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IS FISCAL
POLICY
SUSTAINABLE IN
DEVELOPING
ECONOMIES?*

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Abstract: This paper investigates fiscal policy sustainability in Peru, the Philippines, South Africa, Thailand, and Venezuela using competing methodologies. Standard unit roots and cointegration analyses do not endorse the validity of the intertemporal budget constraint. In contrast, to varying degree across-countries, alternative testing employing a fiscal policy reaction function indicates sustainability defined as surplus adjustments in response to higher debt to income ratios. Corresponding debt-dynamics analyses show that corrective measures were put in place to revert non-sustainable trends in government debt. However, ancillary variables in the debt modeling produce statistically weak evidence of procyclical fiscal behavior in the Latin American countries.

Key words: fiscal policy sustainability; fiscal policy reaction functions; developing countries.

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Tiivistelmä: Tutkimuksessa arvioidaan veropolitiikan kestävyttä Perussa, Filippiineillä, Etelä-Afrikassa, Thaimaassa ja Venezuelassa. Yksikköjuurten tai yhteisintegroituvuuden testeillä ei saatu tukea budjettirajoitteen pitävyydelle yli ajan. Lisäksi kestävyttä testattiin veropolitiikan reaktiofunktiolla, jossa kestävyys määritellään ylijäämäsopeutumiseksi velka-tulosuhteen muuttuessa. Testeissä havaittiin, että veropolitiikka olisi kestäväällä pohjalla. Vastaava velkasopeutuksen analyysi osoittaa, että maat reagoivat tarvittavalla tavalla velan kasvuun. Kuitenkin analyysiä täydentävät muuttujat osoittivat tilastollisesti heikkoa myötäsyklisyyttä latinalaisen amerikan veropolitiikassa.

Asiasanat: veropolitiikan kestävyys, veropolitiikan reaktiofunktiot, kehitysmaat

Summary

Measuring fiscal policy sustainability is fundamental, and for developed countries there is ample evidence on the topic. However, the literature on developing countries is more limited, and that is particularly so regarding investigations that contrast country experiences and implement alternative methodological approaches. And yet developing economies are prone to fiscal imbalances.

This paper contributes to the understanding of fiscal policy sustainability in developing countries. The investigation focuses on economies from Africa, Asia, and Latin America: Peru, the Philippines, South Africa, Thailand, and Venezuela. The research plan consists in recounting economic and fiscal policy developments in each of these countries, and in employing alternative empirical methods in testing fiscal sustainability.

The study finds that the benchmark condition for the government's budget surplus is not binding in Peru, the Philippines, South Africa, Thailand, and Venezuela. However, the investigation also applies Bohn's (1998) fiscal policy reaction function approach. Using this framework the behavior of budget surpluses indicates fiscal sustainability – albeit statistically weakly.

Additionally, debt-dynamics analyses show that corrective measures were put in place to revert non-sustainable trends in debt to GDP ratios. Notably, the evidence backing fiscal sustainability in Thailand is particularly robust. In contrast, the results for the Philippines and South Africa are mixed, and rather weak for Peru and Venezuela. Moreover, the ancillary variables in the debt modeling produce statistically weak evidence of procyclical fiscal behavior in the Latin American countries.

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1. Introduction

Measuring fiscal policy sustainability is fundamental, and for developed countries there is ample evidence on the topic (Hamilton and Flavin, 1986; Trehan and Walsh, 1988; Ahmed and Rogers, 1995; Bohn, 1998; Afonso, 2005). But the literature on developing countries is more limited, and that is particularly so regarding investigations that contrast country experiences and implement alternative methodological approaches. Yet developing economies are prone to fiscal imbalances.

In recent history this vulnerability has been exacerbated by various adverse developments. These include the 1970s oil price shocks, and the international debt crisis, credit crunch, and worsening in commodity prices in the early 1980s. Consequently, many developing countries found themselves in unsustainable fiscal positions and requested assistance from the international financial institutions. And this implied that they had to pursue fiscal budget restraining policies and structural adjustment. More generally, a plethora of idiosyncratic obstacles, like highly concentrated tax systems and expenditure rigidities, complicate developing countries' efforts to consolidate their fiscal positions (Burgess and Stern, 1993).

This paper contributes to the understanding of fiscal policy sustainability in developing countries. The investigation focuses on economies from Africa, Asia, and Latin America. Namely Peru, the Philippines, South Africa, Thailand, and Venezuela. The research plan consists in recounting economic and fiscal policy developments in each of these countries, and in employing alternative empirical methods in testing fiscal sustainability.

This approach facilitates answering the following country-specific policy questions. What are the main challenges developing economies face in achieving fiscal sustainability? If so, under what circumstances did reforming institutions and policies progress? Can empirical modeling generate evidence of corrective fiscal actions in response to an increasing debt to GDP ratio?

The paper proceeds as follows. Section 2 relates economic and fiscal policy developments in Peru, the Philippines, South Africa, Thailand, and Venezuela. Section 3 explains the standard fiscal sustainability condition for the government's fiscal surplus and Bohn's fiscal policy reaction function approach. In so doing it emphasises qualifications to have in mind when applying these methodologies to developing countries. Section 4 carries out the empirical modelling. Section 5 provides concluding remarks.

