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**Sleeping in the Bed One Makes:  
The Venezuelan Fiscal Policy Response to the Oil Boom**

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## Introduction

At the broadest level, Venezuelan fiscal accounts went through three phases between the democratic consolidation of 1958 and the constitutional reform of 1999. A pre-boom period of remarkable calm existed from 1962-1973 during which per capita oil revenues were relatively stable and so too were fiscal accounts. This was followed by a pair of incomprehensibly massive spikes in per capita oil revenues—peaking first in 1974, receding, then peaking again in 1981—which gradually eroded to pre-boom levels by 1985. This period witnessed massive increases in spending during the first peak, adjustment as the peak subsided, a resurgence during the second peak, and renewed adjustment as the second peak subsided. But the pre-boom calm was never restored: from 1986 through the 1990s, per capita oil revenues continued to decline significantly below their pre-boom levels necessitating continued fiscal adjustment. During this period, fiscal policy was in considerable turmoil: oil revenues volatile and declining, new sources of non-oil revenues developed, and both the magnitude and composition of expenditures fluctuating significantly from year to year.<sup>1</sup>

The story of Venezuelan fiscal policy is the reaction to these massive, exogenous shocks to revenues. In this chapter, we will document this reaction, compare it to theoretical prescriptions for optimal fiscal policy when faced with such shocks, and assess the degree to which suboptimal fiscal policy in the face of these shocks is responsible for the sustained contraction in non-oil per-capita GDP that Venezuela suffered from 1979-2003.

The essential questions are two. First, was the windfall of the oil booms spent wisely? The answer here is pretty clearly “no” though it must be qualified by a realistic appraisal of the political feasibility of optimal fiscal policy. Second, to what extent did excesses during the boom years saddle the economy with a crippling legacy that can account for the continued decline? Or to restate: why didn’t the squandering of the boom simply represent a missed opportunity after which the economy could resume its original growth path? Was the aftermath of the boom entirely to blame, was post-boom fiscal policy also at fault, or were non-fiscal factors to blame? This second question must be addressed to judge the degree to which the *sustained* growth collapse can be laid at the door of improvident fiscal policy.

### Optimal Fiscal Policy in the Face of a Deluge

Fluctuations in Venezuelan fiscal accounts, and indeed in the economy as a whole, are driven primarily by fluctuations in the international market for crude oil. Oil revenues averaged 66% of total central government revenues during the period leading up to the collapse 1962-1979. Moreover, oil revenues had a coefficient of variation 2.3 times as

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<sup>1</sup> The period 2000- present could be characterized as a fourth distinct period due to both rejuvenated oil prices and the adoption in December 1999 of a new and dramatically different constitution replacing the previous one of 1961. This period will remain outside of our analysis as largely irrelevant to the question of whether Venezuelan fiscal policy has contributed to the growth collapse of 1979-2003. It remains to be seen whether the Venezuelan economy will accrue more lasting benefits from the current boom in oil prices than it did from the first boom.

high as non-oil revenues over the same period. Before the collapse and the ensuing volatility in GDP and instruments of taxation, fluctuations in total revenues were driven almost entirely by fluctuations in oil revenues. As we will see, expenditures roughly follow revenues, with negligible inter-temporal smoothing.

The magnitude of the shock to revenues resulting from the oil price hikes of 1973-4 is staggering. The increase in central government revenues between 1973 and 1974 due to the oil sector was 34.5% of 1973 GDP. Over the entire period of high oil prices from 1974 to 1985, the increase of oil prices above their 1960-1973 average contributed an additional 523% of 1973 GDP to a government that traditionally occupied 18-20% of the economy. These figures do not account for the additional profits retained by the oil sector which then had an indirect impact on government revenues through spending in the non-oil sector. To deliver an equivalent shock to the present-day US economy would require the addition of \$69 trillion (constant 2006 dollars) over the next eleven years *to government revenues alone*. A boom of this magnitude simply has no precedent in the developed world and had few precedents anywhere in 1974.

What constitutes optimal fiscal policy in the face of such a colossal influx of revenues? If we view the government as a unitary, benevolent social planner facing an inter-temporal optimization problem, consumption of this windfall ought to be smoothed by investing the vast majority of it. But there are several obstacles to such an increase in the investment rate.

First of all, it is difficult to believe that the domestic economy could find efficient use for this much new capital in such a short span of time. Neo-classical growth models assume diminishing returns to capital implying that developing countries earn higher raw rates of return on investments than advanced economies. These models further assume that the productivity of investments is independent of the speed with which they are undertaken: there exists a set of investments ready to be undertaken whenever the economy can raise the capital. From the perspective of growth models, it follows that all investment ought to be domestic.

This assumes that the proper growth path and associated investments are costlessly and instantly identifiable. But the profitability of an investment depends on the future stream of profits which depend in turn on the future state of the marketplace. The required projection of the marketplace becomes far more elusive in a climate of ultra-rapid growth and sectoral change. Moreover, easy liquidity often results in laxity of due diligence. The resulting combination has historically lead to devastating excesses in developing and advanced economies alike. The over-investment in internet infrastructure and spate of barely-planned dot-coms in the late 1990s US is but the most recent and widely publicized of a long history of irrational investment bubbles. A future of potentially exciting but poorly understood opportunities acts like soapy water. All that is required is a puff of easy credit to produce a raft of bubbles.

In essence, most growth models assume there is no horizon to the growth path. On the contrary, identification of profitable investments requires knowledge of current prices

and ability to project future prices. If individual investments are sufficiently small and are taken in sequence such that each subsequent investment may observe the previous one, then investments are likely to proceed along an efficient path. When one's stride is short compared to the horizon, one can keep to the path. However, if investment is undertaken all at once, even by a single social planner who can solve coordination problems, it seems unlikely that such a planner would be capable of anticipating the complex web of interactions between the various investments to be undertaken simultaneously. During such a rapid flow of funds, the economic landscape may change too quickly for price signals to adjust, be noticed, and the implications processed. This is especially true if allocations are no longer governed by prices but by an industrial planning ministry. If one takes a stride many times longer than the horizon, one may find the path of development has turned aside and one has striven blindly into a quagmire.

The traditional solution in developing countries is state-planned industrialization. Central coordination may ease some, though not all, of the difficulties with directing massive investment. Certainly the direction of capital by a single social planner makes possible projects exhibiting increasing returns to scale, requiring broad technical expertise or the coordination of many firms, or requiring long gestation periods. The perils of planning a large step all at once are somewhat alleviated by the existence of developed countries further up the growth path whose histories may provide some guide to successful industrialization. Nonetheless, the past forty years have made it abundantly clear that no one-size-fits-all development strategy exists. Moreover, even if the broad brushstrokes are correctly painted, successful implementation is fraught with unforeseen, country-specific perils.

Drawing on sixteen case studies of natural resource booms, Ascher (1999) details the unforeseen difficulties governments face trying to pursue centrally planned investment strategies for natural resource windfalls—low accountability of State-owned Enterprises (SOEs), unwise investments within the sector, mis-pricing of inputs and outputs, failure to minimize costs, under-exploitation and inefficient exploitation due to under-capitalization. His cases highlight the difficulty in sustainably extracting revenues from the natural resource sector. As both Ascher and many contributions to this volume (Di John, Manzano, and Haussmann and Rodriguez) detail, Venezuela struggled to extract revenues without crippling the development of the oil industry.

Perhaps as worrying is the likelihood that a rapid and massive investment, even if properly directed, would result in a divergence of aggregate supply and demand. The challenge is not simply in refraining from killing the hen that lays the egg. There is also the danger that the egg will not hatch.

In the long run, spending the boom on productive investments (as opposed to consumption or projects with poor returns) ought to increase aggregate supply as well as aggregate demand. In practice, increases in the former lag behind increases in the latter as investments take time to produce returns. Moreover, proper coordination of centrally directed industrialization is nontrivial and can easily result in disappointing productivity

gains. This is especially true of the kind of big-push policies to which Venezuela turned in 1974. Di John (this volume) writes

“Big push” natural-resource-based industrialization strategies commit large sums of state resources to long-gestating, technologically demanding investment projects, which require complementary investment and state-business conglomerate coordination. . . . The greater learning costs and gestation periods of such ‘big push’ investments bring greater economic and political challenges and risks that distinguish this type of economic strategy from the small-scale and simple technology of the easy ISI stage. . . . As it turned out, the Achilles Heel of Venezuelan industrialization strategy was to be a growing inefficiency in the implementation of ‘big push’ strategies.

