_t + \beta_2(D_1 \times OG_t) + \beta_3(D_2 \times OG_t) + \beta_4(D_3 \times OG_t) + \varepsilon_t \quad (4.11)$$

where βi (i=2,..4) are the estimated coefficients for the interaction effects. Rejecting the null hypothesis $H_0 : \beta_2 = \beta_3 = \beta_4$ in expression 4.11, indicates whether the response of the fiscal variable to the output gap is not constant along the decades or five-year periods under analysis. In addition, the F test on the null hypothesis $H_0 : \beta_2 = \beta_3 = \beta_4 = 0$, implies that the slope coefficients are jointly zero.[2] The multiple indicator approach makes better use of the available degrees of freedom than estimating rolling regressions and defines multiple breaks. [3]

Table 4.4 shows the statistically significant cyclicality coefficients of countries

[1] The *indicator* variable D1 in the sample 1960-2010, takes the value of 1 for the decade periods starting in 1971, D2 for the periods starting in 1981, D3 starting in 1991, and D4 starting in 2001. Similarly, a second approach relies on the *indicator* variables D1-D8, taking the value of one for the five-year periods starting in 1966 and so on.

[2] As in the case for Wald tests, an F test implies defining $\mathbf{R} = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$ and $\mathbf{r} = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}$ in the 3×4 matrix defined above.

[3] Following a similar criteria, the specification with centred indicators estimated is: $F_t = \alpha + \beta_1 OG_t + \beta_2(D_1 \times OG_t) + \beta_3(D_2 \times OG_t) + \beta_4(D_3 \times OG_t) + \beta_5(D_4 \times OG_t)$ and $+\beta_6(D_5 \times OG_t) + \beta_7(D_6 \times OG_t) + \beta_8(D_7 \times OG_t) + \beta_9(D_8 \times OG_t) + \varepsilon_t$ the null hypothesis tested is: $H_0 : \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = \beta_8 = \beta_9 = 0$

Table 4.4: Year of switch: indication of multiple break points every decade and 5-year periods

Country	Year of switch (5-year)	Year of switch (Decade)
Afghanistan	2000	
Albania	2000	
Argentina	2000	1990
Azerbaijan		1990
China	1980, 1995	
Congo, Rep.	1995, 2000	
Cuba	2005	
Cyprus	1990, 2005	
Djibouti		1980
Eritrea	2005	2000
Fiji	1975, 1985	
Liberia	2000	
Mauritania		1980
Mauritius		2000
Palau	2000	
Russian Federation	2000	1990
Solomon Islands	2005	
Swaziland		1980, 1990
Tanzania		1980, 2000
Ukraine	2000	1990
United Arab Emirates	1995	
Uruguay	1975, 1990	
Venezuela, RB		1980

Note.- Year of switch is estimated based on cyclicality coefficients (statistically significant at 10%) in every decade and 5-year periods and F-test statistics.

with multiple break points every 5-year periods based on the F-test statistic and a significant cyclicality coefficient , for the full sample (1960-2010). In this case, a country switches fiscal policy in 2005 is equivalent to saying that the sum of coefficients in 2005 is equivalent to saying that the sum of coefficients $\beta_1 + \beta_2 + \beta_3 + \beta_4 + \beta_5 + \beta_6 + \beta_7 + \beta_8 + \beta_9 + \beta_{10}$, is jointly statistically different to zero, negative and the β_1 coefficient is positive and statistically different to zero.

4.5 Concluding remarks

There are no significant differences when cyclicality coefficients are calculated using Hodrick-Prescott filtering instead of Baxter-King and first-differenced variables. The main objective of the chapter is to build up on a constrained model, a pooled mean group estimator model and then explore a time series approach. The first stage involved analysing the causality of the model and the existence of autocorrelation and heteroskedasticity in the errors. For most countries, the output gap causes changes in the fiscal variable and not the converse.

With the estimated coefficients in hand, the analysis moved on to introduce structural breaks and testing regime switches of fiscal policy in 1985 and 1999 individually for each country.The next step consisted in verifying the existence of multiple structural breaks and ascertain the fact that 'graduation' from pro-cyclicality is feasible in several years, contrasting with the established literature. Consistently, evidence has shown that developing and emerging countries exhibit multiple structural breaks in five-year and in decade periods that were individually tested individually.

The validity of a time-varying framework has been tested and statistically significant parameters allowed to reject the null hypothesis that coefficients are stable in the period under study. The main conclusion of the chapter is that developing countries and emerging economies were able to overcome the fiscal pro-cyclicality bias and become counter-cyclical in recent years.

Chapter 5

The determinants of fiscal policy cyclicality and access to markets.

This chapter is devoted to analysing cross-country variations in the estimated cyclicality coefficients that were obtained from the country-by-country time series analysis in chapter 4. The data employed for this purpose is qualitative and follows similar approaches in the established literature. The analysis is based on the cyclicality coefficients for 166 countries and for the entire period of the sample 1960-2010. In consequence, it omits the time-variation of the cyclicality coefficients because of the reduced sample (due to statistical significance of the coefficients) and relies on time-averaged indicator variables.

The analysis focuses on political and institutional indicators, including variables measuring development and levels of economic freedom. A section draws on the effects of political fragmentation measuring the voracity effect on fiscal policies (Tornell and Lane (1999)) and includes a sensitivity analysis to verify these estimates. It also includes a specification testing the constraints faced by developing and emerging economies to access the international financial market.

The determinants of access to international financial market are treated based on the evidence in the literature suggesting that capital inflows cycles affect fiscal policy, especially in developing and emerging economies (Kaminsky et al. (2005)). In consequence, the analysis draws on identifying the determinants that explain developing and emerging economies ability to tap into foreign capital markets.

Finally, the chapter contributes to the literature by introducing the estimation of an ordered Probit specification. The model is explained and the motivation is presented with the explanation of the estimation procedure and the definition of the dependent variable and the explanatory indicator variables. For robustness, estimation methods such as ordinary least squared are used to support the empirical results.

5.1 Theoretical arguments for analysis.

The arguments for the analysis are based on the fact that a decrease in procyclicality (by a reduced coefficient) is dependent on the variation of the explanatory variables ($\Delta\beta_i = \lambda\Delta X_i$). Hence, a negative λ implies that positive changes in the explanatory variables, for instance, an improved control of corruption (proxying for improved institutions) *ceteris paribus*, impacts negatively on the fiscal behaviour resulting in a more counter-cyclical fiscal policy.

5.1.1 Cross-sectional specification

Following Alesina et al. (2008), Cespedes and Velasco (2011), and Lledó et al. (2009), the specification to be tested by is:

$$\beta_i = \delta + \phi \cdot CC_i + \lambda X_i + \xi X_i \cdot CC_i + \varepsilon_i \tag{5.1}$$

where the dependent variable β_i is the country-specific cyclicality coefficient calculated in the time series approach specified by the expression $F_t = \alpha + \beta OG_t + \varepsilon_t$, for each country i, CC_i is the country's i control of corruption, X_i is a vector of time-averaged control variables containing the explanatory variables, $X_i \cdot CC_i$ is its interaction effect and ε_i are the errors. [1]

Including the political fragmentation indicator to the specification, following Volkerink and Haan (2001) and Perotti and Kontopoulos (2002) transforms the expression to:

$$\beta_i = \delta + \phi\, CC_i + \varphi\, pfrag_i + \lambda\, X_i + \xi\, X_i \cdot CC_i + \varepsilon_i$$

(5.2)

where $pfrag_i$ is the political fragmentation variable, and the rest of the variables are defined above in equation 5.1. Alternatively, the variable indicator of polarisation (*frac*) from the Database for Political Institutions (Keefer (2012)) and the political competition (*polcomp*) index of the Polity IV project (Marshall et al. (2012)) are used as substitute variables to political fragmentation.

[1] Note that the interaction terms are also time-averaged and different to zero in all cases. The total effect of a change on the control variable can be interpreted as a partial effect, holding all other variables constant, i.e. $\frac{\Delta \beta_i}{\Delta X_i} = \lambda + \xi \cdot CC_i$.

5.1.2 Cyclicality determinants.

This part sets out the empirical models that test the determinants of the cyclicality of fiscal policy. The first step consists of investigating the existence of multi-collinearity in the explanatory variables. The model is estimated based on the categorical variable using an ordered Probit approach. This approach takes into account the ordering of the dependent variable (pro-, a-, or counter-cyclicality) as other estimation methods are not appropriate for this setting. The dependent variable is the country cyclicality coefficient and the categorical variable is recorded on a five-category scale having four thresholds over the latent variable.

The categorical variable "a" is defined as:

Category	Definition	Explanation
1	"Strongly significant counter-cyclical."	Negative β coefficient with a significance level of 1%.
2	"Weakly significant counter-cyclical."	Negative β coefficient with a significance level of 5%.
3	"A-cyclical"	Zero β coefficient or statistically insignificant result.
4	"Weakly significant pro-cyclical."	Positive β coefficient with a significance level of 5%.
5	"Strongly significant pro-cyclical."	Positive β coefficient with a significance level of 1%.

Table 5.1: Definition of categorical variable "a" according to the country's cyclical fiscal behaviour.

Advantages of using the estimated coefficients as dependent variable

The advantages of using estimated coefficients as dependent variable are based on the significant variance of cyclicality coefficients across advanced, developing and emerging economies. Hence, the variable makes the estimation of equation 5.1 and 5.2 not only feasible but it also allows to identify the determinants of pro-, a- or counter-cyclical fiscal policies in a cross-sectional setting. In addition, there is the possibility of employing alternative estimation methods on the uncategorised cyclicality coefficients for sensitivity analysis.

5.2 Explanatory variables.

The index of institutional quality is an explanatory variable used by Cespedes and Velasco (2011). It is divided in five different categories: quality of governance, the legal structure, security and property rights, access to sound money, exchange with foreigners and regulation of capital, labour and business. Another variable included in the regressions measures the exchange rate flexibility.

In a similar way to Alesina et al. (2008), the analysis relies on the initial cyclicality coefficients estimated in Chapter 4 as dependent variable, control of corruption, the democracy variable, and control of corruption interaction terms with the governance indicators (Kaufmann et al. (2009)) and development and economic freedom (Heritage Foundation (2012)) as explanatory variables.

Variables used to analyse the determinants of access to financial markets, following Lledó et al. (2009), are those related to finance restrictions: domestic, external and variables indicating the debt sustainability and macroeconomic stability. The variables comprise the subsequent indicators: credit-to-private sector as share of GDP, debt to GDP ratios, in addition to the inflation rate and an indicator of the real interest rates.

Governance indicators

Following Alesina et al. (2008), an initial appraisal of the nature of the correlation between the categorical variable and the quality of governance employing the World Bank Governance Indicators (Kaufmann et al. (2009)) is required.[1] Similarly, other studies relied on a similar cohort of institutional quality variables explaining their role on capital flows (Darby et al. (2010), Kawai and Lamberte (2010)) The set comprises variables such as the control of corruption (CC) (a qualitative variable that measures the level of perceptions of corruption, which is defined as the exercise of public power for private gain) and government effectiveness (GE). The latter combines into a single grouping the response on the quality service provision, quality of bureaucracy, and competence of civil servants. It also accounts for the independence of civil service from political pressures and the credibility of the government's commitment to policies (for the period 1996 -2009).

[1] For a comprehensive definition of the explanatory variables and the cross-correlations, see the appendix.

A qualitative variable political stability (PS) (which combines several indicators aiming to measure the perceptions of the likelihood that the ruling government could be destabilised or overthrown by unconstitutional and violent means, like domestic violence and terrorism) is also included. Another relevant qualitative variable is rule of law (RL), which includes several indicators measuring the extent to which agents have confidence in and abide by the rules of society, including perceptions of crime, effectiveness of the judiciary, and enforceability of contracts. Finally, the regulatory quality (RQ) qualitative variable includes measures of the incidence of market-unfriendly policies such as price controls or inadequate bank supervision, and perceptions of burdens imposed by excessive regulation in foreign trade and business development.

The variables are time-averaged for the sample of 166 countries, similarly to Alesina et al. (2008). Cross-correlation is reported in the appendix, with variables chosen in order to minimise the possibility of collinearity. Another drawback of this data is that the time span covers fewer years than the researched sample. Furthermore, variance of governance variables in yearly-averaged data is minimal. For example, the variable control of corruption shows a reduced time variance in country observations.

Political fragmentation

In order to analyse the voracity effect on fiscal policy across all countries, the variable political fragmentation is included in the specification. The variable initially suggested by Volkerink and Haan (2001) and Perotti and Kontopoulos (2002), is calculated as the relative number of seats from given political parties represented in the government as weighting factors, and the ideological complexion of the government, ranging from 1 (right-wing) to 5 (left-wing) from Jaap Woldendorp et al. (2011). The variable political fragmentation is calculated for 39 economies.[1]

[1] The data is available for Australia, Austria, Belgium, Bulgaria, Canada, Croatia, Cyprus,

The outlay contains information from the party government data set from 1960 until 2008 and accounts for political fragmentation, or the degree to which political parties in the ruling coalition are based on different ideologies. Thus, political fragmentation is included as an explanatory variable along with other political variables in the cross-country beta regressions. For sensitivity analysis, alternative indicators used are the polarisation variable from the Database of Political Institutions (DPI) (Keefer (2012)) and the variable political competition extracted from Polity IV (Marshall et al. (2012)). In the former, the variable measures the probability [0-1] that two deputies chosen randomly from the legislature will be of different parties. The latter variable measures the level of political competition, ranging from 1 to 10 (broader political competition dynamics). [1]

Development and economic freedom

The categorical variable is regressed as the latent variable, on the indices of economic and business freedom, from the Heritage Foundation, also used by Claessens et al. (2007), Acemoglu et al. (2000) and Mehl and Reynaud (2010). The approach follows Alesina et al. (2008). The set of variables include the freedom from corruption (FC) variable, which scores on a 0-100 scale (with 0 indicating very corrupt regimes, whereas 100 indicates a regime free of corruption), and the economic freedom index (EFI). Additionally, the variable index of freedom from government (FG) measures the government expenditures and the revenues generated by state-owned enterprises (SOEs), it ranges between 0-100 with 100 representing the maximum degree of freedom from government.

The index of monetary freedom (MF), which is based on the weighted average

Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, India, Ireland, Israel, Italy, Japan, Latvia, Lithuania, Luxembourg, Macedonia, Malta, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom. It is obtained from Jaap Woldendorp et al. (2011).

[1] The Database of Political Institutions (DPI) variable is available for 154 countries, while Polity IV project data exists for 141 countries in the dataset.

inflation rate for the most recent years, ranges between 0-100, with the highest score representing the maximum degree of monetary freedom, and is also included in the specification. The index of property rights (PR) scores the degree of law protection and respect to property rights, as well as the enforcement of these laws, independence of the judiciary and the ability to enforce contracts. The index also ranges between 0-100, with 100 representing the maximum degree of protection of property rights. Lastly, the qualitative indicator of trade freedom (TF) and freedom to trade internationally (FTI) measures the extent of the country's trade barriers (Heritage Foundation (2012)).

The next part covers the determinants of access to financial markets. The analysis is based on the evidence presented in the literature on the relationship between capital inflows and fiscal policy pro-cyclicality (Kaminsky et al. (2005)). The fiscal policy is positively correlated to the country's access to financial markets proxied by the capital inflows (measured by levels of foreign government debt) with the causal relationship running from the latter to the former. The analysis seeks econometric appraisal on the determinants of access to financial markets in developing and emerging economies taking into account this evidence.