2. Macroeconomic and fiscal policy background

2.1 Peru

Peru's recent economic history is marked by political and economic instability. During the 1970s expansionary fiscal policy led to serious imbalances. The fiscal position was, however, brought under control by the end of the decade partially aided by favorable export commodities prices. But despite this improving scenario the economy further deteriorated in the early 1980s. Particularly, macroeconomic imbalances, the debt crisis, adverse international economic conditions, and the damaging impact inflicted by natural phenomena (like El Niño) resulted in declining output at the beginning of the decade.

President Alan Garcia's administration main task during 1985 and 1986 was designing and implementing a heterodox stabilization plan (Lago, 1991). It focused on, inter alia, boosting aggregate demand through increases in real wages and subsidies and via decreases in taxes. Also, the exchange rate was devalued, but kept at the official rate soon after. In fact, later on differentiated exchange rates for imports and for exports were put in place. This multiple exchange-rate system would later cost the administration dearly, not least in terms of the resulting central bank losses.

These policies had an initial net expansionary impact, mainly reflected in higher GDP growth. But the exchange rate policy led to currency overvaluation, alongside a deteriorating fiscal stance. The outcome was recession at the end of the 1980s. And so in 1988 the government embarked on a further stabilization attempt. This fresh plan devalued the currency, and focused on addressing the new policies' social impact. Nonetheless, 1988 saw contracting output, a depreciating exchange rate, and a ballooning rate of inflation. Tight monetary and fiscal policies ensued, alongside the pressure from social unrest. Regardless of these efforts there was hyperinflation from 1988 – largely arising from the monetization of the large fiscal imbalances.

Subsequently, in tandem with similar developments across Latin America, the 1990s brought a series of wide-ranging structural reforms, and a new stabilization strategy. Trade liberalization, fiscal reform, privatization, and public sector restructuring were at the heart of the reforms programme. In spite of these reforming efforts, further contraction followed the 1990s stabilization programme. But from 1993 onwards output picked-up and Peru's economy went on to display sustained economic growth in the next five years. This was largely a by-product of the structural reforms implemented earlier in the decade and of the tighter fiscal policy stance. These developments, alongside the implementation of an inflation targeting framework from 1997, consolidate Peru's tools for safeguarding macroeconomic stability.

2.2 The Philippines

The Philippines economy has somewhat lagged behind after implementing a relatively successful industrialization strategy in the 1960s. The 1970s and 1980s were marred by inflation and overall macroeconomic instability. Moreover, during the 1980s the Philippines faced a contracting economy from 1983 to 1985, eventually recovering during 1988. But this upturn was short-lived, and the economy contracted again in 1992. Fiscal policy is one factor at the heart of this boom-bust cycles. Actually, several authors document the low tax collection to GDP ratios in the Philippines. In contrast, other Asian economies, such as Malaysia and Thailand, have somewhat succeeded in achieving a more solid fiscal stance.

A major turning point for the Philippines' economy was the IMF-supported stabilization programme agreed in 1994. Parallel to this, giving independence to monetary policy was a remarkable advance. In fact, in 1993 a new Central Bank was established and replaced the old Central Bank of the Philippines. Notably, the latter became insolvent as a result of the 1980s private banking sector rescue effort. The 1997 Asian crisis was an early test for the newly created Central Bank, and in fact the Philippines stirred-through that problem somewhat successfully.

These developments should contribute to achieving a sound fiscal policy stance in the Philippines, tackling non-sustainable fiscal trends from its roots. To this end fiscal policy was also directly reformed by introducing a wide-ranging tax reform package. This package featured expanded value added tax and trade liberalization. Privatization of government-owned enterprises was a further element in the reforming endeavor.

But Lim and Montes (2002) document that even after introducing substantial policy reforms in the last twenty years the Philippines produce a weak economic performance. They attribute that to macroeconomic instability and to low saving rates. This highlights the fact that fiscal soundness is an important pre-condition for achieving overall macroeconomic stability and economic growth.

2.3 South Africa

South Africa displayed an increasing government debt during most of the 1970s. Yet this trend was successfully reverted from the end of that decade largely due to increasing government revenues from Gold mining. However, from the beginning of the 1980s the South African government went on to have an increasingly larger participation in economic activity. This was mainly reflected in expanding government expenditure and a correspondingly higher tax burden, which ultimately translated into an upward trending debt-GDP ratio.

In fact, until the mid-1990s South Africa's government debt was growing considerably. And this was the case even in the light of privatization, which was somehow disappointing in terms of revenue generation. But it is worth pointing out that several, somewhat exogenous, factors were at least partly responsible for

the observed fiscal outcomes. Amongst these were political and social change, economic contraction, and the government's limited leeway to implement restraining fiscal measures.

However, from 1994 South Africa embarked on a reforming agenda to secure its fiscal position (IMF, 2003). As a result the deficit has been reduced from roughly 9% of GDP in 1993 to less than 2% of GDP at the beginning of the 2000s. Achieving this fiscal outcome was made possible by improving tax collection (for instance, the South African revenue authority was granted administrative independence in 1997), and by reducing expenditure. Moreover, at the end of the 1990s South Africa formally adopted an inflation targeting monetary policy strategy. Crucially, adopting this approach demands fiscal soundness, which in turn endorses the government's overall commitment to macroeconomic stability.