Di John then explains how failures in the coordination, monitoring, and discipline of the state owned enterprises and private businesses receiving government loans—due largely to populist, clientele politics—led to a failure of the investments to lead to productivity gains.

Absent productivity gains and export earnings, a huge increase in government investment produces an imbalance between domestic aggregate supply and demand, leading to too many dollars chasing too few goods. This kind of imbalance may regularly result from investments that are unproductive or whose returns are delayed. But in an economy on a smooth growth path, this sort of imbalance will simply be part of the steady state. Given the enormity of the Venezuelan oil boom, the associated imbalances are likely to be a sizeable fraction of GDP, swamping other effects, resulting in considerable overheating and the attendant misallocations: in short, dire consequences for the non-oil sector. A smoother growth path of government expenditure would serve to prevent domestic aggregate demand from outstripping domestic aggregate supply thus preventing runaway inflation.

Di John describes the difficulties in selecting the proper firms, coordinating complementary investments, monitoring the use of funds, and effectively conditioning government loans and transfers on performance. The question that is often glossed over is the ability of the central government to identify the proper growth path. Di John submits that Venezuela invested in exactly the same mix of heavy manufacturing industries—steel, chemicals, -- as the countries which industrialized successfully through big push policies. While this signals that such an industrial mix is not fatally flawed, it does not necessarily follow that this was either the correct mix for Venezuela or the most efficient mix overall.

The clear prescription would be to establish an oil fund to smooth the domestic absorption of the windfall. The fund would buy foreign securities—in effect lending the money overseas to larger markets with a larger pool of credible investment opportunities—to be repatriated in the future. In the meantime, a smaller, more manageable fraction of the money would be steadily invested in the proven domestic enterprises whose rate of return exceeded that available overseas. Reducing the ratio of new investment to the size of the established economy would have two effects. First, breaking the windfall into several moderate strides rather than one long one would enable institutional learning-by-doing, enabling the economy to adjust to and address mistakes in

the initial approach. Second, it would reduce the magnitude of the inevitable momentary divergences of demand and supply. And third, by lengthening the period over which the windfall is invested, it would deliver a longer period for new projects to gestate before the fiscal tap is turned off, making the transition from oil to non-oil economy smoother.

During the sample period, Venezuela failed to put into practice a functioning oil development fund to smooth the use of the windfall.<sup>2</sup> Practically the entirety of the boom was domestically invested as soon as it was accrued: net foreign loans never constituted more than 1% of total expenditures in any year, and averaged just over one third of one percent during the boom years from 1974-1985. The fiscal balance averaged a deficit of 0.6% of total GDP during the period 1974-1985. We will show that this unwillingness to smooth the entry of oil revenues into the economy contributed to an overheating of the economy which undermined growth. In effect, there was neither inter-temporal smoothing of the surplus, nor rationing of domestic credit. The fiscal authority failed to control the taps so the economy was deluged.

### **The Venezuelan Growth Spiral**

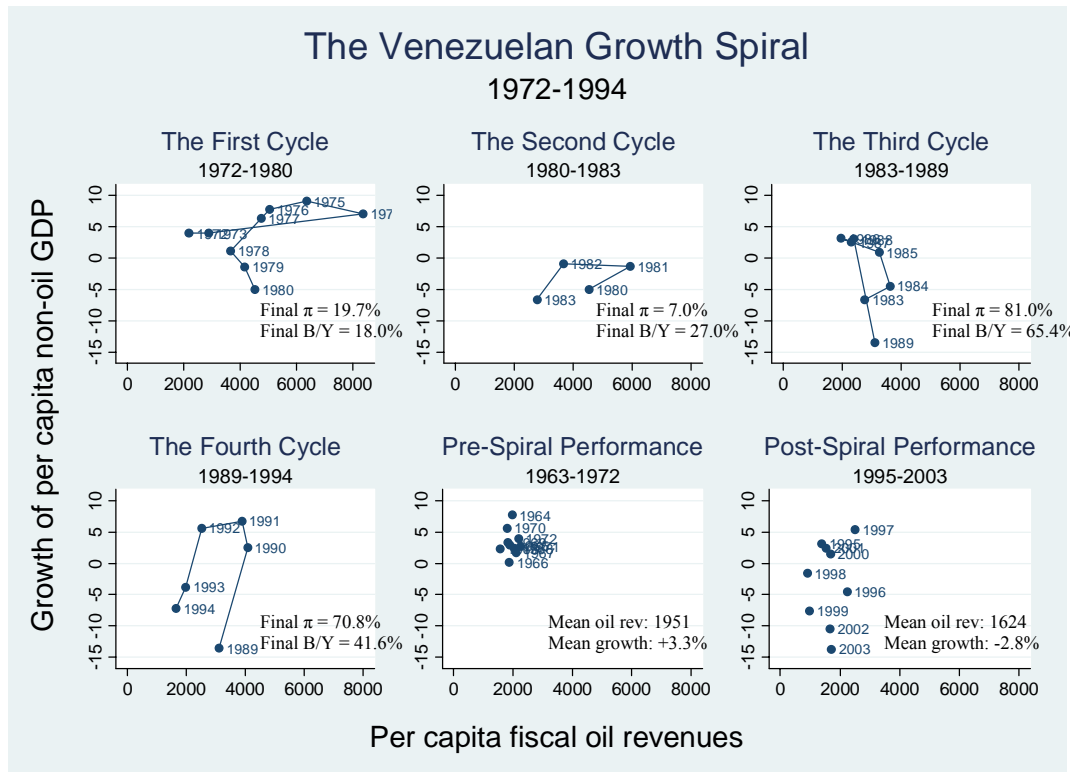
During the period 1972-1994, the Venezuelan economy underwent four repetitions of a distressing cycle (see figure 1). Driven by a surge in the price of oil, a boom in per capita oil revenues led to a surge in growth of the non-oil sector.<sup>3</sup> As the initial boost to revenues (and expenditures) subsided, the growth surge continued a few years longer before the economy slid into recession. The next oil price spike rescued the economy from recession briefly only to lead to a new cycle. But the cycle is not closed: as we progress from one to the next, the economy gradually spirals downward. Each new cycle begins with some combination of higher inflation, more debt, and slower growth than the previous cycle. The last two frames of figure 1 compare the pre-spiral era to the post-spiral era to show the cumulative effect on the economy. The average annual growth rate of real per capita non-oil GDP has declined from 3.3% in the pre-boom era to -2.8% in the post boom era. Moreover, growth is far more volatile in the post-boom era. True, oil revenues are on average 16.7% lower in the post-spiral era and are also more volatile, but

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<sup>2</sup> An oil stabilization fund was enacted in a reform to the Central Bank Law in 1960, but it was later eliminated in 1974. More than two decades later, in 1998 an Investment Fund for Macroeconomic Stabilization (Spanish acronym FIEM) was created; however, its law underwent several reforms (1999, 2001, 2002, 2003). In 2003, a new law was approved (Macroeconomic Stabilization Fund Law), but it has not been operative yet.

<sup>3</sup> The first cycle is driven by the first oil price hikes in 1973-4. The second cycle is driven by the second oil price hikes in 1979-81. The fourth cycle is driven by the mild oil price spike accompanying the Persian Gulf War. Unlike the others, the third cycle is driven not by an increase in the international price of crude oil, but by a 25% devaluation of the Venezuelan nominal exchange rate in 1984. Because a large fraction of Venezuela's fiscal revenues come from the export of oil, devaluation adjusts the relative price of oil exports and public goods, balancing the fiscal accounts. This was a trick the Venezuelan government was to resort to again in 1986 when the price of oil finally collapsed from the abnormally high levels that prevailed from 1974-1985. In effect, one could actually split the third cycle into two sub-cycles: one from 1984-1986 driven by the first devaluation and another from 1986-1989 driven by the second devaluation. Taken together, these sub-cycles were weaker than the others and resulted in a more dire final downturn because they were not the result of an oil boom but rather a devaluation in the face of a revenue decline.

the differences in both the average growth rate and its volatility seem out of proportion to this decline. One imagines that had the economy gone directly from the oil revenues of the pre-spiral period to those of the post-spiral period, skipping over the volatile years, the consequences would not have been so dire. The Venezuelan economy has exhibited significant hysteresis in response to the oil shocks.