Access to financial markets

In order to perform an empirical estimation of access to international finance, the specification employed follows Gelos et al. (2011) and Lensink and VanBergeijk (1991). The dataset used is the World Bank Global Development Finance (2012) (GDF) (The World Bank (2012)) survey on external debt of developing countries. The number of countries covered is 111.[1] A proxy measure of the access to capital markets is included, following the measure of credit booms proposed by Mendoza and Terrones (2008).

[1] The dataset comprises statistics on the amount of outstanding total external debt, including short-term debt, and long-term debt as well as the amount of debt service on external debt and aggregated data of public and publicly guaranteed debt with private creditors, commercial banks, bonds and other creditors on a country basis.

The variables chosen as part of this set are the following:[1]

- The size of the country, proxied by GDP per capita, Y_{it}/P_{it} .
- Income volatility, proxied by the GDP growth rate, Y_{it}^{*} .
- Inflation rate, INF_{it} .
- Gross domestic investment as share of GDP, I_{it}/Y_{it} .

Other indicators for credit worthiness used in a similar vein as Lensink and Van-Bergeijk (1991) are:

- Debt service on external debt (as share of exports of goods and services), DS_{it}/E_{it} .
- Debt-service to GDP, DS_{it}/Y_{it} .
- Control of corruption, CC.
- Democracy, DEM.
- Government effectiveness, GE.

[1] The data is sourced from Penn World Table, PWT 7.1 (Heston et al. (2012)).

5.3 Ordered Probit estimation

Motivation

The conventional econometric literature outlines the different approaches used to estimate qualitative responses. These models are constructed to be applied in data where conventional regression methods are not appropriate. In these specifications, the estimation method used is maximum likelihood, which assumes that the optimality properties for maximum likelihood estimation are met.

Models of multinomial-choice ordered variables applied in economics estimate bond ratings, opinion surveys, voting outcomes, or level of insurance coverage taken by consumers. In this case, the dependent ordered variable can be classified as pro-, a- or counter-cyclical (parameter positive, zero or negative.) There are several examples of ordered Probit modelling in the economic literature, although this approach is the only one as far as it is known that focuses on the cyclicality of fiscal policies. Other instance is Karlan and Zinman (2011) estimation of the impact evaluation using randomised credit scoring for the micro-credit sector in developing countries. Knack (2008) measures the tax policy and administration efficiency concerning the revenue mobilisation of sovereign rents in developing countries employing an ordered Probit model. Finally, Reinhart (2002) also estimates an ordered Probit model for measuring countries' access to international capital markets and the role of sovereign credit ratings.

5.3.1 Specification

In general, an ordered Probit model is given by:

$\mathbf{S} = \mathbf{x}'\beta + \varepsilon \rightarrow$ with $\mathbf{y}^*$ as the unobserved variable. The observed values for the dependent variable are:

$$
\begin{aligned}
S = 0 \quad & if \quad y^* \leq 0 \\
= 1 \quad & if \quad 0 < y^* \leq \mu_1 \\
= 2 \quad & if \quad \mu_1 < y^* \leq \mu_2 \\
\ldots & \\
= J \quad & if \quad \mu_{J-1} \leq y^*,
\end{aligned}
\tag{5.3}
$$

Where ***S*** is the dependent variable and ***x'*** is the vector of independent variables, β are the estimated parameters and μ_j are the thresholds. Linear regression methods would prove unsuccessful. For instance, estimating **S** with a linear regression, with the estimated probability between **S**=0 and **S**=1 is only possible if $\mathbf{x}'\beta$ exists for bounded values of **x** and if certain restrictions on β are satisfied, making the problem difficult to solve in practice. [1]

5.3.2 Categorical variable: testing other specifications.

This part sets out the empirical models used to test the determinants of cyclicality of fiscal policy. Thus, the measure for fiscal cyclicality follows the criteria delimited by Alesina et al. (2008), Catão and Sutton (2002) and Gavin and Perotti (1997). The model is estimated based on the categorical variable using and ordered Probit approach. Initially, the dependent variable is recorded on a five-category scale and will have four thresholds over the latent variable. An alternative specification recurs to a three-point dependent variable (pro-, a- and counter-cyclical fiscal policy) and two thresholds. Increasing the categorical variable implies a more pro-cyclical fiscal policy.

[1] Furthermore, the error terms could yield more outcomes following a non-normal distribution with resulting heteroskedasticity.

Category	Definition	Explanation
1	"Counter-cyclical"	Significant negative β coefficient.
2	"A-cyclical"	Zero β coefficient or statistically insignificant result.
3	"Pro-cyclical"	Significant positive β coefficient.

Table 5.2: Definition of categorical variable according to cyclicality. ("b").

5.3.3 The specification of the determinants of international markets access.

The model is based on a panel data specification. The access to international credit markets is analysed by regressing a set of factors indicating the ability of developing countries to tap into international financial markets with the binary variable frequency of access aggregated over two years as the dependent variable.

The panels are grouped according to their level of development, for both developing and emerging economies. In consequence, the specification estimated is:

$$d_{it} = \beta_0 \ln(Y_{it}/P_{it}) + \beta_1 Y_{it}{}^* + \beta_2 INF_{it} + \beta_3 \ln(I_{it}/Y_{it}) \quad (5.4)$$

$$+\beta_4 \ln(DS_{it}/E_{it}) + \beta_5 \ln(DS_{it}/Y_{it}) + \beta_6 CC_{it} + \beta_7 DEM_{it} + \beta_8 GE_{it}$$

$$+ \mu_i + \nu_{it}$$

The dependent variable access d_{it} takes the value of one when the external debt gap $\ln(\,real\,external\,debt) - \ln[\tau_t\,(real\,external\,debt)]$ is positive, where τ_t is the trend component of the Hodrick-Prescott filtered data, and zero otherwise. Hence, the econometric panel data model uses a Logit approach following the

methodology employed in the literature (Gelos et al. 2011). For purposes of robustness, the binary variable access takes the value of one when the real interest rate exceeds the value of its mean minus one standard deviation for the period under analysis, and zero otherwise.

First, assume that p_{it} is the probability that a country has access to the international financial market in year t. The expected value $E(d_{it}) = 1 \cdot p_{it} + 0 \cdot (1 - p_{it}) = p_{it}$ is modelled as a function of the explanatory variables,

$$p_{it} = \Pr(d_{it} = 1) = E(d_{it}/x_{it}) = F(x_{it}^{'}\beta) \tag{5.5}$$

for a linear probability model $F(x_{it}^{'}\beta) = x_{it}^{'}\beta$, panel data methods would not guarantee that $\hat{y}_{it}$ to lie in the unit interval. A possible solution is to rely on the logistic or normal cumulative distribution function that constrains $F(x_{it}^{'}\beta)$ to be between 0 and 1. [1] As a result,

$$\Pr\left[d_{it} = 1\right] = \Pr\left[d_{it}^{*} > 0\right] = \Pr\left[\nu_{it} > -x_{it}^{'}\beta - \mu_i\right] = F(x_{it}^{'}\beta + \mu_i) \tag{5.6}$$

The usual solution to this is to maximise the conditional likelihood function

$$L = \prod_{i=1}^{N} \Pr(d_{i1}, ...d_{iT} / \sum\nolimits_{t=1}^{T} d_{it}) \tag{5.7}$$

[1] Considering a standard fixed-effects panel data model, $y_{it}^{*} = x_{it}^{'}\beta + \mu_i + \nu_{it}$ where μ_i denotes the unobservable individual-specific effect and ν_{it} denotes the remainder disturbance.

which is the conditional Logit estimation of β. For instance, consider two cases. A country without access to the international financial market one year ($d_{i1} = 0$) and with access the next ($d_{i2} = 1$), $T = 2$.

$$L = \prod_{i=1}^{N} \Pr(d_{i1}) \Pr(d_{i2}) \tag{5.8}$$

where the sum $d_{i2} + d_{i2}$ can be 0,1 or 2, if it is zero, both d_i and d_{i2} are zero. Then the probability,

$$\Pr\left[d_{i1} = 0, d_{i2} = 0 / d_{i1} + d_{i2} = 0\right] = 1 \tag{5.9}$$

If the sum is 2, both d_{i1} and d_{i2} are 1. And the probability is transformed to,

$$\Pr\left[d_{i1} = 1, d_{i2} = 1 / d_{i1} + d_{i2} = 2\right] = 1 \tag{5.10}$$

but $log(1) = 0$. For relevance only the case $d_{i1} + d_{i2} = 1$ is assumed, the likelihood is given by $\Pr\left[d_{i1} = 0, d_{i2} = 1 / d_{i1} + d_{i2} = 1\right]$ and $\Pr\left[d_{i1} = 1, d_{i2} = 0 / d_{i1} + d_{i2} = 1\right]$ and can be calculated as $\Pr\left[d_{i1} = 1, d_{i2} = 0\right] / \Pr\left[d_{i1} + d_{i2} = 1\right]$ with $\Pr\left[d_{i1} + d_{i2} = 1\right] = \Pr\left[d_{i1} = 0, d_{i2} = 1\right] + \Pr\left[d_{i1} = 1, d_{i2} = 0\right]$, and the last two events are mutually exclusive.[1] From 5.6 it yields:

$$\Pr\left[d_{it} = 1\right] = \frac{e^{\mu_i + x_{it}^{'} \beta}}{1 + e^{\mu_i + x_{it}^{'} \beta}} \tag{5.11}$$

[1] Including $d_{i1} + d_{i2}$eliminates the μ_i.

Therefore, a solution to this problem is:

$$\Pr\left[d_{it}=1, d_{i2}=0/d_{i1}+d_{i2}=1\right]=\frac{e^{x_{i1}^{'}\beta}}{e^{x_{i1}^{'}\beta}+e^{x_{i2}^{'}\beta}}=\frac{1}{1+e^{(x_{i2}-x_{i1})'\beta}} \tag{5.12}$$

and

$$\Pr\left[d_{it}=0, d_{i2}=1/d_{i1}+d_{i2}=1\right]=\frac{e^{x_{i2}^{'}\beta}}{e^{x_{i1}^{'}\beta}+e^{x_{i2}^{'}\beta}}=\frac{e^{(x_{i2}-x_{i1})'\beta}}{1+e^{(x_{i2}-x_{i1})'\beta}} \tag{5.13}$$

The estimated results of this specification are discussed in section 5.4.3.

5.4 Empirical results

This section focuses on describing the results and the estimated parameters of the cross-sectional ordered Probit specification, the effects of political fragmentation on the cyclicality of fiscal policies and the estimation results on the determinants of access to international financial markets. Emphasis is put on comparing the estimates to those in the established literature. Lastly, the sensitivity analysis allows the verification of previous estimates and tests if the specifications used present evidence on the fact that governance indicators, development and economic freedom variables are determinants of fiscal policy cyclicality.

Estimated parameters

Tables 4 and 5.5 shows the ordered Probit estimated parameters of equation 5.1. Initially, the dependent variable is defined over the five categories described in 5.1.2. The estimated parameter for the explanatory variable government effectiveness (GE) interaction variable that measures the quality of policies and public goods is 0.201, implying in economic terms, that an standard deviation increase

in the variable, holding all other variables constant, increases the categorical variable (pro-cyclicality) by 0.1891 of standard deviation. Simultaneously, an increase equivalent to a standard deviation of the variable increases the predicted probability of pro-cyclicality by 0.0872 and decreases the predicted probability of a-cyclicality by 0.0965. The statistically significant parameter for political stability (PS) is 0.464 (and the interaction term is 0.438). The finding implies that a standard deviation increase in the index variable, holding all other variables constant, increases the categorical variable (pro-cyclicality) by 0.4263 of standard deviation (0.403 for the interaction term). Put in terms of predicted probability changes, this means that a standard deviation increase to the political stability index increases the probability of pro-cyclicality by 0.1475 (0.1389 for the interaction term) and reduces the probability of a-cyclicality by 0.1636 (0.154 for the interaction term).

The democracy (DEM) variable and its interaction term yield positive parameters, 0.0826 and 0.0233, respectively. Testing the same specification relying on the alternative specification with the cyclicality coefficients (b) as dependent variables yield statistically significant positive results, 0.0853 and 0.0883 for the interactions term. The estimates imply that a standard deviation increase in the democracy index increases the categorical variable by 0.0771 (0.0798 for the interaction term). The estimated changes of predicted probabilities finding suggests that a standard deviation increase in the democracy index, increases the probability of pro-cyclicality by 0.095 (0.2589 for the interactions effect) and reduces the probability of counter-cyclicality by 0.01 (0.03 for the interactions term). Democracy estimates are in line with estimates in Alesina et al. (2008).

Other results are obtained with the Heritage Foundation indicator variables. The variable fiscal freedom (GF) indicator, measured by the level of tax rates on individual and corporate income yields a negative parameter, -0.0212 and is highly significant, -0.0388 (and -0.0285 for the interaction term) in the alternative specification (b). The estimates imply that a standard deviation increase in the democ-

racy index decreases the categorical variable by 0.0315 (0.0231 for the interaction term). Changes in predicted probabilities imply that a standard deviation increase in the fiscal freedom index, decreases the probability of pro-cyclicality by 0.1622 (0.709 for the interaction terms) and increase the probability of counter-cyclicality by 0.013 (0.116 for the interaction terms).

Table 5.3: Ordered Probit: Real Government Expenditures Pro-cyclicality and qualitative indicators.(DV: Coeff. a)

	(1)	(2)	(3)	(4)	(5)
Variable	**b/se**	**b/se**	**b/se**	**b/se**	**b/se**
Control of Corruption	-0.00814	-0.287	-0.184	0.256	-0.0510
	(0.304)	(0.357)	(0.215)	(0.415)	(0.252)
Democracy	0.0826				
	(0.0459)				
Democracy × Control of Corruption	0.0233				
	(0.0386)				
Government Effectiveness		0.452			
		(0.344)			
Government Effectiveness × Control of Corruption		0.201*			
		(0.0961)			
Political Stability			0.464*		
			(0.220)		
Political Stability × Control of Corruption			0.438**		
			(0.148)		
Rule of Law				-0.0854	
				(0.393)	
Rule of Law × Control of Corruption				0.198	
				(0.108)	
Regulatory Quality					0.277
					(0.246)
Regulatory Quality × Control of Corruption					0.202
					(0.109)
N	141	166	166	166	166

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

When the variable economic freedom (EF) is analysed, the tested specification yields significant parameters. The parameter is negative, -0.039, suggesting that a standard deviation increase in the economic freedom index decreases the categorical variable standard deviation by a factor of 0.0361. The changes in predicted probabilities produce interesting outcomes. A standard deviation increase to the index of economic freedom decreases the predicted probability of pro-cyclicality by 0.171 and increases the predicted probability of counter-cyclicality by 0.0183.

The freedom of government (FG) variable, an index according to the revenue generated by State Owned Enterprises (SOE) and government expenditures as share of GDP yields significant and negative parameters, -0.01376 and -0.0116 for the interaction term. A standard deviation increase in the freedom of government (FG) variable, decreases the categorical standard deviation by 0.0122, and 0.0103 for the interaction term. The changes to the predicted probabilities imply that a standard deviation increase to the index variable, decreases the predicted probability of pro-cyclicality by 0.1056 (0.2802 for the interaction term). Conversely, the hike increases the predicted probability of counter-cyclicality by 0.0106 (0.0307 for the interaction term).