2.4 Thailand

Thailand is a success story in Asia and across the developing world. Its economy has been performing strongly since the 1950s, mainly driven by a successful private-sector-focused industrial development strategy. However, the economy did suffer as a consequence of the second 1970s oil shock. In fact, Thailand ended up resorting to IMF assistance, and that was important in overcoming adverse developments in the prices of its key primary export commodities. The IMF package was duly linked to a reforming programme. In complying with the programme's conditionality, and within a wider-ranging development effort, from the mid-1980s Thailand privatized, embarked on trade liberalization, and reformed its fiscal and monetary policy institutions.

As a result the fiscal deficit that arose at the beginning of the decade was wiped-out, successfully curtailing a non-sustainable fiscal trend. And the deficit actually became a surplus by the end of the 1980s. These developments translated into higher economic growth and macroeconomic stability during most of the 1980s. Yet by the end of that decade Thailand's economy was facing new challenges. Particularly difficult was handling the large amount of inflowing capital during that period. This development led to latent inflationary pressures becoming a real threat to macroeconomic stability. Although they were somehow contained until the early 1990s, capital flows were at least partly responsible for the economy's collapse later during the decade.

Thailand recovered rather quickly from the floating of the Thai baht and from the resulting regional and global turmoil known as the Asian crisis. An IMF report (IMF, 2002) remarks that even after the country's economic crisis in 1997 its fiscal stance did not compare unfavorably to that of other emerging market economies. And, key to the analysis to be developed in this paper, the same study highlights Thailand's success in consolidating its debt and in generating fiscal surpluses during the decade before 1997. Achieving a positive fiscal stance was instrumental in weathering the uproar from the Asian crisis.

2.5 Venezuela

Venezuela's economic performance in the last two decades has been weak. This period has seen macroeconomic instability and deteriorating living standards in spite of, and arguably to some extent due to, the economy's oil abundance (Rodríguez and Sachs, 1999).¹ Lax fiscal policy management has likely exacerbated this weak performance. For instance, even though Venezuela did benefit from the oil price hikes of the 1970s the proceeds were mainly committed to financing fiscal shortcomings. In fact, Venezuela's economy has registered fiscal deficits almost continuously during the last three decades. And, as in the rest of Latin America, the 1980s brought adverse financial conditions that exacerbated the economy's underlying fragile position.

During the 1990s Venezuela suffered from unfavorable developments. These included declining oil prices, political unrest during 1992-1993, and a consequential banking crisis in 1994-1995. Still, fiscal policy consolidated in 1996, helped by a strongly performing oil sector. Additionally, in 1996 the country signed a stand-by agreement with the IMF, and contributed to improving economic conditions. But Venezuela's low non-oil fiscal proceeds linger as a major concern. That is why a major challenge for the economy is diversifying its revenue sources away from oil. However, resuming sustainable economic growth is essential before the non-oil economy can be successfully taxed.

¹ Hausmann and Rigobón (2003) advance alternative insights on resource rich economies.

3. Alternative tests of fiscal sustainability

3.1 *Benchmark intertemporal sustainability test*

The benchmark method for measuring fiscal sustainability involves an intertemporal analysis (Hamilton and Flavin, 1986). Essentially, for fiscal policy to be sustainable every deficit should be financed by a future surplus. So the standard equation for testing the government's budget surplus intertemporal sustainability can be written as

$$R = \lambda + \delta G + \varepsilon. \quad (1)$$

The hypotheses to be tested in (1) are that ε is stationary, and that $\delta = 1$. The economic implications of these hypotheses are that the government's expenditure (G) and revenue (R) move together in the long-run. Thus a sustainable fiscal policy is compatible with finding cointegration in Engle and Granger's (1987) sense. More precisely, if $\delta = 1$ all public expenditure will be financed by revenue and public debt will not be growing without bound (no-Ponzi-game condition). In contrast, if these variables are not cointegrated the gap between them will be growing indefinitely, and fiscal policy is not sustainable.

What stipulations should be made when applying this framework to developing countries? Probably the most important is that several revenue sources usually coexist. These include central bank financing, foreign debt issuance and other domestic sources such as commercial banks and trade credit. Thus capturing all potential revenue sources via equation (1) is unfeasible.

A further problem characterizing developing countries is the timing of tax collection. This feature is also known as the Olivera-Tanzi effect. It basically postulates that inflationary developments can erode the real value of fiscal revenues by the time of collection. But there are other factors to be considered, such as the Patinkin or reversed Olivera-Tanzi effect.

This sort of qualification should be pondered as one amongst a series of more structural features characterizing taxation in development as discussed by, inter alia, Burgess and Stern (1993). A third major concern when investigating equation (1) is that for most developing countries data is limited. And testing for cointegration ideally demands long-run time series data.

3.2 *Bohn's tests of fiscal sustainability*

Bohn's (1998) procedure allows determining if a government is taking corrective actions to comply with its intertemporal budget constraint by analyzing the relationship between the budget surplus (S/Y) and the debt to GDP (D/Y) ratios.

Bohn postulates that if (S/Y) reacts positively to (D/Y) this could be interpreted as a signal showing that the government is undertaking the necessary actions to achieve fiscal policy sustainability.