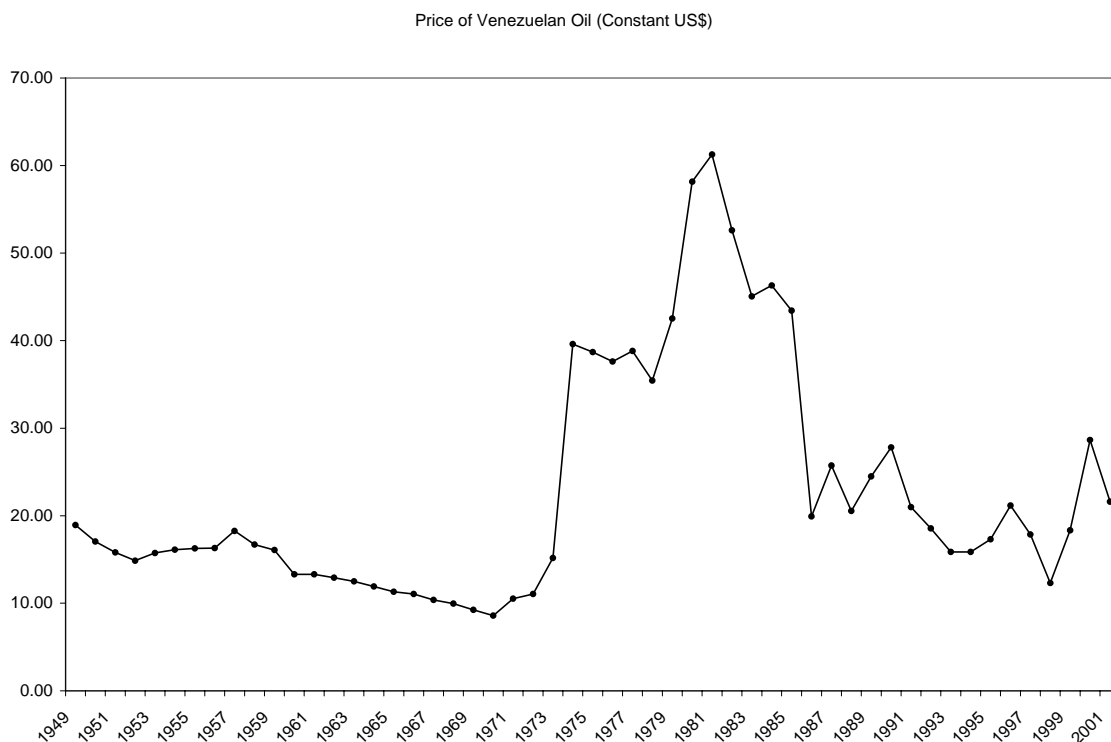
**Figure 1:** Successive shocks to per capita oil revenues generate bursts of growth which eventually overheat the economy, leading to inflation. As the revenue burst subsides, spending adjusts with a slight lag, leading to an increase in debt. The ratio of debt to GDP is exacerbated by the output decline of the overheated economy. The economy is never allowed to cool off fully before a new influx of revenues is added. As a result, each new cycle begins from a more dangerous position. Post-cycle economic performance is dramatically worse than pre-cycle performance: the boom has left a bad legacy.

Source: author's calculations based on oil price data from Lopez-Obragon and Rodríguez (2001), and GDP data from Rodríguez (2004).

Is fiscal policy responsible for this hysteresis? Part of the answer comes from the efficiency of fiscal policy during the boom. Did an increase in government spending or transfers to enterprise (whether publicly or privately operated) actually stimulate output growth? Figure 1 strongly suggests not! But figure 1 does not separate the effects of discretionary fiscal policy from other concurrent effects of the oil boom. To isolate the effects of fiscal spending on the economy, we first discuss the evolution of fiscal accounts and then estimate a three-variable VAR—net transfers, government consumption, and output growth—with oil revenues as an exogenous forcing process.

## Driven by Oil

Throughout this chapter, we take these oil revenues as largely exogenous to fiscal policy decisions for two main reasons. Like a producer in any market, a country may perhaps raise the price of its own oil, depending on its market share, substitutability between its oil and that of other producers, and other factors. However, given the limited government control over quantity before nationalization, its limited vote in the OPEC cartel, and its limited market share in all periods, it is unclear exactly how much market power Venezuela as an individual country, distinct from its membership in OPEC, has been historically able to exercise over periods longer than a few quarters.<sup>4</sup> Nonetheless, even if the Venezuelan oil industry is considered a price taker, oil revenues may still be considered endogenous for a second reason. The strategy of exploration and extraction determines the time-path of the quantity of oil produced and thus the time path of revenues, given a price. Thus oil revenues can be considered exogenous only to the extent that the oil development strategy remains stationary.



**Figure 2:** Constant dollar price of Venezuelan oil.

Source: author's calculations on data from Lopez-Obragon and Rodríguez (2001)

<sup>4</sup> Ascher (1999) describes an incident in 1982 when the Minister of Hydrocarbons and Mines raised the price of Venezuelan heavy crude to offset the loss of revenues from OPEC's decisions to reduce prices on light crude by stating that "it was clear to oil experts that the price increase would soon reduce demand for Venezuelan heavy crude." Though not a formal estimate of elasticity, this incident illustrates that Venezuela did retain control over some prices under OPEC but that demand exhibited significant elasticity on a time-scale of a few quarters.

As Manzano explains in his contribution to this volume, Venezuelan oil development policy is characterized by three broad philosophies during our sample. These philosophies broadly coincide with three different eras in the price of Venezuelan oil (see figure 2 and table 1). In the first era (1962-1973), oil prices are low and relatively stable. The Venezuelan policy is one of conservation leading to high taxation and low investment. During the second period (1974-1985), prices are high and moderately volatile. Nonetheless, production and revenues per capita are falling in Venezuela due to low investment in previous years and the OPEC strategy of further limiting production to keep prices high. In the third period (1986-1999), prices are middling and highly volatile. Meanwhile, conservation and total nationalization is deemed unsuitable and a relaxation of taxes and limited return of private investment leads to a modest expansion in production. As the development strategy shifts, the data generating process for revenues changes. But within an era, shifts in revenues are driven mainly by exogenous factors that affect the world oil market, with one crucially important exception. As oil revenues fell and adjustment was sometimes incomplete or delayed, the fiscal authority often faced serious deficits. Several times during the sample period, Venezuela devalued the official exchange rate to increase oil fiscal revenues to shore up fiscal accounts. Thus we have divided the sample into these three periods for analysis: 1962-1973, 1974-1985, and 1986-1999 but we measure oil prices variously in either Bolivars or Dollars. In our descriptive analysis we refer to prices in constant Bolivars. In the structural VAR, we enter oil prices in constant dollars to keep it from including exchange rate policy.