The property rights (PR) variable yields a negative parameter, -0.0191. A standard deviation increase to this index variable, decreases the categorical dependent variable standard deviation by 0.0176. The changes to the predicted probabilities suggest that an increase equivalent to a standard deviation to the variable, improves property rights protection, decreases the predicted probability of pro-cyclicality by 0.1617 and increases the probability of counter-cyclicality by 0.0185, remaining all other variables constant. Property rights estimates are comparable to the estimates in La Porta et al. (1998).

Table 5.4: Standardised coefficients and changes to predicted probabilities by a σ-increase to variable

a. Specification DV: coeff.a			
		Changes to predicted probabilities	
Variable	**Coefficient**	**A-cyclical**	**S. s. Pro-cyclical**
Fiscal Freedom	-0.0197	0.0910	-0.0833
Government Effectiveness × Control of Corruption	0.1891	-0.0965	0.0872
Political Stability	0.4263	-0.1636	0.1476
Political Stability × Control of Corruption	0.4030	-0.1541	0.1390

b. Specification DV: coeff.b			
		Changes to predicted probabilities	
Variable	**Coefficient**	**Counter-cyclical**	**Pro-cyclical**
Control of Corruption	1.32740	-0.07662	0.52031
Democracy	0.07710	-0.01015	0.09572
Democracy × Control of Corruption	0.07980	-0.02962	0.25886
Economic Freedom	-0.03610	0.01830	-0.17165
Fiscal Freedom	-0.03150	0.01267	-0.16219
Fiscal Freedom × Control of Corruption	-0.02310	0.11590	-0.70893
Freedom from Government	-0.01220	0.01060	-0.10556
Freedom from Government × Control of Corruption	-0.01030	0.03078	-0.28022
Property Rights	-0.01760	0.01851	-0.16175

The table represents the impact of a standard deviation increase of the indicator variable on the dependent variable standard deviation and the ordered Probit predicted probabilities.

Sensitivity analysis: estimating the model by OLS

For purpose of checking robustness, the expression (5.1) is estimated by ordinary least squares. Instead of using the ordinal variable defined in section 5.1.2 and 5.3.2, the dependent variables used in all the specifications are the cyclicality coefficients estimated in 4.3.4, including the robustness estimates for variable *Fb*. Hence, the dependent variable is positive indicating pro-cyclicality, and is negative indicating counter-cyclical fiscal policies. The estimated results are shown in Table 5.8.

The parameter freedom to trade internationally (FTI) which measures the level of tax rates on international trade, the velocity of import and export administrative tasks, the relative size of the trade sector, exchange rate regime and restrictions. The variable yields a significant positive parameter, 0.266. The estimate implies that an increase to the index by one point increases the dependent variable, or cyclicality coefficient, by 0.266, implying that countries with increased freedom to trade internationally also increase pro-cyclicality. However, the result is ambiguous and the estimated parameter in specification (b) is negative, -0.26, suggesting the converse. The interaction effects of the variable fiscal freedom (GF) with control of corruption yield a significant and negative parameter, -0.0142. The result presents evidence on the fact that fiscal freedom reduces pro-cyclicality.

Table 5.5: Ordered Probit: Real Government Expenditures Pro-cyclicality and qualitative indicators.(DV: Coeff. b)

	(1)	(2)	(3)	(4)	(5)
Variable	**b/se**	**b/se**	**b/se**	**b/se**	**b/se**
Control of Corruption	-0.468	0.120	0.196	0.327	0.279
	(0.293)	(0.326)	(0.191)	(0.380)	(0.232)
Democracy	0.0853*				
	(0.0427)				
Democracy × Control of Corruption	0.0883*				
	(0.0373)				
Government Effectiveness		0.138			
		(0.318)			
Government Effectiveness × Control of Corruption		0.124			
		(0.0929)			
Political Stability			0.116		
			(0.191)		
Political Stability × Control of Corruption			0.171		
			(0.132)		
Rule of Law				-0.0748	
				(0.359)	
Rule of Law × Control of Corruption				0.144	
				(0.104)	
Regulatory Quality					-0.000438
					(0.222)
Regulatory Quality × Control of Corruption					0.109
					(0.104)
Mrg. eff.	0.0186	-0.00482	-0.00775	-0.0130	-0.0112
S-E	0.0143	0.0133	0.00850	0.0161	0.0106

Standard errors in parentheses

Mrg. eff.: Marginal Effects of coefficient

S-E: standard error of the Mrg. eff.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

5.4.1 The effects of adding political fragmentation to the specification

Including a variable measuring for political fragmentation to the specification produces robust results. Initially, the variable political fragmentation obtained from Jaap Woldendorp et al. (2011) is used to estimate expression 5.2 of section 5.1.1 . The variable control of corruption (CC) is significant, and the parameters range from -2.92 to -0.852. The parameters suggest that an increase to the control of corruption index with improved controls resulting in reduced exercise of public power for private gain results in a less pro-cyclical fiscal policy therefore reducing the voracity effect. The estimates obtained are similar in sign and magnitude to the estimates in Alesina et al. (2008) and in line with the theory.

Other significant variables are the government effectiveness (GE) interaction terms, with a positive parameter, 0.825. Hence, an increase to the government effectiveness increases the cyclicality coefficient (a more pro-cyclical fiscal policy). The interaction term of political stability (PS) yields a positive parameter, 0.748, implying a positive effect on the cyclicality coefficient. Likewise, the interaction term of the variable that measures the rule of law (RL) corresponding to a strong legal system, has a positive parameter, 1.125, with a consequent positive effect on the cyclicality coefficient.

Table 5.6: Ordered Probit: Fiscal variable Pro-cyclicality and qualitative indicators (DV:Coeff. a)

Variable	(1) b/se	(2) b/se	(3) b/se	(4) b/se	(5) b/se	(6) b/se	(7) b/se	(8) b/se	(9) b/se	(10) b/se
Control of Corruption	0.210	0.0196	-0.0820	0.282	0.457	-0.196	0.541	0.286	-0.788	0.122
	(0.353)	(0.616)	(0.364)	(0.554)	(0.326)	(0.396)	(0.753)	(0.414)	(0.637)	(0.704)
Freedom from Corruption	-0.0119									
	(0.00942)									
Freedom from Corruption × Control of Corruption	0.00609									
	(0.00443)									
Economic Freedom		-0.0176								
		(0.0157)								
Economic Freedom × Control of Corruption		0.00688								
		(0.00856)								
Financial Freedom			0.00552							
			(0.00772)							
Financial Freedom × Control of Corruption			0.00543							
			(0.00558)							
Fiscal Freedom				-0.0212*						
				(0.0102)						
Fiscal Freedom × Control of Corruption				0.0000238						
				(0.00728)						
Freedom from Government					-0.00645					
					(0.00562)					
Freedom from Government × Control of Corruption					-0.00337					
					(0.00506)					
Investment Freedom						0.000982				
						(0.00859)				
Investment Freedom × Control of Corruption						0.00820				
						(0.00618)				
Monetary Freedom							-0.0159			
							(0.0121)			
Monetary Freedom × Control of Corruption							-0.00142			
							(0.00884)			
Property Rights								-0.0196		
								(0.0103)		
Property Rights × Control of Corruption								0.00622		
								(0.00498)		
Trade Freedom									0.0228	
									(0.0123)	
Trade Freedom × Control of Corruption									0.0135	
									(0.00873)	
Freedom to Trade Internationally										0.178
										(0.139)
Freedom to Trade Internationally × Control of Corruption										0.00680
										(0.0957)
N	142	142	142	142	142	142	142	142	142	113

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5.7: Ordered Probit: Fiscal variable Pro-cyclicality and qualitative indicators (DV:Coeff. b)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Control of Corruption	0.593	1.458*	0.331	2.528***	0.975**	-0.00246	0.895	0.595	0.287	0.552
	(0.342)	(0.624)	(0.357)	(0.645)	(0.344)	(0.393)	(0.734)	(0.403)	(0.549)	(0.649)
Freedom from Corruption	-0.0160									
	(0.00893)									
Freedom from Corruption × Control of Corruption	0.00209									
	(0.00431)									
Economic Freedom		-0.0396*								
		(0.0154)								
Economic Freedom × Control of Corruption		-0.0115								
		(0.00854)								
Financial Freedom			-0.000190							
			(0.00714)							
Financial Freedom × Control of Corruption			0.000396							
			(0.00544)							
Fiscal Freedom				-0.0388***						
				(0.0111)						
Fiscal Freedom × Control of Corruption				-0.0285***						
				(0.00817)						
Freedom from Government					-0.0138*					
					(0.00559)					
Freedom from Government × Control of Corruption					-0.0116*					
					(0.00526)					
Investment Freedom						0.00740				
						(0.00788)				
Investment Freedom × Control of Corruption						0.00475				
						(0.00612)				
Monetary Freedom							-0.00798			
							(0.0115)			
Monetary Freedom × Control of Corruption							-0.00625			
							(0.00865)			
Property Rights								-0.0191*		
								(0.00966)		
Property Rights × Control of Corruption								0.00213		
								(0.00488)		
Trade Freedom									-0.00473	
									(0.0104)	
Trade Freedom × Control of Corruption									0.00149	
									(0.00774)	
Freedom to Trade Internationally										-0.0457
										(0.127)
Freedom to Trade Internationally × Control of Corruption										-0.0195
										(0.0879)
Mrg. eff.	-0.0245	-0.0569	-0.0150	-0.0727	-0.0368	0.000109	-0.0399	-0.0251	-0.0130	-0.0289
S-E	0.0180	0.0365	0.0176	0.0423	0.0221	0.0174	0.0371	0.0206	0.0255	0.0359

Standard errors in parentheses
Mrg. eff.: Marginal effects of coefficients
S-E: standard error of the Mrg. eff..
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5.8: OLS: Fiscal variable Pro-cyclicality and qualitative indicators (DV: Coeff.a)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Variable	**b/se**	**b/se**	**b/se**	**b/se**	**b/se**	**b/se**	**b/se**	**b/se**	**b/se**	**b/se**
Control of Corruption	0.312	-0.0707	0.0294	0.0211	-0.0171	-0.165	0.344	0.311	-0.600	0.366
	(0.371)	(0.670)	(0.382)	(0.542)	(0.341)	(0.427)	(0.810)	(0.439)	(0.619)	(0.639)
Freedom from Corruption	-0.0190									
	(0.00982)									
Freedom from Corruption × Control of Corruption	0.00357									
	(0.00457)									
Economic Freedom		-0.00685								
		(0.0165)								
Economic Freedom × Control of Corruption		0.00357								
		(0.00927)								
Financial Freedom			0.000479							
			(0.00800)							
Financial Freedom × Control of Corruption			0.00105							
			(0.00578)							
Fiscal Freedom				-0.00287						
				(0.0102)						
Fiscal Freedom × Control of Corruption				0.000983						
				(0.00720)						
Freedom from Government					-0.00220					
					(0.00602)					
Freedom from Government × Control of Corruption					0.00159					
					(0.00537)					
Investment Freedom						0.00698				
						(0.00888)				
Investment Freedom × Control of Corruption						0.00322				
						(0.00657)				
Monetary Freedom							-0.00108			
							(0.0129)			
Monetary Freedom × Control of Corruption							-0.00308			
							(0.00952)			
Property Rights								-0.0184		
								(0.0105)		
Property Rights × Control of Corruption								0.00222		
								(0.00524)		
Trade Freedom									0.0149	
									(0.0118)	
Trade Freedom × Control of Corruption									0.00867	
									(0.00871)	
Freedom to Trade Internationally										0.266*
										(0.127)
Freedom to Trade Internationally × Control of Corruption										-0.0576
										(0.0869)
adj. R^2	0.015	-0.012	-0.015	-0.015	-0.014	-0.010	-0.015	0.010	0.001	0.030
Mrg. eff.	0.312	-0.0707	0.0294	0.0211	-0.0171	-0.165	0.344	0.311	-0.600	0.366
S-E	0.371	0.670	0.382	0.542	0.341	0.427	0.810	0.439	0.619	0.639

Standard errors in parentheses, Mrg. eff.: Marginal effects of coefficients, S-E: standard error of the Mrg. eff..

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5.9: OLS: Fiscal variable Pro-cyclicality and qualitative indicators (DV: Coeff. b)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Variable	**b/se**	**b/se**	**b/se**	**b/se**	**b/se**	**b/se**	**b/se**	**b/se**	**b/se**	**b/se**
Control of Corruption	-0.103	-0.110	-0.200	1.018*	0.193	-0.478	-0.410	-0.347	-0.0592	0.335
	(0.289)	(0.519)	(0.295)	(0.408)	(0.264)	(0.329)	(0.627)	(0.342)	(0.482)	(0.600)
Freedom from Corruption	-0.00810									
	(0.00766)									
Freedom from Corruption × Control of Corruption	0.00450									
	(0.00356)									
Economic Freedom		-0.00617								
		(0.0128)								
Economic Freedom × Control of Corruption		0.00234								
		(0.00718)								
Financial Freedom			0.000589							
			(0.00619)							
Financial Freedom × Control of Corruption			0.00300							
			(0.00447)							
Fiscal Freedom				-0.0129						
				(0.00770)						
Fiscal Freedom × Control of Corruption				-0.0142**						
				(0.00542)						
Freedom from Government					0.000397					
					(0.00466)					
Freedom from Government × Control of Corruption					-0.00338					
					(0.00416)					
Investment Freedom						0.00720				
						(0.00684)				
Investment Freedom × Control of Corruption						0.00652				
						(0.00506)				
Monetary Freedom							0.00558			
							(0.0100)			
Monetary Freedom × Control of Corruption							0.00456			
							(0.00737)			
Property Rights								-0.00143		
								(0.00820)		
Property Rights × Control of Corruption								0.00548		
								(0.00408)		
Trade Freedom									-0.00915	
									(0.00914)	
Trade Freedom × Control of Corruption									0.00165	
									(0.00678)	
Freedom to Trade Internationally										-0.260*
										(0.119)
Freedom to Trade Internationally × Control of Corruption										-0.0198
										(0.0816)
adj. R^2	-0.002	-0.018	-0.018	0.036	-0.016	-0.003	-0.018	-0.007	-0.013	0.019
Mrg. eff.	-0.103	-0.110	-0.200	1.018	0.193	-0.478	-0.410	-0.347	-0.0592	0.335
S-E	0.289	0.519	0.295	0.408	0.264	0.329	0.627	0.342	0.482	0.600

Standard errors in parentheses
Mrg. eff.: Marginal effects of coefficients
S-E: standard error of the Mrg. eff..
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5.10: OLS: Fiscal variable pro-cyclicality and qualitative indicators with political fragmentation. (DV:Coeff. a)

	(1)	(2)	(3)	(4)	(5)
Variable	**b/se**	**b/se**	**b/se**	**b/se**	**b/se**
Political fragmentation	0.0550	-0.0677	0.0888	-0.0855	-0.0155
	(0.396)	(0.326)	(0.335)	(0.294)	(0.364)
Control of Corruption	-2.398	-2.060*	-0.852*	-2.920***	-0.363
	(5.261)	(0.871)	(0.363)	(0.781)	(0.626)
Democracy	0.0106				
	(0.128)				
Democracy × Control of Corruption	0.244				
	(0.526)				
Government Effectiveness		0.583			
		(0.833)			
Government Effectiveness × Control of Corruption		0.825**			
		(0.242)			
Political Stability			0.0904		
			(0.382)		
Political Stability × Control of Corruption			0.748**		
			(0.269)		
Rule of Law				1.178	
				(0.724)	
Rule of Law × Control of Corruption				1.125***	
				(0.255)	
Regulatory Quality					-0.604
					(0.553)
Regulatory Quality × Control of Corruption					0.485
					(0.344)
adj. R^2	-0.136	0.209	0.141	0.349	-0.009

5.4.2 Robustness checks: alternative dependent variable

An alternative specification, uses the categorical dependent variable (Table 5.11) where Fbt is the dependent variable. The variable polarisation of the Database of Political Institutions (DPI) 2012 (Keefer, 2012) is used to check robustness. The DPI variable indicator is positive across all specifications, with parameters ranging from 0.127 to 0.193, indicating that countries with a politically diverse parliament are prone to increased fiscal pro-cyclicality and verifying the existence of the voracity effect. The variable control of corruption (CC) yields a negative parameter, -0.472, consequently decreasing the cyclicality coefficient of fiscal policy, in line with the theory and presenting robustness to the results presented above. Likewise, when the variable political competition of Polity IV project (Marshall et al. 2012) is included to the specification, yields a negative parameter, -0.468, hence, in countries with increased controls of corruption fiscal policy becomes less pro-cyclical.