The relevant equation for analyzing the relationship between the surplus to GDP and the debt to GDP ratios can be written as

$$\left(\frac{S}{Y}\right)_t = \beta_0 + \beta_1 \left(\frac{D}{Y}\right)_{t-1} + \beta_2 GVAR_t + \beta_3 YVAR_t + \varepsilon_t. \quad (2)$$

In equation (2) the variables *GVAR* and *YVAR* should help in accounting for temporary government spending and business cycle factors, respectively. They derive from Barro's (1979) fiscal policy model.² Furthermore, controlling for these factors also helps in accounting for the potential impact of omitted variables. So it follows that in equation (2) β_1 should be positive if fiscal policy is complying with an intertemporal budget constraint, while β_2 and β_3 are expected to carry negative signs. That is, the surplus would decrease if the government is spending more than usual, or if the economy is contracting.

In addition to equation (2), Bohn (1998) suggests testing fiscal sustainability by investigating debt-dynamics. To this end he develops an augmented Dickey-Fuller-type regression such as

$$\left(\Delta \frac{D}{Y}\right)_t = \alpha_0 + \alpha_1 \left(\frac{D}{Y}\right)_{t-1} + \alpha_2 GVAR_t + \alpha_3 YVAR_t + \zeta_t. \quad (3)$$

Equation (3) measures if changes in the debt to GDP ratio (Δ is the difference operator) displays mean reversion, and this would imply that the government is complying with an intertemporal budget constraint. Consequently, in equation (3) α_1 is expected to be negative, whereas α_2 and α_3 should be positive.

Why could Bohn's approach be suitable in analyzing developing countries? Bohn's tests are somehow more flexible than the standard intertemporal analysis, as they only ask if a government is exercising the necessary actions to comply with the intertemporal budget constraint. Further, this approach does not demand any assumptions about interest rates, which also seems practical in modeling developing countries. In this regard Bohn argues that a positive response of the primary surplus to developments in the debt to income ratio conveys reliable information about fiscal sustainability in spite of how interest rates and growth rates compare.

Additionally, Bohn's tests have as an imperative controlling for cyclical economic fluctuations. He justifies this peculiarity by discussing the pitfalls from

² The variables *GVAR* and *YVAR* are constructed as in Barro (1986). The formulae are $GVAR: g_t - g_t^*/y_t$, and $YVAR: \left(1 - y_t/y_t^*\right) \bullet \left(g_t^*/y_t\right)$, where g and g^* are actual and long-term real government spending, while y and y^* are real potential and actual output, respectively.

analyzing a univariate time series of the debt to income ratio, which is particularly susceptible to economic shocks and fluctuations. Unquestionably, this qualification is vital for developing countries. That is the case because such economies tend to experience higher macroeconomic volatility than more advanced economies (Agènor, McDermott, and Prasad, 2000). Furthermore, the variables GVAR and YVAR help in improving the accuracy of the econometrics analyses.

4. Empirical modeling

4.1 Data

The econometric modeling that follow employ data on government revenue, expenditure, debt, output, prices, and population in calculating G , R , S/Y , D/Y , GVAR, and YVAR for each country in the sample. The data are annual for the period 1970-2000, and the sources are the World Bank's World Development Indicators and the International Monetary Fund's International Financial Statistics. Table A1 provides further details on the data.

4.2 Unit Roots and Cointegration Testing

In the following analyses G and R are expressed in (logs) real per capita terms. According to the Dickey-Fuller and Dickey-Fuller tests (Dickey and Fuller, 1979) in Table 1, G and R contain unit roots in their levels but become stationary after first-differencing. That is, they are integrated of order one [I (1)]. Further ahead the paper will be analyzing the time series properties of the remaining variables.

Table 1 also shows the results from analyzing equation (1) using Engle and Granger's (EG) (1987) cointegration test, as well as the long-run solutions to the corresponding autoregressive distributed lags (ADL) equations (Banerjee, Dolado, and Galbraith, 1993). For the ADL estimations the lag length was set to one. The residuals from the EG and the ADL regressions imply that the hypothesis of non-stationarity cannot be rejected for Peru, the Philippines, South Africa, Thailand, and Venezuela. That is, cointegrating relationships cannot be unveiled from these countries' regressions.

However, the evidence in section 2 suggests an effort to deliver sound fiscal management in most countries, and particularly in Thailand. So in checking the robustness of the EG and of the ADL regressions the paper moves on to applying Phillips and Hansen's (1990) fully modified OLS estimator (FM-OLS). Phillips and Hansen's econometric simulations show that in small samples the FM-OLS technique could have advantages over the traditional EG and ADL regressions. The outcomes from estimating equation (1) using this technique (not reported) corroborate the EG and ADL results showing that the no-Ponzi-Game condition is not binding in Peru, the Philippines, South Africa, Thailand, and Venezuela.³

4.3 Estimating Bohn's fiscal reaction functions

The paper moves on to applying Bohn's (1998) approach. This exercise measures (S/Y) as nominal government revenues minus expenditures (primary surplus)

³ Additional testing (not reported) cannot reject a unit root in the surplus to GDP ratios across our sample.

divided by nominal output, and $\left(\frac{D}{Y}\right)$ is the debt to GDP ratio for each country.⁴

Table 2 exhibits the results from estimating equation (2) using OLS, and reports t-ratios computed using heteroscedasticity and autocorrelation consistent standard errors.⁵ This analysis confirms the previous section's findings. That is, using this criterion fiscal policy does not appear to be sustainable (on average during 1972-2000) in Peru, the Philippines, South Africa, Thailand and Venezuela.