	Average	Standard Deviation	Coefficient of Variation	Average <i>absolute</i> rate of growth	Characterization of the era
Period 1 (1962-73)	11.22	1.77	0.158	8.39	Low level, Low volatility
Period 2 (1974-85)	44.96	8.31	0.185	10.18	High Level, Moderate Volatility
Period 3 (1986-99)	19.77	4.17	0.211	19.80	Moderate Level, High Volatility

**Table 1:** The average level and volatility of oil prices during the three distinct eras. Source: Author's calculations on data from Lopez-Obragon and Rodríguez (2001)

## Spending the Windfall

Figure 3 shows that the first peak in oil revenues (1973-4) initiated an increase in government consumption which continued to grow even as the peak in revenues subsided (1974-78) and was sustained through the upswing of the second peak (1979-1981).<sup>5,6</sup>

<sup>5</sup> Government consumption is taken to be the sum of wages and salaries, purchases of good and services, and transfers, both current and capital, to administrative entities. Administrative Entities (AEs) are Central Government's autonomous agencies that provide public services in a variety of areas including education,

Additional revenues went initially to the Venezuelan Investment Fund (Fondo de Inversiones de Venezuela-- FIV) through which the government would finance its development strategy contained in the Fifth National Plan: investment in large-scale industrial development projects (steel, petrochemicals, aluminum, electricity). In the fiscal area, funding was mainly vested in autonomous entities, which included hospitals, highways, a hydroelectric consortium, shipbuilding firms, a national steamship company, an airline, among others); in the classification by sector, the spending firstly favored expenditures directed to productive activities (especially, agriculture) and, secondarily, social items. In part, this represented a continuation of the policy of sowing oil: continued investment in education, health, electricity, potable water, and other basic projects. But it also represented a significant foray into large-scale industrial development.

Government accounts show that the deluge was initially directed mostly toward investment rather than government consumption. Looking at figure 3, one can see that the composition starts out well enough, with much more of the windfall in the first few years earmarked for investment categories than for government consumption. Table 2 shows that the mixture of loans, grants, and outright public investment varied from year to year. For the first few years after an increase in oil revenues, most of the additional investment takes place as a boost in loans to public and private firms after which a transition to direct government investment or outright transfers to SOEs occurs.

As we shall demonstrate later, government expenditures on the whole are only mildly hysteretic during the boom—responding only marginally less quickly to decreases than to increases in revenues. However, this is not true of each individual component of expenditures. As each of the revenue-booms subsided, the increases to government consumption stubbornly persisted while most of the burden of fiscal adjustment fell on investment. As a result, the composition of the additional spending fueled by the rise in oil prices shifted from investment to consumption (see table 2).

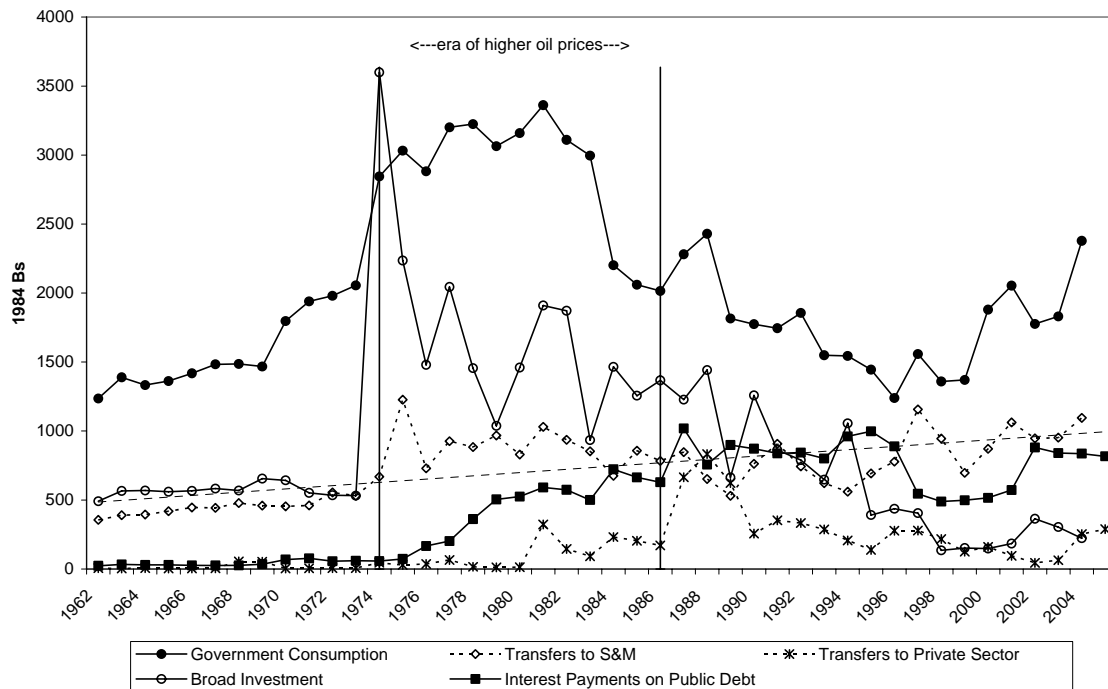
Eventually, government consumption does respond to declines in revenues. For example, real per capita government consumption declines by 38.7% between 1981 and 1985 to return in 1985 to almost exactly its level in 1969, the year before the first big increase. In 1985, real per capita non-oil GDP is still 33% higher than it was in 1969: the contraction of the last six years has not yet completely eroded the gains of the previous decade. Thus government consumption actually occupies a smaller fraction of GDP at this point than it did before the boom. Government consumption would continue to decline over the next decade during the sustained growth collapse.

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healthcare, utilities, transportation and communication, justice, housing, environmental protection, and so on.

<sup>6</sup> In fact, the first big increase in government consumption comes between 1969 and 1971, *before* the oil boom. This pre-boom increase is spent mainly on an expansion of public sector programs on education and healthcare (goods and services +105%) and the additional salaries to government workers (+33%) to administer these programs.

### Per Capita Fiscal Expenditures



**Figure 3:** The lion’s share of the initial boom in 1974 goes to broad investment: government investment, net loans, and transfers to SOEs. But the increases in government consumption are more persistent and as the boom in revenues recedes, they gradually claim a greater share of government expenditures leading to an increase in debt. Explicit transfers to the private sector are not a large part of government finances. Transfers to state and municipal governments gradually increase over the period but remain relatively small. Source: author’s calculations on data from the Central Bank of Venezuela.

#### Spending the Boom: Consumption and Investment

year	Government Consumption [1]	Government Investment [2]	Transfers to SOEs [3]	Net loans-domestic [4]	Total Investment [2]+[3]+[4]	Interest Payments [5]	phase
Increase over historical average (1962-1973) as a fraction of excess oil revenues							
1974	21.3%	0.9%	23.2%	50.1%	51.0%	0.2%	Net Loans
1975	32.5%	3.5%	23.1%	33.8%	37.3%	0.6%	
1976	37.2%	23.9%	50.1%	2.1%	26.0%	3.0%	SOEs + GI
1977	48.5%	11.7%	28.4%	32.5%	44.1%	4.0%	
1978	66.5%	23.6%	27.7%	12.3%	35.9%	10.7%	Net Loans
1979	48.8%	10.9%	-9.3%	4.5%	15.4%	12.6%	
1980	43.5%	-0.3%	-1.3%	24.9%	24.5%	11.0%	Net Loans
1981	36.9%	-0.4%	13.7%	28.2%	27.8%	9.4%	
1982	53.4%	17.0%	-3.0%	28.5%	45.5%	15.4%	SOEs + NL
1983	68.6%	-1.3%	-25.2%	19.1%	17.7%	18.4%	
1984	22.9%	-8.5%	10.1%	13.5%	32.9%	20.6%	SOEs + NL
1985	20.1%	-11.5%	14.4%	13.2%	28.8%	21.5%	
total							
1974-85	21.3%	0.9%	23.2%	50.1%	51.0%	0.2%	Net Loans

**Table 2:** These figures give the increase in a spending category over its pre-boom (1962-73) average as a percentage of the excess oil revenues. Excess oil revenues are calculated as that fraction of oil revenues which is due to the increase in the current oil price over its pre-boom average. Notice the different phases during the first and second oil spikes. An initial increase in net loans is eventually crowded out by consumption as the wave of excess revenues subsides. Columns [1] – [5] need not add to 100% due to changes in non-oil revenues or the deficit. Source: author’s calculations on data from the Central Bank of Venezuela.

Unfortunately, with revenues fluctuations of this magnitude, even modest hysteresis delivered deficits which were a non-negligible fraction of GDP. The ratio of debt to GDP declined at the beginning of the boom (1972-1975) due to GDP growth. But despite continued strong GDP growth, indebtedness soared from less than 7% to almost 35% of GDP between 1975 and 1978 as government spending receded more slowly than revenues from the high-water mark of 1974. While the second oil peak improved public finances between 1979 and 1982, the growth collapse meant that the debt ratio merely paused at 40% during these years. As the oil peak subsided, the debt ratio ballooned to 64% over the next two years. It would eventually grow to 74% in 1989 before starting a decade-long decline.