The determinants of fiscal policy cyclicality were analysed independently with the inclusion of governance qualitative variables and political fragmentation. In the next section, the determinants of country's access to international financial markets based on Kaminsky et al. (2005) are empirically identified.

Table 5.11: OLS: Fiscal variable pro-cyclicality and qualitative indicators with polarization (DPI). (DV: Coeff. b)

	(1)	(2)	(3)	(4)	(5)
Variable	**b/se**	**b/se**	**b/se**	**b/se**	**b/se**
Polarization	0.179	0.178	0.193	0.127	0.270
	(0.516)	(0.387)	(0.376)	(0.382)	(0.395)
Control of Corruption	-0.472*	-0.167	-0.155	-0.373	0.00315
	(0.232)	(0.317)	(0.187)	(0.379)	(0.224)
Democracy	0.00271				
	(0.0484)				
Democracy × Control of Corruption	0.0542				
	(0.0289)				
Government Effectiveness		0.0341			
		(0.311)			
Government Effectiveness × Control of Corruption		0.123			
		(0.0809)			
Political Stability			0.0819		
			(0.189)		
Political Stability × Control of Corruption			0.157		
			(0.114)		
Rule of Law				0.250	
				(0.365)	
Rule of Law × Control of Corruption				0.153	
				(0.0895)	
Regulatory Quality					-0.116
					(0.224)
Regulatory Quality × Control of Corruption					0.0868
					(0.0937)
adj. R^2	0.003	-0.009	-0.011	-0.005	-0.013

Standard errors in parentheses

Table 5.12: OLS Robustness: Marginal effects for Control of Corruption-Regulatory Quality with political competition (Polity IV) (DV:Coeff. b)

	(1)	(2)	(3)	(4)	(5)
Variable	**b/se**	**b/se**	**b/se**	**b/se**	**b/se**
Political Competition	-0.00203	0.0316	0.0258	0.0267	0.0372
	(0.0643)	(0.0396)	(0.0377)	(0.0383)	(0.0400)
Control of Corruption	-0.468*	-0.102	-0.0828	-0.184	0.000716
	(0.234)	(0.305)	(0.179)	(0.373)	(0.215)
Democracy	0.0175				
	(0.0592)				
Democracy × Control of Corruption	0.0526				
	(0.0290)				
Government Effectiveness		-0.0679			
		(0.305)			
Government Effectiveness × Control of Corruption		0.139			
		(0.0769)			
Political Stability			-0.0244		
			(0.189)		
Political Stability × Control of Corruption			0.145		
			(0.108)		
Rule of Law				0.0343	
				(0.365)	
Rule of Law × Control of Corruption				0.154	
				(0.0849)	
Regulatory Quality					-0.147
					(0.218)
Regulatory Quality × Control of Corruption					0.0996
					(0.0883)
adj. R^2	0.000	0.000	-0.005	0.002	-0.005

Standard errors in parentheses

5.4.3 Panel data Logit estimation of access to financial markets

To analyse the determinants of access to international finance, a panel data estimation of equation 5.4 is performed. The estimates, as shown in Table 5.13, indicate that for developing economies, the GDP per capita yields an important and significant positive effect, 1.084, but smaller than the parameter of 2.982 estimated for emerging countries, affecting on a larger scale on the probability of tapping into the international financial markets.

Noteworthy, a positive and significant effect (1.483) of debt service on external debt points to a scale effect on the access to credit for developing countries. Conversely, a higher debt service/GDP ratio reduces the probability of accessing (-1.458) the international financial markets. Results of robustness checks indicate that inflation rate yields a negative parameter, with high inflation reducing the probability of access to international financial markets significantly, in developing economies.

In line with these estimates, developing countries face tougher financial restraints when accessing international financial markets. The estimates indicate that countries with a heavy debt burden, high inflation and a higher proportion of debt service to GDP find difficulties to access financial markets and funding their budget. Consequently, these economies have increased probability to enact procyclical fiscal policies.

Table 5.13: Panel Data Fixed Effects Logit esitmation, Debt estimates: debt access in Developing (1) and Emerging countries (2).(DV: d_i)

	(1)	(2)
Variable	**b/se**	**b/se**
GDP per capita	1.084	2.982
	(1.49)	(1.36)
GDP growth rate	4.768	5.006
	(1.88)	(0.79)
Inflation rate	-0.0526	3.017
	(-0.32)	(1.31)
Gross domestic investment as share of GDP	-0.00182	-2.143
	(-0.00)	(-1.28)
Debt service on external debt	1.483**	-0.556
	(2.90)	(-0.34)
Debt service to GDP	-1.458**	0.448
	(-2.74)	(0.27)
Control of Corruption	-0.271	0.954
	(-0.60)	(0.62)
Government Effectiveness	0.131	-0.880
	(0.27)	(-0.70)
Democracy	0.0972	-0.198
	(0.85)	(-1.01)
Obs.	850	220
Obs. per group	88	20
Log-lik.	-343.5	-90.43
χ^2	218.7	55.73

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

5.5 Concluding remarks

In summary, the empirical results show that government effectiveness and political stability increase the probability of enacting a pro-cyclical fiscal policy. Similarly, democracy also increases the probability of pro-cyclicality. Heritage Foundation indicators fiscal, economic freedom and freedom of government are key variables in the model, suggesting that enhanced fiscal, economic freedom and freedom of government decreases the probability of pro-cyclicality. Property rights protection is a relevant factor to the model, suggesting that countries with high levels of protection decrease their predicted probability of pro-cyclicality.

When the effects of political fragmentation and polarisation are included to the specification, improved control of corruption result in a less pro-cyclical fiscal policy and reduced voracity effect. Alternative variables like DPI 2012 and Polity IV project allow to test the existence of the voracity effect in the analysed sample. When measuring the probability of debt access in developing and emerging countries, large countries and with increased debt to GDP ratios exhibit a higher probability to access the international financial markets. Nevertheless, developing countries with high inflation and high levels of debt service to GDP reduce their probability.

Chapter 6

Conclusions

The present study has analysed the determinants of real government consumption as part of the fiscal policy cyclicality in developing, emerging and advanced economies. As evidenced in other studies, developing and emerging economies were able to graduate from 'pro-cyclicality' in the last decade. Institutional quality, competitive fiscal regimes and financial systems and access to international capital markets are the implicit factors associated to such improvement.

Using annual data for 184 countries, the study shows that fiscal policies in developing and emerging economies behave pro-cyclically in the period 1960-2010. The data analysed corresponds to the real government consumption as a proxy for fiscal policy. Although, a missing component of investment and transfers correspond to a share of the government spending, the real government consumption is still a reliable indicator of the fiscal policy stance. Not surprisingly, these findings coincide with those of other authors.

From these estimates and to check robustness, a five-categorical variable on the level of significance of the degree of fiscal cyclicality was employed. Similarly, a three-categorical variable was constructed in order to analyse the determinants of cyclicality. An additional estimation performed a sensitivity analysis on the

stability of cyclical coefficients over time, making an emphasis on the behaviour of fiscal policy during booms and recessions.

Temporal effects on the cyclical behaviour during economic booms and recessions have been found, indicating that the fiscal policy *proxied* by the cyclical component of real government consumption is dependent on the economic conditions. Similarly, slope break tests indicate that there exist multiple slope breaks in five and ten-year periods for several developing and emerging countries. These findings imply that the estimated coefficients vary throughout the analysed 51-year span of data. Estimates showed that developing and emerging countries 'graduated' from pro-cyclicality. The reasoning behind this statement consists of two facts. First, in the 1980's, a period characterised by debt crises withstand by most developing and emerging economies, the fiscal policy behaviour was notoriously pro-cyclical. Second, in the 2000's following the shortfalls triggered by extended financial crises, developing and emerging countries shifted to counter-cyclical fiscal policies, a fact also replicated by some commodity-rich exporting countries.

The improvement in the quality of governance, institutions, and financial system resulted in 'graduation' from 'pro-cyclicality'. In a first analysis, the evidence gathered traced the determinants of pro-cyclical fiscal policies to institutional, fiscal and financial factors. The variables are government effectiveness, political stability, an indicator of fiscal, economic freedom, freedom of government and protection of property rights. While advanced economies normally exhibit higher marks on the institutional framework, developing and emerging economies have developed stronger institutions and improved investment and legal systems in recent years.

The second analysis focused on access to financial markets. When measuring the probability of debt access in developing and emerging countries, large countries and with increased debt to GDP ratios increased their chance to access the in-

ternational financial markets, with the exception of countries with high inflation and high levels of debt service to GDP.

It is shown that in fact some developing and emerging countries have escaped the 'pro-cyclicality' trap and became counter-cyclical in the last decade. This shift in fiscal behaviour has also been related to the institutional improvement in developing and emerging markets, improved financial regulation, openness to foreign investment, improved controls of corruption and competitive fiscal regimes.

6.1 Final remarks and contribution to the literature

The evidence presented contributes to the literature with the understanding of the underlying causes of pro-cyclical fiscal policy in developing and emerging economies. Pooled Mean Group (PMG) coefficients estimated between fiscal variables and the output gap and time series analysis with sensitivity analysis allowed to verify the existence of multiple structural breaks on a country basis, with concerns of heteroskedasticity and autocorrelation in the errors.

For robustness purposes, Baxter-King band-pass and First-Difference filtering were used to present robustness to Hodrick-Prescott filtering. With the estimated coefficients , the analysis introduced structural breaks and tested regime switches of fiscal policy in 1985 and 1999 individually for each country. The existence of multiple structural breaks for economies is evidenced with feasibility of 'graduation' from pro-cyclicality in several years, contrasting with the literature. The use of more refined models to analyse this situation is a challenge for future research.

The analysis focused on political and institutional indicators, including variables measuring development and levels of economic freedom. The effects of political fragmentation measuring the voracity effect on fiscal policies with sensitivity analysis examined the constraints faced by developing and emerging economies to access international financial markets. This research also contributes to the literature by introducing the estimation of an ordered Probit specification with robustness checks supporting the empirical results.

Government effectiveness and political stability are factors for a pro-cyclical fiscal policy. Similarly, democracy also increases the probability of pro-cyclicality. With improved fiscal, economic and freedom of government, pro-cyclicality can be reduced but also property rights protection is relevant. Improved control of corruption reduces the probability of a pro-cyclical fiscal policy and reduces the voracity effect. In terms of the probability of accessing financial markets, large developing and emerging economies, with increased debt to GDP ratios are in advantage, contrasting with small developing economies with high inflation and debt service to GDP.

Appendix A

Table 1: Granger causality test

	Country	F:OG p-value	OG:F p-value	Sig.
1	Afghanistan	0.011	0	**
2	Albania	0.01	0.003	**
3	Algeria	0.739	0.435	
4	Angola	0.277	0.021	
5	Antigua and Barbuda	0.967	0.833	
6	Argentina	0.893	0.848	
7	Armenia	0.007	0.001	***
8	Australia	0.427	0.518	
9	Austria	0.288	0.538	
10	Azerbaijan	0.079	0.047	*
11	Bahamas, The	0.156	0.065	
12	Bahrain	0.346	0.153	
13	Bangladesh	0.02	0.497	**
14	Barbados	0.326	0.347	
15	Belarus	0.408	0.6	
16	Belgium	0.171	0.174	
17	Belize	0.729	0.83	
18	Benin	0.077	0.294	*
19	Bhutan	0.006	0.257	***
20	Bolivia	0.207	0.808	
21	Bosnia and Herzegovina	0.194	0.083	
22	Botswana	0.095	0.291	*
23	Brazil	0.756	0.782	

Continued on next page

Table 1 – continued from previous page

	Country	F:OG p-value	OG:F p-value	Sig.
24	Brunei Darussalam	0.884	0.278	
25	Bulgaria	0.012	0.027	**
26	Burkina Faso	0.708	0.711	
27	Burundi	0.431	0.405	
28	Cambodia	0.623	0.875	
29	Cameroon	0.073	0.216	*
30	Canada	0.17	0.618	
31	Cape Verde	0.771	0.199	
32	Central African Republic	0.048	0.114	**
33	Chad	0.131	0.156	
34	Chile	0.01	0.132	**
35	China	0.291	0.043	
36	Colombia	0.627	0.178	
37	Comoros	0.143	0.678	
38	Congo, Dem. Rep.	0.032	0.465	**
39	Congo, Rep.	0.089	0.221	*
40	Costa Rica	0	0	***
41	Cote d'Ivoire	0.853	0.62	
42	Croatia	0.404	0.26	
43	Cuba	0.383	0.566	
44	Cyprus	0.036	0.146	**
45	Czech Republic	0.951	0.823	
46	Denmark	0.026	0.225	**
47	Djibouti	0.613	0.134	
48	Dominica	0.362	0.991	
49	Dominican Republic	0.027	0.033	**

Continued on next page

Table 1 – continued from previous page

	Country	F:OG p-value	OG:F p-value	Sig.
50	Ecuador	0.259	0.892	
51	Egypt, Arab Rep.	0.553	0.34	
52	El Salvador	0.034	0.809	**
53	Equatorial Guinea	0.476	0.178	
54	Eritrea	0.649	0.163	
55	Estonia	0.021	0.027	**
56	Ethiopia	0.258	0.036	
57	Fiji	0.41	0.677	
58	Finland	0.399	0.42	
59	France	0.326	0.517	
60	Gabon	0.467	0.926	
61	Gambia, The	0.011	0.222	**
62	Georgia	0.079	0.063	*
63	Germany	0.037	0.043	**
64	Ghana	0.81	0.47	
65	Greece	0.383	0.296	
66	Grenada	0.285	0.593	
67	Guatemala	0.831	0.51	
68	Guinea	0	0.648	***
69	Guinea-Bissau	0.236	0.002	
70	Guyana	0	0	***
71	Haiti	0.682	0.002	
72	Honduras	0.2	0.332	
73	Hungary	0.108	0.519	
74	Iceland	0.412	0.675	
75	India	0.549	0.867	