These countries' budget surpluses are not responding positively to increasing debt to GDP ratios, as hypothesized by Bohn (1998). In fact, for all the countries β_1 is negative; and for Peru, Thailand and Venezuela these coefficients double their standard errors. However, for the Philippines and for South Africa the coefficients are not statistically significant. Importantly, for all the countries the coefficients on GVAR and YVAR are negative – as predicted by Barro's tax-smoothing model- but not always statistically significant.

However, a caveat applies to the above modeling. And it is that from a policy perspective coefficients reflecting average behavior over a 30-year time span are only of limited value. They likely conceal important within sample developments. Gaining further insight may be possible by, for instance, estimating the recursive t-ratios corresponding to the crucial β_1 coefficients.

Figure 1 displays graphs containing such estimations. Thailand clearly stands out: even though its surplus did not systematically respond, on average, as predicted by Bohn it has done so after the mid-1980s. In fact, β_1 's recursive t-ratio increases consistently from the mid-1980s, rising above 2.5 by the end of the sample in 2000.

In contrast, South Africa did show significant and positive surplus reactions to increases in the debt to GDP ratio during the 1980s. But this pattern subsequently dies out, and β_1 actually turns out to be insignificant by the beginning of the 1990s. However, there are well-known reasons for this drift towards a non-sustainable fiscal path (see Section 2). The Philippines' β_1 shows a rather similar pattern to, but much less marked than, South Africa's.

Peru and Venezuela end the sample with negative β_1 t-ratios above two, albeit Venezuela's becomes negative before. Particularly, Peru's β_1 t-ratio is positive and marginally significant during the early and mid-1980s. And this behavior likely reflects efforts undertaken during this time to curtail the non-sustainable fiscal trend generated by the debt crisis.

⁴ South Africa's and Thailand's debt comprise the government's total domestic and foreign debt. Only the government's foreign debt is considered for the rest of the countries in the absence of time series on total debt.

⁵ The variables g^* and y^* are calculated by applying the Hodrick-Prescott filter to the original series assigning λ a value of 6.5 -as suggested by Ravn and Uhlig (2002) for annual data.

Debt-dynamics modeling follows, complementing the fiscal sustainability analysis so far. It is worth pointing-out that Barro's tax-smoothing model argues that it may not be sensible for a government to systematically run surpluses to pay-off debt. Undertaking such a policy implies temporarily higher taxes, and that goes against the tax-smoothing principle. However, if increasing debt to income ratios lead to, for instance, an increasing probability of default, there would be a disincentive for building-up abnormally high debt to income ratios.

Also, developing countries' common trigger-point for reversing unsustainable fiscal trends is the loss of market access caused by crises. Illustrating this fact, Latin American countries managed to somehow break-away from the 1980s debt predicament by restructuring part of its sizeable debt into trade able bonds (e.g. Brady bonds). And in many cases overcoming high debt-ratios involved pursuing fiscal restraint via the conditionality attached to IMF-supported stabilization programmes.

Examining the time series properties of the debt to GDP ratios starts the debt modeling exercise. The unit root tests in Table 3 reveal non-stationary debt to GDP ratios in all the countries excepting Thailand. These results are similar to Bohn's (1998) account on the U. S., and he stresses the fact that the non-rejection of a unit root in the debt to GDP ratio features prominently in the literature.

Consequently, estimating Bohn's equation (3) using the paper's sample should help in further illuminating these results. Interestingly, Table 3 shows that for all the economies in our sample fiscal policy seems to be sustainable in Bohn's sense. That is, there is mean reversion in the debt to GDP ratio, as evidenced by the negative coefficient on $(D/Y)_{t-1}$. However, not all the coefficients on $(D/Y)_{t-1}$ double their heteroscedasticity and autocorrelation consistent standard errors – yet for all but one country all are at least one and a half times as large.

But it seems adequate to employ critical values for ADF statistics in determining α_1 's significance. The corresponding 1% and 5% critical values are -2.86 and -3.43. Using these more exacting criteria α_1 is not statistically significant at the 5% level for any of the countries. So there is only weak statistical support for fiscal sustainability as captured by α_1 .

The ancillary variables GVAR and YVAR carry weakly significant coefficients for all the countries in the sample, but nevertheless merit a brief interpretation. For the Philippines, South Africa and Thailand the coefficients on GVAR and YVAR are positive. This evidence supports Bohn's predictions and Barro's tax-smoothing model. However, the coefficient on YVAR is statistically well-determined only for the Philippines and for Thailand. And this corresponds with the fact that these countries have successfully smoothed-out serious macroeconomic fluctuations, notably those arising from the Asian crisis. These economies, particularly Thailand, also engineered successful fiscal policy and more general macroeconomic strategies in fighting adverse developments during the 1980s.

The debt equations for the Latin American countries contrast with the rest of the sample. Specifically, Peru and Venezuela display negative coefficients on GVAR and YVAR, pointing to procyclicality in these countries' debt-dynamics. These results, albeit statistically weak, are in harmony with the surplus equations reported above. Moreover, that is also the case vis-à-vis the findings in Gavin and Perotti (1997) – a paper that investigates a sample of Latin American countries including Peru and Venezuela. Gavin and Perotti estimate that the fiscal surplus response to an increase in output growth is not significant, and that procyclicality appears to be a feature of Latin American fiscal policy.⁶

As with the surplus equations, the study computes the recursive t-ratios for the α_1 coefficients to gain further insight on within sample developments. Figure 2 displays these statistics. Peru and Venezuela show a weakening in α_1 during the mid-1980s, but to some extent recover by the end of the decade. In Peru's case this pattern coincides with President García's heterodox stabilization plan. Yet both economies show a fairly stable feedback from debt to income ratios on debt-dynamics during the 1990s. These results may be interpreted as a sign that Peru and Venezuela to some extent succeeded in consolidating their fiscal stance.