There are two other trends worthy of comment. Gavin and Perotti (1997) have previously noted a mild trend toward decentralization in Latin America as a whole. In Venezuela, however, transfers to state and municipal governments as a fraction of GDP are not statistically significantly different in the second half of the sample than in the first. Direct transfers to private individuals remain small throughout the period, peaking at 3.6% of GDP in 1987 and averaging less than 1% of GDP over the entire sample from 1962 to 1999. As in most Latin American countries, Venezuelan government is not a significant manager of entitlement programs during the sample period.<sup>7</sup>

### **The Bang for the Buck**

Of course, the total economic return on a spending item is not always in line with its classification as either consumption or investment. Our category for government consumption includes spending on education, transportation, law enforcement, healthcare, and other goods that may improve human capital or be classified as public infrastructure and therefore be expected to have significant returns. Similarly, not all investment is productive.

To get a measure of the effectiveness of these spending categories, we estimate a three-variable VAR of GDP, government spending on public goods, and net transfers to the private-goods sector using oil revenues as an exogenous forcing process. All variables are seasonally adjusted using the X12 process. All variables are in log of per capita real values using the 1984 base year. Oil revenues have been converted to \$US to net out Venezuelan devaluations. Due to difficulty acquiring historical quarterly GDP data, our sample is somewhat truncated, running from 1976:1 to 1999:4. Appendix A details the construction of these variables from fiscal accounts as well as the construction of the elasticities required for the identification strategy. The specification is

$$X_t = A(L)X_{t-1} + B(L)O_t + u_t$$

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<sup>7</sup> This more limited role for government accounts for the majority of the difference in government size between Latin American governments and European governments. The fraction devoted to provision of public goods is roughly the same in both sets of countries.

where  $X_t = [T_t \ G_t \ Y_t]'$  is the vector of net transfers to the private goods sector, government expenditures on consumption and public investment, and output growth,  $O_t$  is the exogenous variable oil revenues, and  $u_t$  are the VAR disturbances. The VAR is estimated with four lags of each endogenous variable, four lags of the exogenous variable, plus a constant term and quarterly dummies (not shown). The number of lags was chosen using Wald lag exclusion statistics. The quarterly dummies are excluded from the calculation of impulse responses so the impulse response functions correspond to a shock in quarter one. In practice, the differences in responses by quarter are miniscule. Dickey-Fuller and Philips-Peron tests strongly indicate that all variables are  $I(1)$ , thus the VAR is estimated on first differences. The reported impulse responses are for the original un-differenced variables.

Identification is achieved via the strategy detailed in Blanchard and Perotti (2002) and Perotti (2004). Without loss of generality, the VAR innovations are written as functions of the structural shocks,  $e$ . For shocks  $e$  and  $u$ , the subscript refers to the quarter, the superscript to the endogenous variable.

$$u_t^t = \alpha_{ty} u_t^y + \beta_{tg} e_t^g + e_t^t$$

$$u_t^g = \alpha_{gy} u_t^y + \beta_{gt} e_t^t + e_t^g$$

This identification strategy is based on the assumption that discretionary fiscal policy cannot respond to output within the same quarter, thus  $\alpha_{TY}$  and  $\alpha_{GY}$  consist only of the automatic policy responses of T and G to Y.<sup>8</sup> These can be calculated (with effort) prior to the VAR using information on the tax codes and spending rules (see Appendix A). In general they will be time-varying as tax codes and other fiscal rules change. Cyclically adjusted shocks can then be calculated using these estimates.

$$\tilde{u}_t^t = u_t^t - \hat{\alpha}_{ty} u_t^y = \beta_{tg} e_t^g + e_t^t$$

$$\tilde{u}_t^g = u_t^g - \hat{\alpha}_{gy} u_t^y = \beta_{gt} e_t^t + e_t^g$$

Assuming a particular Cholesky ordering of T and G allows one to restrict either  $\beta_{tg}$  or  $\beta_{gt} = 0$ .<sup>9</sup> This system can then be solved for the structural shocks  $e^g$  and  $e^t$ . These can then be used as instruments for the VAR innovations to estimate the structural parameters for output,  $\alpha_{yt}$  and  $\alpha_{yg}$ .

$$u_t^y = \hat{\alpha}_{yt} u_t^t + \hat{\alpha}_{yg} u_t^g + e_t^y$$

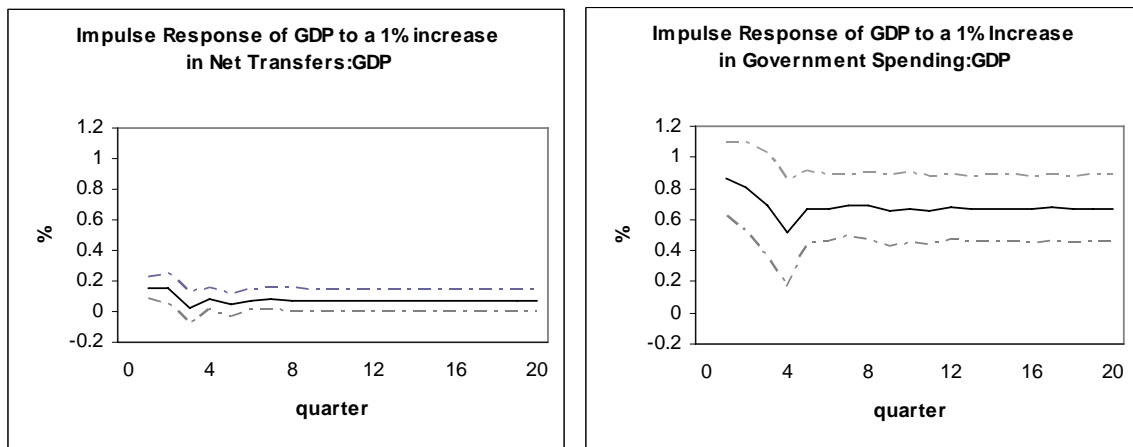
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<sup>8</sup> We include contemporaneous oil revenues on the right-hand side to allow for a within-quarter response of fiscal accounts to oil revenues.

<sup>9</sup> In their studies of the US and other OECD countries, Blanchard and Perotti suggest there is little theoretical or empirical guidance for the choice of ordering between G and T and note that it makes little difference due to the low correlation between the cyclically adjusted residuals for G and T. However, in our case, there is clear anecdotal and empirical evidence that spending decisions respond to revenues rather than the other way around. Hence we choose to order net transfers before spending.

Thus the structural parameters are identified. For a careful response to several of the major criticisms of this method including the timing of fiscal shocks, whether VAR innovations simply reflect the delivery schedule of fiscal programs, whether VAR innovations simply reflect accounting principals, and whether fiscal shocks are anticipated and therefore misidentified by the structural VAR, we refer you to Perotti (2004).

Our decomposition of fiscal accounts separates government purchases and investments in public goods (G) from net transfers to private actors and SOEs (T).<sup>10</sup> The intent is to separately identify the effectiveness of direct public sector stimulus from that of transfers to the private sector.



**Figure 4:** 1976:1-1999:4. Within a five year horizon, government spending on public goods is much more effective than transfers to the private sector.

Figure 4 displays the impulse response of output to increases of 1% of GDP in transfers to the private goods sector and government expenditures for the full sample. Notice that each of these shocks is expected to be expansionary with permanent effects which are almost fully realized within the first 6 quarters. We have chosen our decomposition of fiscal accounts so as to separate transfers for the production of private goods (T) and spending on the provision of public goods (G). Table 3 displays the results when estimated for the sub-periods corresponding to the different eras of the oil sector. Several things become clear when looking at these tables:

- (i) Government spending and investment in public goods is much less effective during the oil boom (1976-1985) than after it (1986-1999); further evidence that the economy was already at full employment during this period.