Continued on next page

Table 1 – continued from previous page

	Country	F:OG p-value	OG:F p-value	Sig.
76	Indonesia	0.368	0.304	
77	Iran, Islamic Rep.	0.008	0.057	***
78	Iraq	0.021	0.953	**
79	Ireland	0.058	0.054	*
80	Israel	0.369	0.579	
81	Italy	0.186	0.187	
82	Jamaica	0.063	0.436	*
83	Japan	0.16	0.57	
84	Jordan	0.984	0.87	
85	Kazakhstan	0.555	0.632	
86	Kenya	0.266	0.045	
87	Kiribati	0.188	0.135	
88	Korea, Rep.	0.029	0.177	**
89	Kuwait	0.16	0.088	
90	Kyrgyz Republic	0.432	0.19	
91	Lao PDR	0.519	0.893	
92	Latvia	0.322	0.319	
93	Lebanon	0.136	0.853	
94	Lesotho	0.627	0.773	
95	Liberia	0.604	0.969	
96	Libya	0.72	0.937	
97	Lithuania	0.133	0.31	
98	Luxembourg	0.625	0.946	
99	Macedonia, FYR	0.157	0.246	
100	Madagascar	0.007	0.275	***
101	Malawi	0.347	0.414	

Continued on next page

Table 1 – continued from previous page

	Country	F:OG p-value	OG:F p-value	Sig.
102	Malaysia	0.193	0.921	
103	Maldives	0.587	0.954	
104	Mali	0.92	0.003	
105	Malta	0.09	0.561	*
106	Marshall Islands	0.183	0.331	
107	Mauritania	0.614	0.437	
108	Mauritius	0.293	0.132	
109	Mexico	0.051	0.022	*
110	Micronesia, Fed. Sts.	0.637	0.649	
111	Moldova	0.354	0.295	
112	Mongolia	0.003	0.001	***
113	Montenegro	0.952	0.846	
114	Morocco	0.004	0.783	***
115	Mozambique	0.135	0.27	
116	Namibia	0.301	0.716	
117	Nepal	0.144	0.694	
118	Netherlands	0.024	0.148	**
119	New Zealand	0.178	0.007	
120	Nicaragua	0.051	0.019	*
121	Niger	0.073	0.283	*
122	Nigeria	0.427	0.139	
123	Norway	0.04	0.028	**
124	Oman	0	0	***
125	Pakistan	0.062	0.512	*
126	Palau	0.333	0.107	
127	Panama	0.393	0.526	

Continued on next page

Table 1 – continued from previous page

	Country	F:OG p-value	OG:F p-value	Sig.
128	Papua New Guinea	0.002	0.002	***
129	Paraguay	0.039	0.167	**
130	Peru	0.323	0.011	
131	Philippines	0.795	0.615	
132	Poland	0.635	0.418	
133	Portugal	0.015	0.037	**
134	Qatar	0.686	0.205	
135	Romania	0.107	0.314	
136	Russian Federation	0.048	0.086	**
137	Rwanda	0.464	0.759	
138	Samoa	0.264	0.663	
139	Sao Tome and Principe	0.965	0.016	
140	Saudi Arabia	0.087	0.352	*
141	Senegal	0.718	0.26	
142	Serbia	0.024	0.068	**
143	Seychelles	0.53	0.113	
144	Sierra Leone	0	0	***
145	Singapore	0.25	0.749	
146	Slovak Republic	0.499	0.338	
147	Slovenia	0.53	0.441	
148	Solomon Islands	0.608	0.994	
149	Somalia	0.165	0.109	
150	South Africa	0.121	0.31	
151	Spain	0.016	0.023	**
152	Sri Lanka	0.035	0.229	**
153	St. Kitts and Nevis	0.063	0.1	*

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Table 1 – continued from previous page

	Country	F:OG p-value	OG:F p-value	Sig.
154	St. Lucia	0.42	0.853	
155	St. Vincent and the Grenadines	0.69	0.501	
156	Sudan	0.286	0.002	
157	Suriname	0.14	0.329	
158	Swaziland	0.005	0.104	***
159	Sweden	0.006	0.004	***
160	Switzerland	0.134	0.505	
161	Syrian Arab Republic	0.176	0.724	
162	Tajikistan	0.597	0.269	
163	Tanzania	0.437	0.641	
164	Thailand	0.165	0.538	
165	Timor-Leste	0.255	0.332	
166	Togo	0.591	0.08	
167	Tonga	0.096	0.395	*
168	Trinidad and Tobago	0.035	0.145	**
169	Tunisia	0.352	0.26	
170	Turkey	0.001	0.003	***
171	Turkmenistan	0.334	0.592	
172	Uganda	0.014	0.05	**
173	Ukraine	0.159	0.3	
174	United Arab Emirates	0.823	0.953	
175	United Kingdom	0.167	0.195	
176	United States	0.018	0.609	**
177	Uruguay	0	0.035	***
178	Uzbekistan	0.007	0.009	***
179	Vanuatu	0.268	0.367	

Continued on next page

Table 1 – concluded from previous page

	Country	F:OG p-value	OG:F p-value	Sig.
180	Venezuela, RB	0	0	***
181	Vietnam	0.036	0.013	**
182	Yemen, Rep.	0.084	0.562	*
183	Zambia	0	0.109	***
184	Zimbabwe	0.473	0.6	

Table 2: Fiscal variable and OG

	Country	Bi-var corr.	a) Cycl. coeff. (log-dev.)	p-val	b) Cycl. coeff. (First-dif.)	p-val	Frankel et al. (1960-2010)	Alesina et al (1960-2003)
1	Afghanistan	0.651	0.765	0.000	0.615	0.012	-	-
2	Albania	0.912	2.222	0.000	0.045	0.874	-	-
3	Algeria	0.777	0.959	0.000	0.481	0.083	0.35	-
4	Angola	0.919	1.427	0.000	-0.318	0.575	0.33	-
5	Antigua and Barbuda	0.876	0.975	0.000	0.854	0.005	-	-
6	Argentina	0.985	0.864	0.000	-0.244	0.102	0.24	-0.0110222
7	Armenia	0.996	1.180	0.000	4.121	0.000	-	-
8	Australia	0.926	0.954	0.000	0.534	0.017	-0.42	0.3189909
9	Austria	0.977	1.020	0.000	0.611	0.004	-0.36	0.1919033
10	Azerbaijan	0.888	0.843	0.000	1.757	0.019	0.9	-
11	Bahamas, The	0.412	0.300	0.007	-0.036	0.845	-	-
12	Bahrain	0.304	0.187	0.053	0.154	0.367	0.26	-
13	Bangladesh	0.847	1.666	0.000	0.678	0.022	0.59	-
14	Barbados	0.389	1.092	0.005	0.928	0.177	-	-
15	Belarus	0.993	1.047	0.000	-0.395	0.098	-	-
16	Belgium	0.963	1.031	0.000	0.369	0.081	-0.09	0.1196384
17	Belize	0.577	0.665	0.000	0.872	0.001	-	-0.2617198
18	Benin	0.668	0.681	0.000	0.449	0.044	-	-
19	Bhutan	0.811	0.827	0.000	0.607	0.015	-	-
20	Bolivia	0.988	0.998	0.000	-0.060	0.354	0.2	0.278352
21	Bosnia and Herzegovina	0.998	1.057	0.000	-0.921	0.000	-	-
22	Botswana	0.613	0.569	0.000	0.203	0.222	0.8	0.2241606

Continued on next page

Table 2 – continued from previous page

	Country	Bi-var.corr.	a) Cycl. coeff. (log-dev.)	p-val	b) Cycl. coeff. (First-diff.)	p-val	Frankel et al.)	Alesina et al.)
23	Brazil	0.997	0.952	0.000	-0.677	0.009	0.15	-0.1041727
24	Brunei Darussalam	0.819	0.987	0.000	0.776	0.004	-	-
25	Bulgaria	0.861	1.407	0.000	0.036	0.751	-	0.4322959
26	Burkina Faso	0.931	1.155	0.000	0.795	0.001	-	-0.071315
27	Burundi	0.879	1.058	0.000	0.171	0.494	-	0.0155021
28	Cambodia	0.993	0.998	0.000	0.484	0.000	-	-
29	Cameroon	0.804	0.883	0.000	0.435	0.050	0.77	0.0172185
30	Canada	0.852	1.106	0.000	0.685	0.028	-0.19	0.3591472
31	Cape Verde	0.848	1.092	0.000	0.154	0.514	-	-
32	Central African Republic	0.579	1.019	0.000	0.688	0.079	-	-
33	Chad	0.943	0.981	0.000	0.581	0.003	-	-0.0442024
34	Chile	0.998	1.087	0.000	-0.094	0.243	0.2	-0.0600886
35	China	0.902	1.245	0.000	0.106	0.664	-	-
36	Colombia	0.933	1.037	0.000	0.180	0.385	0.04	0.0871374
37	Comoros	0.886	1.046	0.000	0.551	0.023	-	-
38	Congo, Dem. Rep.	0.954	0.963	0.000	0.104	0.702	-	-
39	Congo, Rep.	0.812	0.750	0.000	0.429	0.013	-	-
40	Costa Rica	0.976	1.338	0.000	0.201	0.316	0.26	-0.2637012
41	Cote d'Ivoire	0.937	0.946	0.000	0.509	0.015	-	-
42	Croatia	0.998	1.043	0.000	-0.235	0.321	-	0.0008157
43	Cuba	0.951	0.902	0.000	0.403	0.067	-	-
44	Cyprus	0.772	0.830	0.000	0.235	0.274	-	-
45	Czech Republic	0.887	1.286	0.000	1.187	0.010	-	-
46	Denmark	0.973	1.018	0.000	0.456	0.034	-0.06	0.8399062
47	Djibouti	0.500	0.409	0.001	0.151	0.510	-	-

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Table 2 – continued from previous page

	Country	Bi-var.corr.	a) Cycl. coeff. (log-dev.)	p-val	b) Cycl. coeff. (First-diff.)	p-val	Frankel et al.)	Alesina et al.)
48	Dominica	0.400	0.452	0.010	0.477	0.202	-	-
49	Dominican Republic	0.859	1.240	0.000	0.432	0.021	-	0.0477094
50	Ecuador	0.774	1.209	0.000	1.312	0.000	0.24	-0.0975525
51	Egypt, Arab Rep.	0.984	1.048	0.000	-0.051	0.692	0.22	-0.0278669
52	El Salvador	-0.117	-0.149	0.413	-0.205	0.551	0.07	0.0229697
53	Equatorial Guinea	0.485	0.593	0.000	0.255	0.237	-	-
54	Eritrea	0.747	1.193	0.000	2.732	0.005	-	-
55	Estonia	0.986	0.976	0.000	0.135	0.667	-	-
56	Ethiopia	0.721	0.895	0.000	0.661	0.007	-	-0.0212749
57	Fiji	0.904	1.235	0.000	1.015	0.001	-	-
58	Finland	0.948	1.040	0.000	0.528	0.017	-0.56	0.2642007
59	France	0.973	0.997	0.000	0.432	0.037	-0.4	0.4010991
60	Gabon	0.767	0.843	0.000	0.636	0.004	0.71	-0.3837382
61	Gambia, The	0.781	0.955	0.000	0.363	0.135	-	-
62	Georgia	0.999	1.006	0.000	0.788	0.013	-	-
63	Germany	0.978	1.095	0.000	0.581	0.022	0.19	-0.0856829
64	Ghana	0.692	0.622	0.000	-0.301	0.078	0.43	-
65	Greece	0.935	1.103	0.000	0.357	0.132	-0.17	0.135772
66	Grenada	0.642	0.816	0.000	0.351	0.303	-	-
67	Guatemala	0.926	1.051	0.000	0.416	0.063	0.49	-0.4611335
68	Guinea	0.882	0.921	0.000	0.192	0.218	-	-
69	Guinea-Bissau	0.174	0.476	0.271	0.101	0.395	-	-
70	Guyana	0.805	0.552	0.000	0.353	0.020	-	-
71	Haiti	0.777	1.802	0.000	0.023	0.949	0.34	0.1876386
72	Honduras	0.891	0.713	0.000	0.190	0.257	0.22	0.032723

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Table 2 – continued from previous page

	Country	Bi-var.corr.	a) Cycl. coeff. (log-dev.)	p-val	b) Cycl. coeff. (First-diff.)	p-val	Frankel et al.)	Alesina et al.)
73	Hungary	0.907	1.001	0.000	0.513	0.072	-	0.2476369
74	Iceland	0.960	1.298	0.000	-0.045	0.490	-	0.2395005
75	India	0.931	0.916	0.000	0.388	0.063	0.24	-0.0191069
76	Indonesia	0.990	1.080	0.000	-0.151	0.346	0.33	0.18123
77	Iran, Islamic Rep.	0.915	0.896	0.000	0.745	0.000	0.56	0.1453354
78	Iraq	0.963	0.995	0.000	0.002	0.983	-	-
79	Ireland	0.958	0.957	0.000	0.533	0.007	-0.08	-0.3325504
80	Israel	0.992	0.916	0.000	0.013	0.848	-	-
81	Italy	0.972	1.060	0.000	0.617	0.004	-0.09	0.4186661
82	Jamaica	0.961	0.773	0.000	0.322	0.025	-0.32	-0.5170432
83	Japan	0.968	0.964	0.000	0.696	0.000	-0.22	0.2777845
84	Jordan	0.802	0.899	0.000	0.468	0.044	0.33	-
85	Kazakhstan	0.983	1.372	0.000	2.219	0.002	-	-
86	Kenya	0.806	1.296	0.000	0.355	0.133	0.51	-
87	Kiribati	0.834	0.882	0.000	0.875	0.001	-	-
88	Korea, Rep.	0.959	1.076	0.000	0.862	0.001	-	-
89	Kuwait	0.310	0.530	0.132	1.188	0.057	0.07	-
90	Kyrgyz Republic	0.974	0.896	0.000	0.060	0.843	-	-
91	Lao PDR	0.907	0.809	0.000	0.075	0.530	-	-
92	Latvia	0.883	0.802	0.000	1.001	0.002	-	-
93	Lebanon	0.715	0.819	0.000	-0.131	0.586	-	-
94	Lesotho	0.880	0.977	0.000	0.588	0.007	-	-
95	Liberia	0.845	1.067	0.000	0.407	0.207	-	-
96	Libya	0.903	0.693	0.000	0.079	0.705	0.02	-
97	Lithuania	0.821	0.656	0.000	0.796	0.016	-	-

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Table 2 – continued from previous page

	Country	Bi-var.corr.	a) Cycl. coeff. (log-dev.)	p-val	b) Cycl. coeff. (First-diff.)	p-val	Frankel et al.)	Alesina et al.)
98	Luxembourg	0.885	0.960	0.000	0.347	0.137	-	-0.2671819
99	Macedonia, FYR	0.991	0.884	0.000	-0.174	0.525	-	-
100	Madagascar	0.819	0.992	0.000	0.556	0.018	0.47	0.1389433
101	Malawi	0.737	0.902	0.000	0.514	0.014	-	-
102	Malaysia	0.761	0.995	0.000	0.694	0.009	0.39	-0.00334
103	Maldives	0.947	0.922	0.000	0.382	0.070	-	-
104	Mali	0.800	1.454	0.000	0.377	0.268	0.58	0.0639561
105	Malta	0.965	0.935	0.000	0.502	0.025	-	-
106	Marshall Islands	0.247	0.440	0.119	-0.188	0.684	-	-
107	Mauritania	0.670	0.887	0.000	0.873	0.002	-	-
108	Mauritius	0.840	1.046	0.000	0.405	0.102	-	-0.3128121
109	Mexico	0.961	1.108	0.000	0.189	0.159	0.21	-0.0941705
110	Micronesia, Fed. Sts.	0.944	0.946	0.000	0.802	0.006	-	-
111	Moldova	0.994	0.993	0.000	2.510	0.000	-	-
112	Mongolia	-0.377	-0.521	0.028	-0.036	0.804	-	-
113	Montenegro	0.933	1.080	0.000	0.569	0.153	-	-
114	Morocco	0.857	1.043	0.000	0.198	0.401	0.43	-0.0320571
115	Mozambique	0.774	1.008	0.000	0.266	0.060	0.25	-
116	Namibia	0.870	0.934	0.000	0.579	0.004	-	-0.2425039
117	Nepal	0.690	0.781	0.000	0.754	0.006	-	0.0134607
118	Netherlands	0.969	0.952	0.000	0.542	0.007	-0.05	0.20904
119	New Zealand	0.962	1.067	0.000	0.400	0.050	0.05	0.2063387
120	Nicaragua	0.997	0.990	0.000	-0.932	0.000	0.5	-0.1451551
121	Niger	0.886	0.986	0.000	0.817	0.000	0.64	-
122	Nigeria	0.435	0.770	0.006	0.021	0.913	0.41	-