The α_1 coefficients' t-ratios for the Philippines and for Thailand also show an improving fiscal policy stance from the end of the 1980s and into the 1990s. Thailand's debt equation bears the largest shock around the 1997 Asian crisis. Finally, South Africa α_1 coefficient's t-ratio reflects a sound fiscal performance during the 1980s, but a failing one from the beginning of the 1990s. Yet as noted before, the latter was a time of political, economic, and social transformations. Still, South Africa managed to break this non-sustainable fiscal trend later-on during the 1990s.

⁶ Explaining fiscal procyclicality in developing countries is quite relevant, and this has led to a growing literature approaching the problem from alternative angles. E.g. Aguiar, Amador, and Gopinath, 2005; Alesina and Tabellini, 2005; Talvi and Végh, 2005.

5. Conclusion

The paper has investigated fiscal sustainability in a sample of developing countries using competing methodologies. It finds that the benchmark condition for the government's budget surplus is not binding in Peru, the Philippines, South Africa, Thailand, and Venezuela. The investigation also applies Bohn's (1998) alternative fiscal reaction function approach. Using this framework the behavior of budget surpluses indicates fiscal sustainability – albeit statistically weakly.

Additionally, debt-dynamics analyses show that corrective measures were put in place to revert non-sustainable trends in debt to GDP ratios. Notably, the evidence backing fiscal sustainability in Thailand is particularly robust. In contrast, the results for the Philippines and South Africa are mixed, and rather weak for Peru and Venezuela.

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Table 1. Unit Roots and Cointegration Tests

Variables	Peru	The Philippines	South Africa	Thailand	Venezuela					
Part A										
Unit root tests, 1970-2000										
R	-2.16	-1.81	-2.77	-1.65	-1.50					
G	-2.07	-2.01	-1.32	-2.26	-1.64					
ΔR	-4.33**(DF)	-4.04**	-4.91**	-3.16*	-4.73**					
ΔG	-5.71**(DF)	-3.58*	-4.26**	-3.33*	-3.71**					
Part B										
Engle-Granger (1970-2000) and ADL (1,1) (1971-2000) OLS regressions, LHS variable is R										
RHS/tests	EG	ADL	EG	ADL	EG	ADL	EG	ADL	EG	ADL
Constant	-0.06 (0.19)	0.29 (0.55)	1.40** (0.23)	1.34* (0.54)	1.55** (0.17)	1.52** (0.34)	-1.07** (0.31)	-0.75 (1.25)	-2.33 (1.54)	0.78 (3.07)
G	1.02** (0.07)	0.87** (0.22)	0.63** (0.06)	0.65** (0.15)	0.55** (0.04)	0.56** (0.09)	1.32** (0.08)	1.31** (0.31)	1.37** (0.20)	0.93* (0.43)
ADF test	-2.23	-3.39	-2.80	-3.46	-3.24	-3.93	-1.73	-2.99	-2.03	-4.33
$WALD - \chi^2$	-	0.00**	-	0.00**	-	0.00**	-	0.00**	-	0.03*

Notes: Part A: DF indicates a Dickey-Fuller test applies, while ** and * denote significance of a test (i.e. rejection of non-stationarity) at the 1% and 5% levels, respectively. Δ is the first difference operator. Part B: (1) Coefficients' standard errors are inside parentheses. $WALD - \chi^2$ is a test of the null that all long-run coefficients are zero, with $\chi^2(\cdot)$ distribution. (2) ADL = autoregressive distributed lag. Critical values, at the 1% and 5% levels, for the ADF test applied to the residuals of the cointegrating relations are from MacKinnon (1991). The corresponding critical values are -4.27 and -3.53, and -5.28 and -4.48 for the EG and ADL regressions, respectively. A significant test means rejection of the hypothesis of non-stationarity, i.e. a cointegrating relationship exists between the variables under analysis. (3) ** and * denote a coefficient/test is significant at the 1% and 5% levels, respectively. LHS and RHS stand for left and right-hand side, respectively.

Table 2. *Bohn's Government Surplus Reaction Functions, 1971-2000*

RHS/ Test	Peru	The Philippines	South Africa	Thailand	Venezuela
The Dependent Variable is S/Y					
Constant	0.03 (3.04)	0.03 (3.20)	0.02 (0.99)	0.07 (4.22)	0.11 (4.56)
$(D/Y)_{t-1}$	-0.06 (-2.99)	-0.02 (-1.66)	-0.08 (-1.11)	-0.22 (-2.69)	-0.12 (-2.64)
GVAR _t	-0.36 (-2.76)	-0.28 (-2.30)	-1.48 (-2.10)	-0.99 (-1.58)	-0.00001 (-0.06)
YVAR _t	-0.54 (-1.65)	-0.26 (-0.61)	-1.64 (-1.59)	-0.93 (-0.78)	-0.006 (-0.98)
R ²	0.40	0.24	0.16	0.42	0.31
σ	0.019	0.014	0.027	0.02	0.042

Notes: heteroscedasticity and autocorrelation consistent (HACSE) standard errors are used in calculating the reported t-ratios. GVAR and YVAR are constructed following Barro (1986). R^2 and σ are the coefficient of multiple correlation squared and the equation's standard error, respectively. RHS stands for the variables in the right-hand side of the equations.