<sup>10</sup> We have tried other two-variable decompositions of fiscal accounts which more closely match the spirit of the discussion in the preceding section, "Spending the Windfall". However, these decompositions fail to give consistently coherent results. Perhaps this indicates that such groupings are less useful than this more traditional grouping.

- (ii) The minimal and maximal responses of GDP to an increase in transfers indicate that the initial effect is positive but that after perhaps a year, the effect becomes negative.
- (iii) In both sub-periods, government spending on public goods is far more effective at stimulating the economy than government transfers to SOEs and the private sector. The effect of transfers is quite weak.
- (iv) Items (ii) and (iii) are true in both sub-periods but while the effect of direct government spending is stronger in the post-boom, the effect of transfers is stronger during the boom.

Response of GDP to a Net Transfers Shock									
Sample	2	4	8	12	20	max	quarter	min	quarter
76-99	0.15	0.08	0.08	0.07	0.07	0.16	1	-0.16	3
76-85	-0.06	-0.01	-0.06	-0.01	-0.01	0.19	3	-0.19	6
86-99	0.05	-0.04	-0.09	-0.07	-0.08	0.05	2	-0.05	6

Response of GDP to a Public Spending Shock									
Sample	2	4	8	12	20	max	quarter	min	quarter
76-99	0.80	0.51	0.69	0.68	0.67	0.86	1	0.51	4
76-85	0.36	-0.07	0.30	0.48	0.34	0.67	7	-0.07	4
86-99	0.91	1.25	0.96	1.06	1.04	1.25	4	0.91	2

**Table 3:** In conjunction with the evidence of a strong output response to public spending in the post-boom era, the weak response of output to public spending during the boom era is further evidence of an overheated economy.

The response to government spending peaks at 4 quarters with a medium-run multiplier of roughly one in the post-boom period but only one third during the boom. This is strong evidence of an economy that was saturated and overheating during the boom. The results on transfers to the private sector might be interpreted in two (or more) ways. At first glance, the general weakness suggests that government transfers—including transfers to SOEs for the purpose of producing private goods—are not nearly as effective stimulus as government spending on public goods. On the other hand, in an investigation of six OECD countries, Perotti (2004) found a wide variety in the output response of a similarly defined net transfer category. As Blanchard (2006) notes in reference to these results,

This may tell us something about the weakness of structural VARs (vector auto-regressions), as well as something about fiscal policy. I think it would be wrong to say the fault is entirely with the structural VARs. The results may be the effects of the methodology, but they may also reflect something real.

Blanchard and Perotti have somewhat different aims than we do. They are primarily interested in stimulus from income-tax cuts in industrialized countries. On the contrary, we are interested in transfers to SOEs in a developing country. Nonetheless, this is more evidence that the macroeconomic effects of transfers are somewhat more complex than current theory predicts. For our immediate purposes, it is more evidence suggesting that transfers to SOEs failed to deliver the expected stimulus to output within five years.

## **Into the Straits of Messia**

The first cycle dumped a staggering amount of money into the economy. Between 1974 and 1978, the increase in oil prices above their 1960-1973 average contributed 143.6% of 1973 GDP to government revenues. Most of this first windfall was government directed investment though a significant fraction went to an increase in government purchases and the public wage bill. But the economy clearly overheated. Inflation began to rise and GDP first halted in 1978 and then fell in 1979, despite the rebound of oil prices to even greater heights.

In fact, the second oil price spike contributed a second influx of easy money which was, as a fraction of the economy before the spike, similar in magnitude to the first. Between 1979 and 1985, the increase in oil prices above their 1960-1973 average contributed 164.4% of 1978 GDP to government revenues. But the economy was already overheated and not capable of domestically processing this second influx of cash. Inflation, which had spiked from a historical average of 3% in 1972 to almost 12% in 1974, hovered at just under 8% in 1978. The second influx of cash sent it soaring immediately to 20% in 1979.

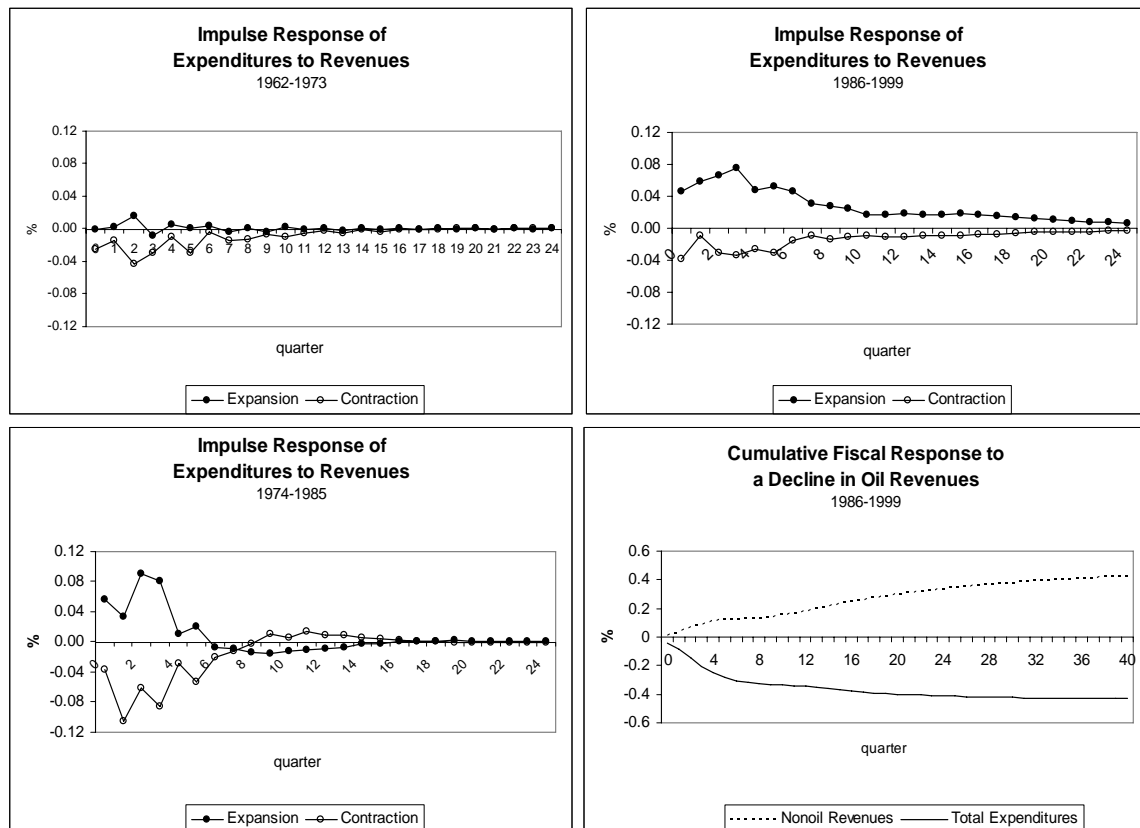
Throughout the second cycle, the economy suffered a deep contraction to work off the inflationary excesses that followed the first boom. By the end of the cycle, inflation had been reduced from a peak of 20% to a more manageable 7%. In 1983, debt was a reasonable 27% of GDP and the budget was close to balanced: the deficit was 1.6% of GDP, down from 4.7% the previous year despite a one-year decline in per capita oil revenues of 24.4%. However, non-oil GDP had contracted by a tragic 6.7% in 1983—the fifth consecutive year of outright decline and the worst.

At this point the government was entering the fiscal equivalent of Odysseus' voyage through the Straits of Messia. Faced with an increasing debt to GDP ratio, the government could choose to do nothing and suffer a rising level of debt with consequences for interest rates and future access to capital, or devalue the Bolivar, increasing the domestic value of fiscal oil revenues and thus balancing the budget. Unfortunately, the latter approach is tantamount to printing money with predictable consequences for inflation. Caught between the Scylla of inflation and the Charybdis of debt.