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Table 2 – continued from previous page

	Country	Bi-var.corr.	a) Cycl. coeff. (log-dev.)	p-val	b) Cycl. coeff. (First-diff.)	p-val	Frankel et al.)	Alesina et al.)
123	Norway	0.926	0.930	0.000	0.470	0.032	-0.01	0.5360815
124	Oman	0.517	0.487	0.001	0.905	0.000	0.71	-
125	Pakistan	0.802	0.834	0.000	0.246	0.260	0.37	0.0950563
126	Palau	-0.164	-0.136	0.305	-0.444	0.037	-	-
127	Panama	0.521	0.679	0.000	0.614	0.049	0.16	-0.1642356
128	Papua New Guinea	0.757	0.778	0.000	0.262	0.237	-	-0.0937892
129	Paraguay	0.914	0.929	0.000	0.300	0.083	0.53	-0.0378031
130	Peru	0.997	1.194	0.000	-0.508	0.003	0.67	-0.0372987
131	Philippines	0.955	0.930	0.000	0.552	0.007	0.54	0.043228
132	Poland	0.939	0.964	0.000	-0.044	0.766	-	-
133	Portugal	0.893	1.156	0.000	0.377	0.113	0.45	0.4251986
134	Qatar	0.436	0.348	0.029	0.636	0.013	0.69	-
135	Romania	0.918	0.867	0.000	0.210	0.204	-	0.1403313
136	Russian Federation	0.948	1.321	0.000	1.887	0.002	-	-
137	Rwanda	0.836	1.013	0.000	0.883	0.000	-	-0.0348761
138	Samoa	0.912	1.054	0.000	0.910	0.002	-	-
139	Sao Tome and Principe	-0.497	-0.930	0.003	0.059	0.830	-	-
140	Saudi Arabia	0.233	0.247	0.263	0.025	0.945	0.61	-
141	Senegal	0.812	1.054	0.000	0.704	0.008	0.47	0.0350804
142	Serbia	0.986	0.923	0.000	-0.185	0.627	-	-
143	Seychelles	0.631	1.218	0.000	0.660	0.055	-	-0.4127659
144	Sierra Leone	0.744	1.048	0.000	0.361	0.064	0.67	-
145	Singapore	0.634	0.927	0.000	0.501	0.135	-	-0.0265213
146	Slovak Republic	0.657	1.057	0.000	1.257	0.007	-	-
147	Slovenia	0.981	0.950	0.000	-0.264	0.634	-	-

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Table 2 – continued from previous page

	Country	Bi-var.corr.	a) Cycl. coeff. (log-dev.)	p-val	b) Cycl. coeff. (First-diff.)	p-val	Frankel et al.)	Alesina et al.)
148	Solomon Islands	0.845	0.996	0.000	0.579	0.026	-	-
149	Somalia	0.952	1.104	0.000	0.092	0.479	-	-
150	South Africa	0.965	0.988	0.000	0.589	0.002	0.09	0.1328128
151	Spain	0.980	1.071	0.000	0.361	0.080	-0.26	0.264881
152	Sri Lanka	0.848	0.841	0.000	0.373	0.051	0.11	-
153	St. Kitts and Nevis	0.630	0.605	0.000	-0.254	0.380	-	-
154	St. Lucia	0.620	0.807	0.000	0.370	0.306	-	-0.0580893
155	St. Vincent and the Grenadines	0.877	0.720	0.000	0.753	0.000	-	-
156	Sudan	0.620	0.779	0.000	0.088	0.636	-0.15	-
157	Suriname	0.992	0.984	0.000	0.280	0.078	-	-
158	Swaziland	0.610	0.867	0.000	0.462	0.129	-	-
159	Sweden	0.978	1.069	0.000	0.409	0.065	0.08	0.7876476
160	Switzerland	0.974	1.052	0.000	0.794	0.000	-0.52	0.0780493
161	Syrian Arab Republic	0.822	0.675	0.000	0.401	0.013	-	-
162	Tajikistan	0.619	0.494	0.011	0.561	0.123	-	-
163	Tanzania	0.448	0.790	0.002	-0.448	0.192	0.24	-
164	Thailand	0.835	1.324	0.000	0.937	0.011	0.23	0.1285644
165	Timor-Leste	0.974	1.372	0.000	1.848	0.013	-	-
166	Togo	0.700	0.629	0.000	0.292	0.137	0.5	-0.739064
167	Tonga	0.920	1.072	0.000	0.375	0.168	-	-
168	Trinidad and Tobago	0.724	0.882	0.000	0.737	0.003	-	-
169	Tunisia	0.837	0.967	0.000	0.445	0.051	0.48	0.0210156
170	Turkey	0.842	1.029	0.000	-0.086	0.286	0.15	-0.2620791
171	Turkmenistan	0.991	1.033	0.000	-0.247	0.291	-	-
172	Uganda	0.929	0.889	0.000	0.090	0.026	0.04	-

Continued on next page

Table 2 – concluded from previous page

	Country	Bi-var. corr.	a) Cycl. coeff. (log-dev.)	p-val	b) Cycl. coeff. (First-diff.)	p-val	Frankel et al.	Alesina et al.)
173	Ukraine	0.958	0.963	0.000	0.919	0.072	-	-
174	United Arab Emirates	0.543	1.556	0.005	1.746	0.044	-	-
175	United Kingdom	0.965	1.135	0.000	0.476	0.030	-0.52	0.2157052
176	United States	-0.133	-0.365	0.353	0.375	0.595	-0.35	0.3890695
177	Uruguay	0.672	0.905	0.000	0.121	0.253	0.31	-0.0408077
178	Uzbekistan	1.000	0.961	0.000	0.021	0.945	-	-
179	Vanuatu	0.950	0.950	0.000	0.628	0.008	-	-
180	Venezuela, RB	0.918	1.526	0.000	0.477	0.008	0.45	-0.144108
181	Vietnam	0.999	0.992	0.000	-0.013	0.862	-	-
182	Yemen, Rep.	0.993	0.946	0.000	-0.051	0.811	-0.05	-
183	Zambia	-0.437	-0.497	0.004	0.050	0.574	0.16	0.1655583
184	Zimbabwe	0.017	0.049	0.907	-0.173	0.767	-	0.2799954

Table 3: Country coefficients for the sub-period 1960-1999 and 2000-2010

Country	Code	1960-1999	2000-2010	Graduation	Country	Code	1960-1999	2000-2010	Graduation
Afghanistan	AFG	-2.63388	1.706258	BS	Latvia	LVA	1.136336	1.048175	SS
Albania	ALB	1.950103	1.29695	SS	Lebanon	LBN	0.377917	-6.922722	RG
Algeria	DZA	0.5048401	0.591993	SS	Lesotho	LSO	-1.572915	0.9588037	BS
Angola	AGO	2.371309	0.01558	SS	Liberia	LBR	-1.041615	3.307414	BS
Antigua and Barbuda	ATG	1.112043	1.135942	SS	Lithuania	LTU	0.8065914	1.191799	SS
Argentina	ARG	0.6620066	1.455632	SS	Luxembourg	LUX	1.040241	0.753013	SS
Armenia	ARM	1.265063	1.329252	SS	Macedonia, FYR	MKD	1.184214	0.3960963	SS
Australia	AUS	0.3369293	1.307931	SS	Madagascar	MDG	-1.947738	0.4022112	BS
Austria	AUT	1.384053	0.8622773	SS	Malawi	MWI	0.7628865	-0.0044198	RG
Azerbaijan	AZE	0.6404589	-1.599368	RG	Malaysia	MYS	1.016391	0.815758	SS
Bahamas, The	BHS	-0.1596016	-0.1339397	EG	Maldives	MDV	1.051937	-0.083327	RG
Bahrain	BHR	0.0215063	-0.149222	RG	Mali	MLI	4.286565	-0.3472409	RG
Bangladesh	BGD	0.2422876	0.6402166	SS	Malta	MLT	1.407251	1.153929	SS
Barbados	BRB	1.711523	3.819247	SS	Marshall Islands	MHL	-0.2512945	0.907444	BS
Belgium	BEL	0.7114844	1.364215	SS	Mauritania	MRT	-0.9726309	1.908234	BS
Belize	BLZ	0.0963518	2.286907	SS	Mauritius	MUS	-0.2380495	1.103944	BS
Benin	BEN	-0.4559383	1.043976	BS	Mexico	MEX	1.03407	1.286544	SS
Bhutan	BTN	0.5413422	1.476125	SS	Micronesia, Fed. Sts.	FSM	0.9439179	1.472015	SS
Bosnia and Herzegovina	BIH	1.289645	1.491166	SS	Moldova	MDA	0.8980304	0.4122153	SS
Botswana	BWA	0.621915	0.9989902	SS	Montenegro	MNE	1.021391	-0.5671108	RG
Brazil	BRA	0.4028917	1.226816	SS	Morocco	MAR	1.547697	1.421384	SS
Brunei Darussalam	BRN	0.7002507	-0.5789821	RG	Mozambique	MOZ	1.532533	0.8731547	SS
Burkina Faso	BFA	1.45254	1.101613	SS	Namibia	NAM	-0.0202453	0.9443201	BS
Burundi	BDI	-0.5049865	0.7057703	BS	Nepal	NPL	0.5263741	1.898508	SS
Cameroon	CMR	0.0256789	0.9113266	SS	Netherlands	NLD	0.8773641	0.8944445	SS
Canada	CAN	1.441457	0.7679604	SS	New Zealand	NZL	1.082508	1.088555	SS
Cape Verde	CPV	0.9891123	1.985282	SS	Nicaragua	NIC	1.425146	6.083854	SS
Central African Rep.	CAF	0.1198983	-1.805202	RG	Niger	NER	1.040432	1.001832	SS
Chad	TCD	1.114816	0.7403593	SS	Nigeria	NGA	2.343538	-2.019314	RG
Chile	CHL	0.9728698	2.585385	SS	Norway	NOR	1.060795	1.253654	SS
China	CHN	0.5956916	0.2230228	SS	Oman	OMN	0.8708447	-0.3226135	RG
Colombia	COL	-1.293083	1.068156	BS	Pakistan	PAK	1.787535	18.97601	SS
Comoros	COM	2.46057	0.7560638	SS	Palau	PLW	3.110562	-1.613288	RG
Congo, Rep.	COG	2.30894	0.6988088	SS	Panama	PAN	0.7652439	-0.2234858	RG
Costa Rica	CRI	1.541024	1.348019	SS	Papua New Guinea	PNG	1.110407	1.14535	SS
Cote d'Ivoire	CIV	0.8931295	0.9367908	SS	Paraguay	PRY	0.9049515	1.256246	SS
Croatia	HRV	0.8680738	0.8461551	SS	Peru	PER	1.09121	0.5999637	SS
Cuba	CUB	0.8948615	2.373729	SS	Philippines	PHL	0.7251095	0.6063824	SS
Cyprus	CYP	-0.9466041	0.3134164	BS	Poland	POL	0.8214455	1.75079	SS
Czech Republic	CZE	2.525089	1.029167	SS	Portugal	PRT	-1.168275	1.268567	BS
Denmark	DNK	1.397113	0.8969585	SS	Qatar	QAT	0.4111612	1.128826	SS
Djibouti	DJI	0.1179335	1.682093	SS	Romania	ROU	1.574311	1.515721	SS
Dominica	DMA	0.3336438	1.042244	SS	Russian Federation	RUS	1.188837	3.601413	SS
Dominican Republic	DOM	1.556033	0.5368095	SS	Rwanda	RWA	1.158446	0.8370794	SS
Ecuador	ECU	1.823346	0.5172461	SS	Samoa	WSM	1.105782	0.9709554	SS
Egypt, Arab Rep.	EGY	0.5039631	0.8655943	SS	Sao Tome and Principe	STP	0.4085566	5.536315	SS
El Salvador	SLV	-0.2512752	-0.2937595	EG	Saudi Arabia	SAU	-0.4845753	0.2707033	BS
Equatorial Guinea	GNQ	0.2307279	-2.009488	RG	Senegal	SEN	-2.922945	1.22404	BS
Eritrea	ERI	1.491732	-0.7232509	RG	Seychelles	SYC	4.586782	2.481271	SS
Estonia	EST	0.7858922	0.645864	SS	Sierra Leone	SLE	1.092072	1.563701	SS
Ethiopia	ETH	3.752935	0.1559497	SS	Singapore	SGP	1.536736	2.185811	SS
Fiji	FJI	2.135104	1.218069	SS	Slovak Republic	SVK	3.226547	1.237898	SS
Finland	FIN	1.087797	0.8174949	SS	Slovenia	SVN	1.045147	0.7859508	SS
France	FRA	0.6446909	1.033231	SS	Solomon Islands	SLB	0.8972141	1.363374	SS
Gabon	GAB	0.1785985	0.1416339	SS	Somalia	SOM	0.9436709	0.902099	SS
Gambia, The	GMB	0.7480783	0.8000428	SS	South Africa	ZAF	-0.0569726	0.9691247	BS
Georgia	GEO	0.6671757	-1.133397	RG	Spain	ESP	0.9669753	1.251554	SS
Germany	DEU	0.7277238	0.8669137	SS	Sri Lanka	LKA	0.5937425	1.8079	SS
Ghana	GHA	0.5223187	3.021719	SS	St. Kitts and Nevis	KNA	3.078436	-0.6681005	RG
Greece	GRC	0.507526	1.309593	SS	St. Lucia	LCA	1.891831	1.314647	SS
Grenada	GRD	2.131689	-1.688769	RG	St. Vincent a.t.G.	VCT	2.801851	1.230424	SS
Guatemala	GTM	0.9816805	2.409036	SS	Suriname	SUR	0.7908791	4.294554	SS
Guinea	GIN	3.02766	0.6029673	SS	Swaziland	SWZ	0.8331618	0.5383471	SS
Guinea-Bissau	GNB	-0.0574519	3.178331	BS	Sweden	SWE	1.232974	1.13457	SS
Guyana	GUY	1.080321	-4.072282	RG	Switzerland	CHE	2.212798	1.199884	SS
Haiti	HTI	1.526806	1.942528	SS	Syrian Arab Republic	SYR	0.5170503	0.0270647	SS
Honduras	HND	-2.032116	0.4365959	BS	Tajikistan	TJK	0.7931134	1.914901	SS
Hungary	HUN	0.7888801	1.147105	SS	Tanzania	TZA	1.388368	2.057197	SS
Iceland	ISL	1.776762	-0.0385831	RG	Thailand	THA	-0.1282902	1.006497	BS
India	IND	0.5133096	1.050892	SS	Togo	TGO	-0.4302815	0.9439659	BS
Indonesia	IDN	0.895091	1.026707	SS	Tonga	TON	0.9472539	1.251551	SS
Iran, Islamic Rep.	IRN	0.7208863	0.4182813	SS	Trinidad and Tobago	TTO	2.068586	3.401478	SS
Ireland	IRL	1.308741	1.148517	SS	Tunisia	TUN	1.411567	0.9099492	SS
Italy	ITA	0.6413171	0.751597	SS	Turkmenistan	TKM	0.7683823	0.0127108	SS
Jamaica	JAM	0.52425	1.804312	SS	Ukraine	UKR	0.6470553	1.715264	SS
Japan	JPN	1.096286	0.6384818	SS	United Arab Emirates	ARE	1.957766	-0.8659019	RG
Jordan	JOR	0.052767	0.8732054	SS	United Kingdom	GBR	0.1278224	1.562778	SS
Kazakhstan	KAZ	1.16123	1.733456	SS	United States	USA	5.573103	-0.9449229	RG
Kenya	KEN	0.5709717	2.413076	SS	Uruguay	URY	1.658612	1.023423	SS
Kiribati	KIR	0.2149733	0.8677132	SS	Vanuatu	VUT	1.020041	0.4209128	SS
Korea, Rep.	KOR	0.7153754	1.275431	SS	Venezuela, RB	VEN	1.90559	0.5139863	SS
Kuwait	KWT	0.8671731	-0.1706767	RG	Zimbabwe	ZWE	0.9426031	-19.79036	RG
Lao PDR	LAO	0.7874627	-0.2248608	RG					