Table 3. Unit Root Tests of the Debt-GDP Ratios, and Bohn's Debt Reaction Functions

Test/RHS	Peru	The Philippines	South Africa	Thailand	Venezuela
Part A					
Unit root tests of D/Y , 1972-2000					
ADF test statistic	-2.03	-1.82	-1.68	-2.97*	-1.46
Part B					
OLS estimations of Bohn's Debt Reaction Functions, 1971-2000					
The Dependent Variable is $\Delta(D/Y)$					
Constant	0.28 (2.69)	0.15 (1.85)	0.09 (1.71)	0.28 (0.97)	0.29 (1.48)
$(D/Y)_{t-1}$	-0.42 (-2.72)	-0.21 (-1.63)	-0.23 (-1.61)	-1.31 (-1.10)	-0.53 (-1.50)
GVAR _t	-1.73 (-1.11)	1.64 (1.55)	0.88 (0.41)	4.56 (0.66)	-0.0005 (-0.84)
YVAR _t	-0.38 (-0.06)	4.34 (1.46)	3.85 (1.89)	38 (1.95)	-0.03 (-1.17)
R ²	0.11	0.16	0.10	0.28	0.15
σ	0.26	0.12	0.07	0.28	0.27

Notes Part A: * denotes rejection of a unit root at the 5% level. Part B: heteroscedasticity and autocorrelation consistent (HACSE) standard errors are used in calculating the reported t-ratios. GVAR and YVAR are constructed following Barro (1986). R^2 and σ are the coefficient of multiple correlation squared and the equation's standard errors, respectively. Δ is the first difference operator. RHS stands for the variables in the right-hand side of the equations.

Table A1. Data Sources and Definitions: Peru, the Philippines, South Africa, Thailand, and Venezuela

Current revenue, excluding grants	GB.RVC.TOTL.CN. Current LCU.
External debt, total	DT.DOD.DECT.CD. Current US\$. South Africa's and Thailand's series comprise total domestic and external debt, and the source is the IMF's IFS CD-ROM. The corresponding series codes are 19988Z..ZF and 57888Z..ZF, respectively.
Current expenditure	GB.XPC.TOTL.CN. Current LCU.
GDP	NY.GDP.MKTP.CD. Current US\$. NY.GDP.MKTP.CN. Current LCU. For South Africa and Thailand nominal GDP is taken from the IMF's CD-ROM. The series codes are 19999B.CZF and 57899B..ZF for South Africa and Thailand, respectively.
Population	SP.POP.TOTL. Total.
Consumer price index	FP.CPI.TOTL, 1995 = 100.

Notes: World Bank Development Indicators CD-ROM (2002), and International Monetary Fund CD-ROM 1.1.54. LCU = local currency units.

Figure 1. Recursive β_1 t -ratios from Bohn's Government Surplus Reaction Functions