Naturally, the sustainable option is to reduce expenditures, improving the deficit, leading to a reduction in the debt ratio thus widening the straits. Unfortunately, the short term effect of a fiscal adjustment would be a contraction which would temporarily exacerbate the debt ratio, thus narrowing the fiscal Straits. The trick is to properly gauge the speed of adjustment. Too fast and the straits will constrict so much in the short run that the economy will fall prey to one peril or the other before reaching reaping the benefits of adjustment. Too slow and the stagnation is prolonged. A number of events combined to make the Venezuelan adjustment a long and tricky one. Chief among these was the

continued decline in per capita oil revenues even after they had returned to pre-boom levels and the heightened volatility. Venezuelan fiscal accounts did adjust to each new contraction in revenues, but they did so with a lag. The lag meant that each contraction resulted in further accumulation of debt; a further narrowing of the straits.

Entry into the Straits was prompted by the deep recession of 1978-84 during which per capita non-oil GDP fell by a total of 20% in six years. At the same time, real per capita oil revenues in 1983 were less than half of their peak in 1981. The government did decrease expenditures, mainly by reducing both direct government investment and transfers to SOEs but also partly by reducing government consumption. Thus the deficit never spiraled out of control and was a relatively modest 1.6% of GDP in 1983. Nonetheless, the incredible decline in GDP meant that the deficits run during the adjustment grew relatively larger as the economy shrank. The debt to GDP ratio, having held stable near 40% since 1979, grew to 47% in 1983 and then leapt to 64% in 1984. To keep debt under control, the government devalued in 1984 and again in 1986 (in response to the dramatic fall in world oil prices that year) to temporarily boost the domestic value of its oil earnings, thus earning breathing room from debt at the cost of inflation.



**Figure 5:** Expenditures respond very little to revenues during the period of pre-boom calm. The boom introduces a closer relationship between the two, though there is little evidence of a marked difference in the response to expansions and contractions. In the post-boom period, expenditures do respond only partially to declines in revenues. This partial response is completed by an increase in revenues but raising new revenue takes more time and thus results in a greater accumulation of debt.

The fiscal authority was to face this same dilemma repeatedly for the next fifteen years. A decline in oil revenues would force a decline in spending and lead to slow growth. This would threaten to increase the debt to GDP ratio either through higher deficits or outright contraction of the economy. Contractions initiated by non-oil triggers would equally threaten an explosion of the debt ratio delivering the same dilemma. Should we devalue to steer clear of debt, knowing that this sets a course toward higher inflation?

Before considering whether the straits were well-navigated, it is worth asking whether the necessary adjustment in the face of declining fiscal revenues was swift or slow. To that end, we have estimated a two-variable VAR including total revenues and total expenditure (using that Cholesky ordering) on quarterly data. We have estimated the VAR separately for each era to get a sense of how the responsiveness of the government to revenues shocks has changed as a result of the oil boom. Finally, suspecting that expenditures are more easily and swiftly increased than they are decreased, we have allowed the response to depend on the sign of the change in revenues, hence we have two curves: one for the response of expenditures to an increase in revenues (expansion) and one for the response to a decline in revenues (contraction). Figure 5 shows the results.

We can see that in the pre-boom period, expenditures were pretty well insulated from revenues. Revenue declines were dealt with somewhat more energetically than revenue gains. During this period revenues were fairly stable in both trend and volatility around the trend so there was little reason to respond strongly to annual variation. During the oil boom, when shocks to revenues were immense, expenditures responded rapidly to changes. There is little evidence that stabilizations were delayed—the impulse response of expenditures to revenue declines mirrors the response to revenue growth. However, as we noted earlier, the *composition* does display significant hysteresis in that increases in investment are reversed more swiftly than increases in consumption. It is a different story in the post-boom era. Here expenditures declined more slowly and less completely than they increased. However, it would be premature to conclude that adjustment was incomplete. Adjustments to falling revenue during this period were partly solved on the revenue side by the introduction of new forms of taxation. For example, income taxes were revamped and collection improved following an IMF agreement in 1989, the VAT was introduced in 1994, and taxes are indexed to inflation starting in 1994.<sup>11</sup>

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<sup>11</sup> The administration of Jaime Lusinchi (1983-88) implemented a heterodox stabilization program that included strong cuts in government spending between 1984 and 1985, multi-tier exchange-rate system, import protection, stimulus to agriculture, extended producer and consumer subsidies and the external debt renegotiation. Although these measures stimulated growth from 1985 to 1988, the government could no longer support the subsidies and the high debt burden, particularly after the 1986 fall of oil prices. Carlos Andres Perez (1988-93) launched a neoliberal shock therapy program (*The Great Turn – El Gran Viraje*) with the support of the International Monetary Fund and the World Bank that pursued the reduction of the government's role in the economy through a large-scale privatization, a tax reform, a free-market orientation in economic activities, the correction of macroeconomic imbalances and fiscal deficits, the reform of the financial sector, the liberalization of prices, exchange rates and trade, the renegotiation of the external debt payments and subsidies for the poor. Its implementation, that faced strong political opposition and popular rejection, was incomplete, distorted and even interrupted during periods of unexpected oil price increases. A decentralization process that had been proposed years back and delayed by the traditional political parties (AD and COPEI) was legally approved in 1989, just after a big riot (El Caracazo) exploded as a reaction against those measures;

The bottom-right panel of figure 5 shows the results from a three variable VAR of oil revenues, non-oil revenues, and total expenditures (with that Cholesky ordering) estimated for the post-boom period. The swiftest adjustment to an adverse shock to oil revenues comes via a reduction in expenditures: 75% of the total adjustment of expenditures takes place within the first two years. Adjustment by non-oil revenues takes more time: only 30% of the full adjustment takes place within the first two years and the 75% mark is not surpassed until the 22 quarter. Increases in non-oil revenues and reduction in expenditures contribute almost identical amounts to the full adjustment over ten years, and the total adjustment is a respectable 0.85; statistically indistinguishable from 1.<sup>12</sup>

Nonetheless, while the adjustment is comprehensive and impressive, it is clear that nonzero delay results in transitory deficits making the central dilemma more acute with each contraction in revenues. In essence, even these moderate delays lead to a narrowing of the Straits, making successful adjustment less likely. Hence we can see that the continued decline in per capita oil revenues greatly complicated the adjustment process.<sup>13</sup>

## Conclusion

Our analysis suggests that government spending on public goods was effective fiscal stimulus in the post-boom era, but that use of such stimulus was constrained by continued high levels of inflation and debt. The length of the post-boom fiscal crisis is due in large part to two proximate causes: the exceptionally poor state in which the economy exited the period of higher oil prices and the continued decline of per capita oil revenues.

Taking as given the state of the economy in 1983 and the subsequent decline in oil revenues, Venezuelan fiscal policy coped reasonably well with the predicament. Expenditures were reined in and new sources of non-oil revenue were raised. When fiscal accounts could not adjust sufficiently swiftly, devaluation was used to buy time, albeit at the cost of increased inflation. The fault does not lie in the process of adjustment.

In 1978, on the eve of the second oil boom, per capita non-oil GDP grew at 1.1% and the year's inflation was 7.3%.<sup>14</sup> Comparing these figures to their pre-boom (1962-73)

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however, from a fiscal point of view, its impact will start to be felt since 1996. Rafael Caldera (1993-98) condemned the neoliberal program of the precedent administration and started by reversing some of the previous measures, but a huge financial crisis (1994-95) and the failures of heterodox measures implemented led to a new IMF agreement in 1996 (*The Agenda Venezuela*). Under this program, the social programs were given big publicity, but in practice, they, as well as privatization of public enterprises and the tax reform, were very similar to the neoliberal program of Carlos Andres Perez.

<sup>12</sup> Oil revenues here are measured in constant Bolívares so we have not separated out the effects of devaluation.

<sup>13</sup> Manzano (this volume) suggests that the decline in Venezuelan per capita oil production is not entirely due to the external factors contributing to the oil price boom of the 1970s but may also be fueled by Venezuela's pre-boom oil development and extraction strategy. Thus it is not clear that Venezuela could have escaped adjustment even had oil prices continued to evolve smoothly. How pronounced and difficult the adjustment process would have been without the initial volatility is an open question.