Note.- Coefficients for 'Established Graduates' (EG), 'Back to School'(BS), 'Still in School' (SS) and 'Recent Graduates' (RG)

Table 4: OLS: Real Government Expenditures Pro-cyclicality and qualitative indicators.(DV: Coeff. a)

	(1)	(2)	(3)	(4)	(5)
Variable	**b/se**	**b/se**	**b/se**	**b/se**	**b/se**
Control of Corruption	0.308	0.903*	-0.168	0.521	0.487
	(0.326)	(0.440)	(0.254)	(0.514)	(0.313)
Democracy	0.0111				
	(0.0484)				
Democracy × Control of Corruption	-0.0284				
	(0.0405)				
Government Effectiveness		-0.743			
		(0.428)			
Government Effectiveness × Control of Corruption		-0.0918			
		(0.118)			
Political Stability			0.402		
			(0.254)		
Political Stability × Control of Corruption			0.0112		
			(0.170)		
Rule of Law				-0.319	
				(0.485)	
Rule of Law × Control of Corruption				-0.144	
				(0.134)	
Regulatory Quality					-0.298
					(0.302)
Regulatory Quality × Control of Corruption					-0.198
					(0.136)
N	140	166	166	166	166
F	0.551	1.513	1.546	0.775	1.184
RMSE	1.316	1.538	1.538	1.549	1.543

Standard errors in parentheses

Table 5: OLS: Real Government Expenditures Pro-cyclicality and qualitative indicators.(DV: Coeff. b)

	(1)	(2)	(3)	(4)	(5)
Variable	**b/se**	**b/se**	**b/se**	**b/se**	**b/se**
Control of Corruption	-0.476*	0.0633	-0.368	-0.522	0.0347
	(0.230)	(0.339)	(0.195)	(0.393)	(0.240)
Democracy	0.0170				
	(0.0342)				
Democracy × Control of Corruption	0.0527				
	(0.0286)				
Government Effectiveness		-0.231			
		(0.329)			
Government Effectiveness × Control of Corruption		0.119			
		(0.0910)			
Political Stability			0.329		
			(0.195)		
Political Stability × Control of Corruption			0.174		
			(0.131)		
Rule of Law				0.379	
				(0.371)	
Rule of Law × Control of Corruption				0.151	
				(0.102)	
Regulatory Quality					-0.169
					(0.232)
Regulatory Quality × Control of Corruption					0.0736
					(0.104)
adj. R^2	0.009	-0.001	0.004	-0.000	-0.006
Mrg. eff.	-0.476	0.0633	-0.368	-0.522	0.0347
S-E	0.230	0.339	0.195	0.393	0.240

Standard errors in parentheses

Mrg. eff.: Marginal effects of coefficients

S-E: standard error of the Mrg. eff..

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6: OLS: Fiscal variable pro-cyclicality and qualitative indicators with polarization (DPI). (DV: Coeff. a)

	(1)	(2)	(3)	(4)	(5)
Variable	**b/se**	**b/se**	**b/se**	**b/se**	**b/se**
Polarization	0.211	0.449	0.324	0.412	0.299
	(0.730)	(0.493)	(0.480)	(0.488)	(0.503)
Control of Corruption	0.323	0.559	0.0327	0.635	0.206
	(0.329)	(0.404)	(0.239)	(0.484)	(0.285)
Democracy	0.000854				
	(0.0686)				
Democracy × Control of Corruption	-0.0300				
	(0.0408)				
Government Effectiveness		-0.455			
		(0.396)			
Government Effectiveness × Control of Corruption		-0.0235			
		(0.103)			
Political Stability			0.115		
			(0.242)		
Political Stability × Control of Corruption			-4.424		
			(4.343)		
Rule of Law				-0.498	
				(0.466)	
Rule of Law × Control of Corruption				-0.0796	
				(0.114)	
Regulatory Quality					-0.0470
					(0.285)
Regulatory Quality × Control of Corruption RQxCC					-0.0950
					(0.119)
adj. R^2	-0.016	-0.004	-0.010	-0.005	-0.009

Table 7: OLS: Fiscal variable pro-cyclicality and qualitative indicators with political competition(Polity IV). (DV: Coeff. a)

	(1)	(2)	(3)	(4)	(5)
Variable	**b/se**	**b/se**	**b/se**	**b/se**	**b/se**
Political Competition	-0.0265	0.00633	-0.00507	0.00450	-0.0142
	(0.0909)	(0.0562)	(0.0532)	(0.0542)	(0.0564)
Control of Corruption	0.304	0.349	0.0760	0.512	0.0722
	(0.331)	(0.432)	(0.252)	(0.528)	(0.302)
Democracy	0.0269				
	(0.0837)				
Democracy × Control of Corruption	-0.0267				
	(0.0410)				
Government Effectiveness		-0.222			
		(0.432)			
Government Effectiveness × Control of Corruption		-0.0175			
		(0.109)			
Political Stability			0.0972		
			(0.268)		
Political Stability × Control of Corruption			-0.0357		
			(0.153)		
Rule of Law				-0.360	
				(0.516)	
Rule of Law × Control of Corruption				-0.0695	
				(0.120)	
Regulatory Quality					0.133
					(0.307)
Regulatory Quality × Control of Corruption					-0.0717
					(0.124)
adj. R^2	-0.016	-0.017	-0.016	-0.015	-0.013

Table 8: OLS: Fiscal variable pro-cyclicality and qualitative indicators with polarization (DPI). (DV: Coeff. a)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Variable	**b/se**	**b/se**	**b/se**	**b/se**	**b/se**	**b/se**	**b/se**	**b/se**	**b/se**	**b/se**
Polarization	0.356	0.430	0.364	0.377	0.363	0.235	0.307	0.467	0.241	0.531
Control of Corruption	0.270	-0.140	0.00846	-0.107	-0.0849	-0.177	0.260	0.283	-0.628	0.243
	(0.376)	(0.676)	(0.384)	(0.572)	(0.355)	(0.429)	(0.824)	(0.440)	(0.624)	(0.654)
Freedom from Corruption	-0.0190									
	(0.00984)									
Freedom from Corruption × Control of Corruption	0.00383									
	(0.00459)									
Economic Freedom		-0.00918								
		(0.0168)								
Economic Freedom × Control of Corruption		0.00447								
		(0.00934)								
Financial Freedom			-0.00147							
			(0.00853)							
Fiscal Freedom × Control of Corruption			0.00133							
			(0.00580)							
Fiscal Freedom				-0.00309						
				(0.0102)						
Fiscal Freedom × Control of Corruption				0.00233						
				(0.00745)						
Freedom from Government					-0.00222					
					(0.00603)					
Freedom from Government × Control of Corruption					0.00227					
					(0.00547)					
Investment Freedom						0.00573				
						(0.00935)				
Investment Freedom × Control of Corruption						0.00334				
						(0.00659)				
Monetary Freedom							-0.000248			
							(0.0131)			
Monetary Freedom × Control of Corruption							-0.00237			
							(0.00961)			
Property Rights								-0.0196		
								(0.0106)		
Property Rights × Control of Corruption								0.00250		
								(0.00525)		
Trade Freedom									0.0138	
									(0.0120)	
Trade Freedom × Control of Corruption									0.00894	
									(0.00876)	
Freedom to Trade Internationally										0.247
										(0.129)
Freedom to Trade Internationally × Control of Corruption										-0.0432
										(0.0884)
adj. R^2	0.012	-0.015	-0.019	-0.018	-0.018	-0.016	-0.019	0.008	-0.005	0.029
Mrg. eff.	0.356	0.430	0.364	0.377	0.363	0.235	0.307	0.467	0.241	0.531
S-E	0.505	0.526	0.547	0.530	0.519	0.537	0.515	0.510	0.521	0.579

Standard errors in parentheses

Mrg. eff.: Marginal effects of coefficients

S-E: standard error of the Mrg. eff..

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 9: OLS: Fiscal variable pro-cyclicality and qualitative indicators with political fragmentation. (DV: Coeff. b)

	(1)	(2)	(3)	(4)	(5)
Variable	**b/se**	**b/se**	**b/se**	**b/se**	**b/se**
Political fragmentation	0.210	0.0692	0.0745	0.0692	0.0446
	(0.180)	(0.193)	(0.189)	(0.189)	(0.187)
Control of Corruption	-1.734	-0.479	-0.120	-0.674	0.0810
	(2.391)	(0.516)	(0.204)	(0.503)	(0.323)
Democracy	-0.00575				
	(0.0582)				
Democracy × Control of Corruption	0.177				
	(0.239)				
Government Effectiveness		0.280			
		(0.494)			
Government Effectiveness × Control of Corruption		0.155			
		(0.143)			
Political Stability			-0.160		
			(0.215)		
Political Stability × Control of Corruption			0.210		
			(0.152)		
Rule of Law				0.501	
				(0.467)	
Rule of Law × Control of Corruption				0.192	
				(0.164)	
Regulatory Quality					-0.424
					(0.285)
Regulatory Quality × Control of Corruption					0.123
					(0.177)
adj. R^2	-0.035	-0.049	-0.026	-0.022	-0.010

Standard errors in parentheses

Table 10: Robustness: Panel Data F-E Logit estimates: debt access in Developing and Emerging countries.(DV: d_i)

	(1)	(2)
GDP per capita	-0.952	-1.950
	(-0.40)	(-0.26)
GDP growth rate	-4.200	-19.67
	(-1.57)	(-0.93)
Inflation rate	-6.438**	-22.23*
	(-3.28)	(-2.39)
Gross domestic investment as share of GDP	0.358	1.057
	(0.43)	(0.28)
Debt service on external debt	0.477	1.743
	(0.38)	(0.32)
Debt service to GDP	-1.042	-0.781
	(-0.80)	(-0.14)
Control of Corruption	0.863	-1.196
	(0.70)	(-0.28)
Government Effectiveness	-0.0983	2.717
	(-0.09)	(0.60)
Democracy	0.406	-0.0655
	(1.64)	(-0.20)
Obs.	274	115
Obs. per group	29	11
Log-lik.	-68.46	-22.36
χ^2	40.07	30.70

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 11: Ideological Complexion of Government (ICG) and Political Fractionalisation(PFRAC)

	Type of Government (ToG)						Complexion of Government & Parliament (CGP)						
Country	**1**	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**ICG**	**PFRAC**
Australia	32.59%	55.25%	12.00%	0.00%	0.16%	0.00%	7.82%	59.59%	0.00%	32.59%	0.00%	1.5016113	0.8543292
Austria	25.54%	65.64%	6.37%	2.46%	0.00%	0.00%	0.00%	11.36%	6.56%	82.08%	0.00%	2.8315350	0.9849362
Belgium	6.06%	78.07%	13.25%	0.58%	0.30%	1.73%	0.00%	19.39%	29.38%	51.23%	0.00%	2.08412217	0.832342483
Bulgaria	45.21%	29.50%	0.00%	8.31%	0.00%	4.12%	0.00%	29.50%	53.66%	16.84%	0.00%	1.60138889	1.226599706
Canada	84.50%	0.00%	0.00%	15.50%	0.00%	0.00%	14.57%	10.84%	74.59%	0.00%	0.00%	1.41822465	0.918876627
Croatia	48.38%	0.00%	16.25%	26.30%	9.07%	0.00%	0.00%	74.68%	16.25%	9.07%	0.00%	1.32545322	0.785516861
Cyprus	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.24107143	0.742509225
Czech Republic	0.00%	56.10%	0.00%	29.29%	14.61%	0.00%	0.00%	44.60%	28.51%	26.89%	0.00%	1.2045	0.943202288
Denmark	0.00%	11.55%	0.00%	35.03%	53.42%	0.00%	0.00%	44.83%	0.00%	55.17%	0.00%	1.42268986	1.526586002
Estonia	0.00%	72.63%	0.00%	1.93%	22.31%	0.00%	0.00%	77.17%	22.83%	0.00%	0.00%	1.18481848	0.581760088
Finland	0.00%	13.45%	68.02%	8.73%	4.32%	0.00%	0.00%	7.56%	29.52%	61.08%	0.00%	1.925	0.949588658
France	5.24%	8.71%	70.95%	7.72%	6.75%	0.00%	7.68%	55.77%	5.20%	18.15%	5.01%	1.30645161	0.342361371
Germany	2.44%	84.35%	11.97%	0.00%	0.00%	0.00%	0.00%	7.24%	51.98%	40.78%	0.00%	1.89098636	1.34905068
Greece	66.94%	6.10%	5.13%	6.10%	0.10%	0.00%	16.36%	32.00%	6.63%	30.07%	0.00%	1.27666667	0.876303241
Hungary	0.00%	25.66%	74.34%	0.00%	0.00%	0.00%	0.00%	25.83%	49.39%	0.00%	24.77%	1.78106132	0.896817156
Iceland	0.00%	92.78%	5.26%	1.96%	0.00%	0.00%	0.00%	55.61%	27.53%	16.86%	0.00%	1.64565581	0.848903081
India	60.04%	1.52%	16.89%	8.01%	11.00%	0.00%	0.00%	10.00%	79.00%	11.00%	0.00%	1.54033928	1.051065463
Ireland	27.81%	30.83%	0.00%	16.10%	25.26%	0.00%	0.00%	40.25%	56.51%	3.24%	0.00%	1.41869518	0.910114956
Israel	0.00%	23.73%	63.86%	0.00%	6.09%	0.00%	0.00%	24.91%	27.27%	46.42%	0.00%	2.14333333	0.944528409
Italy	0.00%	10.80%	52.76%	14.40%	16.95%	0.00%	0.00%	18.88%	50.13%	28.77%	0.00%	1.65916723	1.191307024
Japan	56.95%	1.66%	29.51%	10.43%	1.45%	0.00%	5.01%	87.71%	7.28%	0.00%	0.00%	1.12193947	0.429851555
Latvia	0.00%	19.55%	49.94%	0.00%	30.50%	0.00%	0.00%	13.58%	86.42%	0.00%	0.00%	1.62125	0.886480375
Lithuania	29.15%	44.14%	21.66%	0.00%	5.05%	0.00%	0.00%	15.68%	18.16%	66.16%	0.00%	1.74468085	1.212855022
Luxembourg	0.00%	97.83%	2.17%	0.00%	0.00%	0.00%	0.00%	42.77%	48.58%	8.66%	0.00%	1.83302838	0.660443294
Macedonia, FYR	0.00%	32.50%	63.67%	0.00%	3.82%	0.00%	0.00%	0.00%	10.54%	23.57%	0.00%	2.79166667	0.687609375
Malta	90.30%	0.00%	0.00%	9.70%	0.00%	0.00%	12.41%	32.20%	13.18%	42.21%	0.00%	1.5647843	1.19459501
Netherlands	0.00%	50.96%	44.81%	0.00%	1.04%	0.00%	0.00%	46.40%	30.88%	22.72%	0.00%	1.57894737	0.733517567
New Zealand	83.81%	4.06%	0.00%	2.16%	9.96%	0.00%	5.22%	58.90%	0.00%	35.88%	0.00%	1.49604996	0.95630707
Norway	26.45%	13.16%	0.00%	45.40%	14.99%	0.00%	0.00%	25.19%	5.70%	69.11%	0.00%	1.40419454	1.518086679
Poland	0.00%	46.48%	24.49%	12.88%	15.55%	0.60%	0.00%	41.21%	8.01%	50.78%	0.00%	1.49207161	0.992941729
Portugal	49.22%	20.66%	0.00%	25.41%	0.00%	1.48%	0.00%	57.04%	10.44%	27.81%	0.00%	1.40690967	0.968721943
Romania	6.94%	8.52%	26.65%	41.19%	16.47%	0.23%	0.00%	23.76%	55.23%	21.01%	0.00%	1.545574	0.959156885
Slovak Republic	0.00%	64.16%	28.25%	7.59%	0.00%	0.00%	0.00%	25.88%	74.12%	0.00%	0.00%	1.53066667	0.873739259
Slovenia	0.00%	57.31%	38.64%	0.00%	4.05%	0.00%	0.00%	36.43%	59.52%	4.05%	0.00%	1.69753086	0.991191739
Spain	41.03%	0.00%	0.00%	58.97%	0.00%	0.00%	0.00%	35.03%	14.85%	50.12%	0.00%	1.55685714	1.294401546
Sweden	6.75%	16.20%	0.00%	69.74%	7.32%	0.00%	0.00%	11.07%	3.96%	84.97%	0.00%	1.41071445	1.794371807
Switzerland	0.00%	9.50%	90.50%	0.00%	0.00%	0.00%	0.00%	9.50%	90.50%	0.00%	0.00%	2.52752701	0.191102139
Turkey	52.96%	26.97%	3.59%	11.06%	0.89%	1.17%	18.83%	10.57%	58.68%	11.32%	0.00%	2.05	0.946175598
United Kingdom	99.00%	0.00%	0.00%	1.00%	0.00%	0.00%	0.00%	56.03%	0.00%	43.97%	0.00%	1.71754113	1.193448501