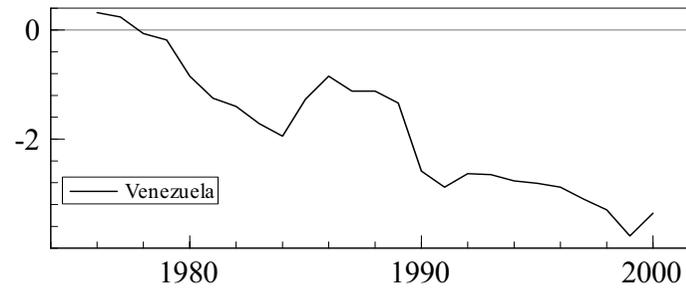
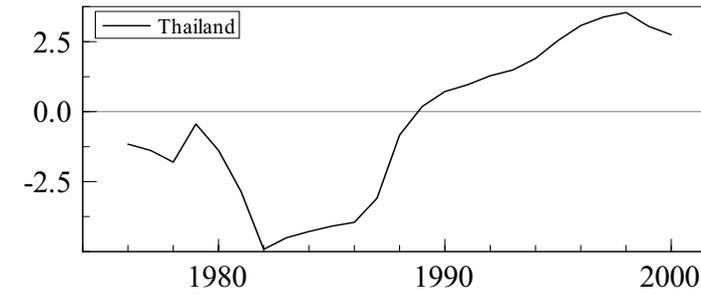
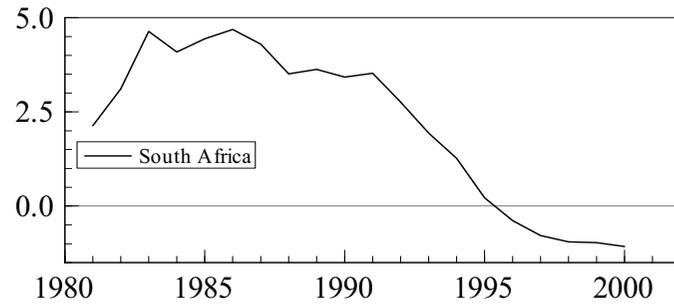
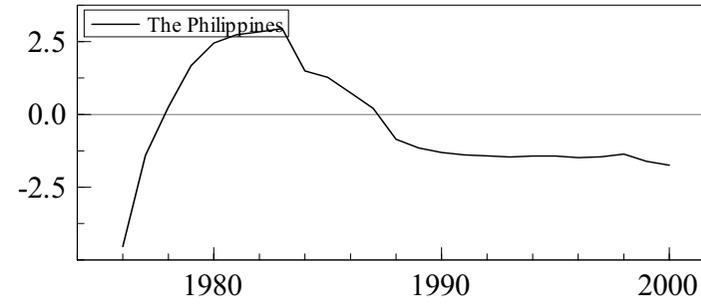
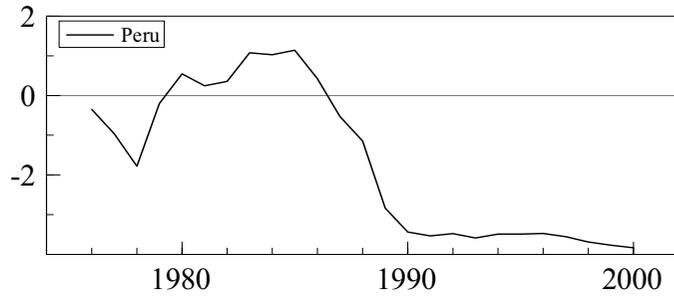
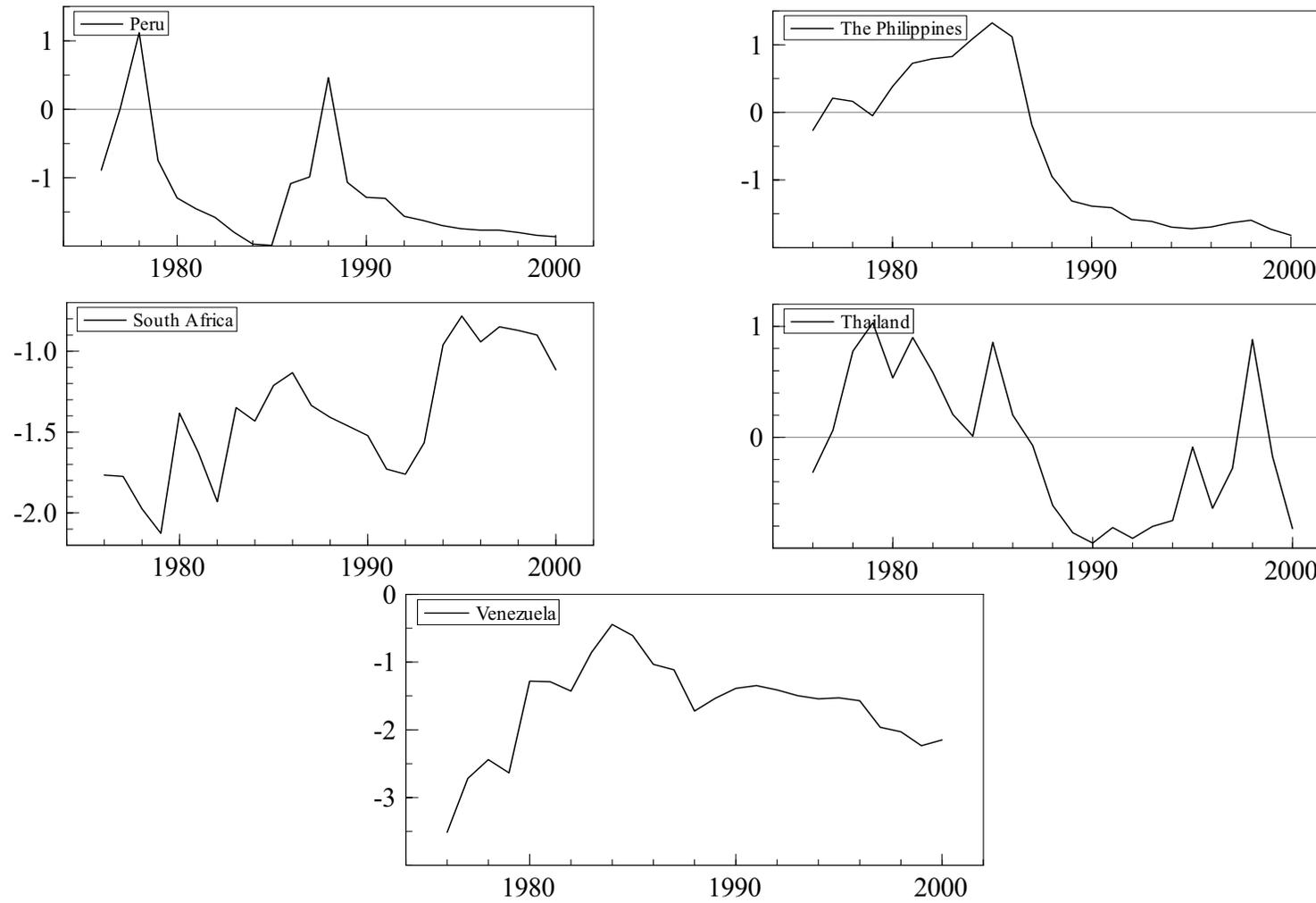


Figure 2. Recursive α_1 t -ratios from Bohn's Government Debt Reaction Functions



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