<sup>14</sup> Inflation figures throughout this chapter are punctual inflation—that is the change in price measured from year beginning to year end—rather than average annualized rate of inflation.

averages of 3.3% and 2.4% respectively makes it clear that at this point the economy was seriously overheated. Ball's (1994) estimate of sacrifice ratios suggests that among OECD countries, trimming each point of inflation requires the loss of between 1.8 and 3.3 percentage points of GDP. Studies using US data, including Mankiw (1991) and Cecchetti and Rich (1999) find values in a similar range.<sup>15</sup> Applying these values to the Venezuelan economy in 1978, a return to historical rates of inflation would have required a loss on the order of 9-15 percentage points of GDP.<sup>16</sup> As the gush of oil money slowed, the economy seemed to have entered this period in 1977-8 as evidenced by the decline in non-oil output growth and inflation. Whether such loss would manifest as a protracted period of slower growth or a swift outright contraction would depend on the speed with which the growth of credit was reversed. Given that most of the excess credit sprung from the oil boom, and given the swift reversal of the hike in oil revenues, it seems likely the lost output would have come as a rather sharp contraction. Indeed, the outright contraction of economy between 1979 and 1980 despite renewed oil-driven spending supports this hypothesis.

It was at this moment that the second oil shock brought a second enormous boost of oil revenues. Unfortunately, Instead of accepting a growth slowdown as the price of cooling off the overheated economy, thereby enabling the oil revenues to be put to productive use at a later time, the fiscal authority chose to once again dump the entire surplus into the economy as it was accrued. The evolution from 1978-1983 (see figure 1) shows the predictably lamentable effects.

A more detailed picture of how the first and second gluts of funds first damaged and then wrecked the economy at the sectoral level is a subject for another paper. One suspects that the story is familiar: the deluge of cheap credit frequently redirected labor and capital from truly productive activity to activity whose productivity was an illusion which held only so long as the spigot remained open.

While imprudent and optimistic, it is perhaps understandable that the initial boom was entirely concurrently invested. The political pressure to invest domestically must have been immense and the possible drawbacks probably seemed distant and theoretical. How could such manna from heaven be bad? But by 1978 the clear overheating of the economy should have been stark evidence that productivity growth could not keep pace with the growth in demand and that a different, measured approach was required. Perhaps the second oil boom simply came a few years too early, when the negative side-effects of keeping an open spigot were not yet fully evident. Another look at figure 1 suggests that by 1981 they surely would have been! Alas, the warning was ignored and the second batch of manna from heaven was simply shoveled onto the flames lit by the first.

This misuse left the economy in a crippled condition, facing a difficult adjustment process. The continued decline in oil revenues below their pre-boom levels presented the fiscal authority with a serious and repeated short-run dilemma: a choice between the Scylla of inflation and the Charybdis of debt. Post-boom fiscal policy did not make it through these fiscal Straits of Messina unscathed. Furthermore, fiscal accounts did

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<sup>15</sup> Cecchetti and Rich do caution that their point-estimates come with rather large standard errors and further caution that one model they estimated gave much larger estimates of the sacrifice ratio.

<sup>16</sup> It may be a stretch to apply these values to a developing economy, but recall the prior to the boom, the Venezuelan economy was extremely high performing, with consistently low inflation and stable growth.

continue to adjust to the repeated decline in oil revenues by raising new revenues and reigning in expenditures. As the saying goes, you sleep in the bed you make.

Fiscal policy has a mixed record during the period from 1962-1999. On the one hand, spending the entire amount of the boom concurrently was a clear mistake given the size of the boom relative to the economy and thus doubts about the ability of the economy to absorb it so quickly. The failure to smooth these revenues doubtless contributed to the dire position of the economy in 1983 and thus the difficulty of the subsequent adjustments process.

It may be conceded that the problem was exacerbated by the failure of these investments to produce significant productivity gains meant that as oil revenues, and thus government spending, receded to historic levels, there was little to take its place. This is a failure distinct from the macroeconomic fiscal decisions considered in this chapter. Nonetheless, given the deliberate strategy of investing in projects with lengthy gestation periods, it should have been obvious that increases in productivity and thus in aggregate supply and foreign exchange would lag behind the massive influxes of capital. To expect that such a massive windfall could be absorbed without temporary divergence of aggregate supply and demand; not to realize that, given the size of the windfall, these disparities could crash the economy: these were grave oversights. The failure to adopt an oil investment fund to smooth the absorption of the windfall is a serious policy mistake. Fiscal policy is responsible to a considerable degree for the dismal macro economic position of 1983.

From this point on, the fiscal authority seems to have responded reasonably to a string of exceptionally difficult challenges. As oil revenues continued to fall, new sources of revenue were raised, and expenditures were cut. Unfortunately, budget cuts are never as swift as increases and the lag between revenue fall and the adjustment of expenditures contributed to a mounting debt, narrowing the straits.

The initial reversal of the steady six-decade growth path was due to the excessive haste with which the windfall was spent, exacerbated by the inefficiency of the resulting industrialization. The prolonged nature of the crisis is due partly to the poor position with which the economy exited the boom years—for which fiscal policy is partly to blame—and partly to the prolonged decline in oil fiscal revenues.

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## Appendix A

The coefficients  $\alpha_{TY}$  and  $\alpha_{GY}$  are weighted averages of the output-elasticities of each of the components of net transfers (T) and government spending (G) respectively. Net taxes and government spending are each built from several components of the quarterly fiscal accounts data. Classification was made based on whether the expenditures were spent on the production of public or private goods. Data come from the Central Bank of Venezuela.

Net Taxes (T) =

- Non-oil Income Taxes [NOIT] (includes both corporate and household)
- + Value added Tax [VAT]
- + Customs [CUST]
- + Central Bank Profits [CBV]
- + Liquor, Cigarettes, and Gasoline taxes [LIQ, CIG, GAS]
- Transfers to Private Individuals [PRIV]
- Transfers to State Owned Enterprises [PE]

Government Spending (G) =

- Wages and salaries [SAL]
- + Purchases of Goods and Services [GS]
- + Government Investment [GI]
- + Transfers to State and Municipal Government [SM]
- + Transfers to Administrative Entities [AE]

## Appendix B

Construction of the output-elasticity for each component is as follows.

*Non-oil Income Taxes:*

Income tax withholding for a given year is based on an ex-ante estimate of annual income filed in December of the previous year. Revision based on shock occurs later, at least three months after the shock. Hence, except for new hires, income tax payments do not vary within the same quarter when income has been hit by a shock. Hence the output-elasticity of income tax revenues is equal to the output-elasticity of employment. (see Perotti 2004 Appendix B) Following Perotti, we have taken our estimate of  $\partial e_t / \partial y_t$  to be  $\hat{\beta}_0$  from the following regression.

$$e_t = \sum_{j=-1}^4 \beta_j y_{t-j}$$

Where  $e$  and  $y$  are logged values of employment and real output. This is estimated via the regression and found to be 0.22.

Firms usually adjust their tax payments for windfalls but individuals do not. We have assumed 0.2 across the entire category.

*Customs, Cigarettes, Liquor, VAT*

Estimate the elasticity by again taking  $\hat{\beta}_0$  from the following regression over the longest recent period during which tax rates are constant.

$$\tau_t = \sum_{j=-1}^4 \beta_j y_{t-j}$$

Where  $\tau$  are logged tax revenues.

Results are:

Tax Category	Period	$\varepsilon$
Cigarettes	1982-2006	1.0818
Customs	1992-2006	1.0815
Gasoline	1985-2006	-1.4753
Liquor	1985-2006	1.1345
VAT	1985-2006	0.9799

Not surprisingly, these are mostly very close to 1. Gasoline is more complex because the economy is driven by oil prices.

*Transfers to Administrative Entities and SOEs*

Completely discretionary so elasticity assumed equal to zero.

*Transfers to State and Municipal Governments*

Transfers to sub-national governments are a mandated percentage of revenues so the output elasticity of transfers is equal to the output-elasticity of revenues. This elasticity is estimated using a regression of the same form as that used for excise taxes. The point-estimate is 1.14.

*Other components of G*

The rest of the components of G seem to be completely discretionary and therefore have an output-elasticity of zero.