ToG 1 =

Single Party Government: one party takes all government seats.
2 = Minimal Winning Coalition: all participating parties are necessary to form the government.
3 = Surplus Coalition: this comprises those coalition governments, which exceed the minimal-winning criterion.
4 = Single Party Minority Government: the party in government does not possess a majority in Parliament.
5 = Multi Party Minority Government: the parties in government do not possess a majority in Parliament.
6 = Caretaker Government: the government formed is not intended to undertake any kind of serious policy-making, but is only minding the shop temporarily.
CGP
1 = Right-wing dominance (share of seats in Government and supporting parties in Parliament larger than 66.6 per cent)
2 = Right-Centre complexion (share of seats of Right and Centre parties in Government and supporting parties between 33.3 and 66.6 per cent each)
3 = Balanced situation (share of Centre larger than 50 per cent in Government and in Parliament; or if Left and Right form a government together not dominated by one side or the other)
4 = Left-Centre complexion (share of seats of Left and Centre parties in Government and supporting parties between 33.3 and 66.6 per cent each)
5 = Left-wing dominance (share of seats in Government and supporting parties in Parliament larger than 66.6 per cent)
1. Values are approximated. As percentage of time duration in government, 1960-2008. Source: Woldendorp,J., Keman, H. & Budge, I., 2011.

Table 12: Definition of variables

Variable	Source
Democracy (Freedom House/Imputed Polity) Scale ranges from 0-10 where 0 is least democratic and 10 most democratic.	Freedom House http://www.freedomhouse.org
Political Stability - combines several indicators which measure perceptions of the likelihood that the government in power will be destabilized or overthrown by possibly unconstitutional and/or violent means, including domestic violence and terrorism. Government Effectiveness -combines into a single grouping responses on the quality of public service provision, the quality of the bureaucracy, the competence of civil servants, the independence of the civil service from political pressures, and the credibility of the government's commitment to policies. The main focus of this index is on "inputs" required for the government to be able to produce and implement good policies and deliver public goods.	
Regulatory Quality - includes measures of the incidence of market-unfriendly policies such as price controls or inadequate bank supervision, as well as perceptions of the burdens imposed by excessive regulation in areas such as foreign trade and business development. Rule of Law - includes several indicators which measure the extent to which agents have confidence in and abide by the rules of society. These include perceptions of the incidence of crime, the effectiveness and predictability of the judiciary, and the enforceability of contracts. Together, these indicators measure the success of a society in developing an environment in which fair and predictable rules form the basis for economic and social interactions and the extent to which property rights are protected. Control of Corruption - measures perceptions of corruption, conventionally defined as the exercise of public power for private gain. The particular aspect of corruption measured by the various sources differs somewhat, ranging from the frequency of "additional payments to get things done", to the effects of corruption on the business environment, to measuring "grand corruption" in the political arena or in the tendency of elite forms to engage in "state capture".	WB Gov. Indicators http://www.govindicators.org
Economic Freedom Index The Economic Freedom index uses 10 specific freedoms, some as composites of even further detailed and quantifiable components: Business freedom , Trade freedom, Fiscal freedom, Freedom from government, Monetary freedom, Investment freedom, Financial freedom, Property rights, Freedom from corruption, and Labor freedom. Each of these freedoms is weighted equally and turned into an index ranging from 0 to 100, where 100 represents the maximum economic freedom. Although changes in methodology have been undertaken throughout the measurement period, continuous backtracking has been used to maximize comparability over time. Business Freedom The business freedom score encompasses 10 components, all weighted equally, based on objective data from the World Bank's Doing Business study (in 2005-2006; a previously other data sources were being used): Starting a business - procedures (number) Starting a business - time (days) Starting a business - cost (% of income per capita) Starting business - minimum capital (% of income per capita) Obtaining a license - procedures (number) Obtaining a license - time (days) Obtaining a license - cost (% of income per capita) Closing a business - time (years) Closing a business - cost (% of estate) Closing a business - recovery rate (cents on the dollar) Each of these raw components is converted into a scale graded from 0 to 100, where 100 represents the maximum degree of business freedom. Trade Freedom The trade freedom score is based on two inputs: The trade-weighted average tariff rate Non-tariff barriers (NTBs) Weighted average tariffs is a purely quantitative fifth measure and accounts for the basic calculation of the score. The presence of NTBs in a country affects its trade freedom score by incurring a penalty of up to 20 percentage points, or one-of the maximum score. The country's trade freedom ranges between 0 and 100, where 100 represents the maximum degree of trade freedom. Fiscal Freedom Fiscal freedom is composed of three quantitative components in equal measure: The top tax rate on individual income The top tax rate on corporate income Total tax revenue as a percentage of GDP In scoring the fiscal freedom factor, each of these numerical variables is weighted equally as one-third of the factor. This equal weighting allows a country achieve a score as high as 67 percent based on two of the components even if it receives a score of 0 percent on the third. The country's fiscal freedom ranges between 0 and 100, where to100 represents the maximum degree of fiscal freedom. Freedom from Government Scoring of the freedom from government factor is based on two components: Government expenditure as a percentage of GDP Revenues generated by state-owned enterprises (SOEs) and property as a percentage of total government revenue. Government expenditure as a percentage of GDP is weighted as two-thirds of the freedom from government factor score, and revenue from SOEs is weighted as one third. In cases where SOE data does not exist, the data is excluded from the factor score. The country's freedom from government ranges between 0 and 100, where 100 represents the maximum degree of freedom from government. Monetary Freedom The score for the monetary freedom factor is based on two components: The weighted average inflation rate for the three most recent years Price controls. The weighted average inflation (WAI) rate for the three most recent years serves as the primary input into an equation that generates the base score for monetary freedom (MF). The extent of price controls is then assessed as a penalty of up to 20 percent subtracted from the base score. The country's monetary freedom ranges between 0 and 100, where 100 represents the maximum degree of monetary freedom. Investment Freedom This factor scrutinizes each country's policies toward foreign investment, as well as its policies toward capital flows internally, in order to determine its overall investment climate. The country's investment freedom ranges between 0 and 100, where 100 represents the maximum degree of investment freedom. Financial Freedom The financial freedom factor measures the relative openness of each country's banking and financial system by determining: the extent of government regulation of financial services; the extent of state intervention in banks and other financial services; the difficulty of opening and operating financial services firms (for both domestic and foreign individuals); and government influence on the allocation of credit. The country's financial climate is measured as an overall score between 0 and 100, where 100 represent the maximum degree of financial freedom Property Rights This factor scores the degree to which a country's laws protect private property rights and the degree to which its government enforces those laws. It also accounts for the possibility that private property will be expropriated. In addition, it analyses the independence of the judiciary, the existence of corruption within the judiciary, and the ability of individuals and businesses to enforce contracts. The less certain the legal protection of property is and the greater the chances of government expropriation of property are, the higher a country's score is. The country's property rights score ranges from 0 and 100, where 100 represents the maximum degree of protection.	Heritage Foundation http://www.heritage.org/index/
Teorell, Jan, Marcus Samanni, Soren Holmberg and Bo Rothstein. 2011. The Quality of Government Dataset, version 6Apr11. University of Gothenburg: The Quality of Government Institute, http://www.qog.pol.gu.se.	

Table 13: Correlation of variables: Oprobit OLS specification (Coeff. a)

	CC	pfrag	DEM	GE	PS	RL	RQ
CC	1						
pfrag	0.1802	1					
DEM	0.724	0.0396	1				
GE	0.983	0.1441	0.7765	1			
PS	0.6848	0.0689	0.4788	0.6905	1		
RL	0.98	0.1367	0.7887	0.9849	0.7003	1	
RQ	0.9043	0.119	0.7176	0.9171	0.7249	0.8995	1

Table 14: Correlation of variables: Oprobit OLS specification (Coeff. b)

	CC	pfrag	DEM	GE	PS	RL
CC	1					
pfrag	0.3659	1				
DEM	-0.2264	0.1802	1			
GE	0.5054	0.724	0.0396	1		
PS	0.4104	0.983	0.1441	0.7765	1	
RL	0.4378	0.6848	0.0689	0.4788	0.6905	1

Table 15: Correlation of variables: Oprobit OLS specification (Coeff. a)

	CC	pfrag	FC	EF	FF	GF	FG	IF	MF	PR	TF	FTI
CC	1											
pfrag	0.112	1										
FC	0.9481	0.0101	1									
EF	0.8187	-0.1389	0.8106	1								
FF	0.5139	-0.079	0.4888	0.7779	1							
GF	-0.4504	-0.4022	-0.4665	-0.1238	-0.0914	1						
FG	-0.3931	-0.351	-0.3808	-0.0306	0.0105	0.7514	1					
IF	0.4444	0.0729	0.4177	0.6352	0.6246	-0.2368	-0.1882	1				
MF	0.79	0.0282	0.7487	0.7215	0.3749	-0.3419	-0.3682	0.3253	1			
PR	0.9005	0.0039	0.861	0.8671	0.5431	-0.3923	-0.303	0.4966	0.7993	1		
TF	0.2877	-0.1418	0.3638	0.5163	0.4145	-0.0524	-0.1006	0.4979	0.1202	0.2897	1	
FTI	0.5346	0.0162	0.5736	0.6621	0.6476	-0.3345	-0.3341	0.7068	0.5088	0.5253	0.5184	1

Table 16: Correlation of variables: Oprobit OLS specification (Coeff. b)

	CC	pfrag	FC	EF	FF	GF	FG	IF	MF	PR	TF
CC	1										
pfrag	0.2852	1									
FC	-0.163	0.112	1								
EF	0.3068	0.9481	0.0101	1							
FF	0.3742	0.8187	-0.1389	0.8106	1						
GF	0.3243	0.5139	-0.079	0.4888	0.7779	1					
FG	-0.0523	-0.4504	-0.4022	-0.4665	-0.1238	-0.0914	1				
IF	-0.0437	-0.3931	-0.351	-0.3808	-0.0306	0.0105	0.7514	1			
MF	0.0851	0.4444	0.0729	0.4177	0.6352	0.6246	-0.2368	-0.1882	1		
PR	0.4405	0.79	0.0282	0.7487	0.7215	0.3749	-0.3419	-0.3682	0.3253	1	
TF	0.3493	0.9005	0.0039	0.861	0.8671	0.5431	-0.3923	-0.303	0.4966	0.7993	1

Appendix B

The VAR lag-order information selection criterion.-

The log-likelihood of the VAR(p) model is:

$$LL = \left(\frac{t}{2}\right)\left\{\ln\left|\hat{\Sigma}^{-1}\right| - k\,\ln(2\pi) - k\right\} \tag{1}$$

where $\hat{\Sigma}$ is the maximum likelihood estimate of $E\left[\varepsilon_{1\mathbf{t}}, \varepsilon_{2\mathbf{t}}\right]$as defined in section 4.2.1. The log-likelihood can be rewritten as:

$$LL = -\left(\frac{t}{2}\right)\left\{\ln\left|\hat{\Sigma}\right| - k\,\ln(2\pi) - k\right\} \tag{2}$$

as

$$\ln\left|\hat{\Sigma}^{-1}\right| = \ln\left|\hat{\Sigma}\right|$$

. Assuming that *LL(j) is the value of the log-likelihood with j lags, yielding the LR statistic for lag order j as* $LR(j) = 2\left\{LL(j) - LL(j-1)\right\}$. *Using the LS estimator with degrees of freedom adjustment* $\Sigma_{\hat{F}}(1) = \frac{t}{t+kp+1}\Sigma_{\varepsilon}$ *and the resulting criterion called final prediction error (FPE) (Lütkepohl (2005)):*

$$FPE(p) = \left|\tilde{\Sigma}_{\varepsilon}(p)\right|\left[\frac{t+kp+1}{t-kp-1}\right]^{k} \tag{3}$$

Assuming that there is a constant in the model and none of the variables is dropped because of multicollinearity, the FPE is implemented as

$$FPE = |\mathbf{\Sigma}_\varepsilon| \left[\frac{t+\bar{p}}{t-\bar{p}}\right]^k \tag{4}$$

the Akaike Information Criterion (AIC), Schwarz Bayesian Information Criterion (SBIC) and the Hannan-Quinn Information Criterion(HQIC) are:

$$AIC = \ln|\mathbf{\Sigma}_\varepsilon| + \frac{2pk^2}{t} \tag{5}$$

$$SBIC = \ln|\mathbf{\Sigma}_\varepsilon| + \frac{\ln(t)pk^2}{t}$$

$$HQIC = \ln|\mathbf{\Sigma}_\varepsilon| + \frac{2\ln[\ln(t)]pk^2}{t}$$

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