XIV

Volume XIV, Number 1, May 2011

Journal of Applied Economics

Betty Agnani
Amaia Iza

Growth in an oil abundant economy: The case of Venezuela

UCEMA

Edited by the Universidad del CEMA
Print ISSN 1514-0326
Online ISSN 1667-6726

Journal of Applied Economics. Vol XIV, No. 1 (May 2011), 61-79

GROWTH IN AN OIL ABUNDANT ECONOMY: THE CASE OF VENEZUELA

Betty Agnani
Universidad de Granada

Amaia Iza*
Universidad del País Vasco

Submitted October 2008; accepted December 2009

Venezuela's growth experience over the 56-year period from 1950 to 2006 was characterized by a high economic growth rate from 1950 to 1974 and a low economic growth rate from 1974 to 2006. We show that the country has been immersed in a 'great depression' since the mid-seventies. We also show that although Venezuela is an oil abundant economy, this growth experience is largely due to the evolution of its non-oil GDP. We perform a growth accounting exercise to quantify the extent to which the growth experience in the non-oil sector is a result of physical capital accumulation, finding that non-oil sector behavior can largely be explained by the evolution of total factor productivity (TFP). Finally, we calculate the correlations between oil rents and physical capital accumulation and TFP in the non-oil sector, finding a high positive correlation during the good performance period, but a negative correlation in the implosion period.

JEL classification codes: O47, Q32
Key words: growth accounting, TFP, oil rents

---

* Amaia Iza (corresponding author): Universidad del País Vasco, Avda. Lehendakari Aguirre, 83, 48015 Bilbao, Spain; email amaia.iza@ehu.es. Betty Agnani: Universidad de Granada, Campus de la Cartuja, s/n, 18011, Granada, Spain; email bagnani@ugr.es. This paper was presented at the DEGIT-X Conference (Mexico, 2005), at the 15th World Congress of the International Economic Association (Istanbul, 2008) and at the International Conference: Globalization, Energy and Environment (Warsaw, 2008). The authors gratefully acknowledge the financial support received from the Spanish Ministry of Education and Science through Projects SEJ2007-62081/ECON and ECO2009-09732, the University of the Basque Country through UPV GIU06/41 and the Basque Government through HM-2009-1-21 and IT-241-07. We thank A. Arreaza and L. E. Pedauga for giving us access to their data. We also thank two anonymous referees and co-editor Mariana Conte Grand for their constructive and encouraging remarks on earlier drafts. Betty Agnani thanks Department of Economics at University of Leicester for hosting her during the final revision of the article. All errors are our own responsibility.

I. Introduction

This paper focuses on the growth experience in Venezuela over the 56-year period from 1950 to 2006, characterized by an expansion period from 1950 to 1974, with a high average growth rate, and by an implosion period from 1974 to 2006 with a low average growth rate, as already noted by Schliesser and Silva (2000), Bello and Restuccia (2003), Hausmann (2003), Hausmann and Rigobón (2003), Arreaza and Dorta (2004), Del Bufalo and Ríos (2005) and Hausmann and Rodríguez (2011), among others.

As many of the above authors mention, the collapse suffered by Venezuela was so spectacular that its per capita Gross Domestic Product (GDP) in 2006 (9,644 US$) was almost the same as in 1960 (9,646 US$).[1] In the last four-odd decades the Venezuelan economy has worsened its position relative to the average in Latin America, despite the poor performance of most Latin American (LA) countries since the early eighties. Using the technical definition of depression by Kehoe and Prescott (2002, 2007), it can be said that Venezuela suffered a "great depression" from the mid-seventies to 2006, despite the country's impressive economic recovery in the 2003-2006 sub-period.[2]

The spectacular collapse that occurred in Venezuela has not been observed in any other country in Latin America. In fact, compared to the average of LA countries, the relative GDP per capita of Venezuela was 2.76 in 1950, but only 1.24 in 2006.[3] If we break down the growth rates of GDP per capita into two sub-periods as mentioned above, Venezuela grew at an average annual rate of 1.4 per cent in the 1950-1974 expansion period (the average annual growth rate in LA countries was 2.5 per cent during the same period). In the contraction period from 1974 to 2006, the average growth rate in Venezuela was negative (-0.3 per cent) and much lower than the average growth rate among most LA countries (1.5 per cent). Therefore,

---

[1] In order to compare Venezuela at the international level, we use data from the Conference Board, *Total economy database,* June 2009, http://www.conference-board.org/economics, whose data are converted at Geary-Khamis PPPs. All the data provided for the GDP are at constant prices.

[2] The results obtained in the empirical literature devoted to explaining Venezuela's growth performance are heavily dependent on the source data set chosen, giving different peak years in which the Venezuelan economy starts to decrease. A broad discussion can be found in Rodríguez (2006).

[3] Despite the strong recovery experienced by the Venezuelan economy during the last years (2003-2006), in which the country's average annual growth rate of GDP per capita was 11.3%, a much higher rate than the 6.0% average of LA countries.

the underperformance in Venezuela in the last period, 1974-2006, was much worse than that of most countries in Latin America.

One characteristic to take into account is that Venezuela has been an oil abundant economy since the late 1920s and a major oil exporter since the early fifties. Therefore, it is also interesting to compare the growth rate of GDP per capita in Venezuela to other major oil-exporting countries. Mexico, for instance, grew at an annual average growth rate of 3.18 per cent during the 1950-1974 period and at an annual average growth rate of 1.4 per cent in the 1974-2006 period; a much higher rate than Venezuela. When comparing the relative GDP per capita of Venezuela to Mexico, a spectacular decrease from 3.16 in 1950 to 1.24 in 2006 can be observed. If we compare Venezuela to Norway, the GDP per capita of Venezuela was 1.37 times Norway's in 1950, but was only one-third in 2006. In consequence, the underperformance characterizing Venezuela has not occurred in other oil-abundant and oil-exporting economies such as Norway or Mexico.

There is vast theoretical and empirical literature that focuses on the curse of natural resources (see Gylfason 2001a, 2001b, 2001c and Hausmann 2003, among others). For example, as Johnson (2006) states: "A surprising finding from numerous empirical studies is that, over the last thirty years or so, countries with abundant natural resources have experienced relatively low economic growth. Economies that are richly endowed with natural resources tend to grow slowly. After controlling for numerous other factors, there is still a strong negative correlation between natural resource abundance and economic growth". Several causes have been suggested for this "curse of natural resources" such as the Dutch disease, lack of human capital accumulation, corruption and rent seeking, and deficiencies in institutions. All these hypotheses assume that oil rents have a negative effect on non-oil sector performance.

Most papers that have analyzed the growth experience in Venezuela (Rodríguez and Sachs 1999; Schliesser and Silva 2000; Hausmann 2003; Hausmann and Rigobón 2003; Manzano and Rigobón 2003; Hausmann and Rodríguez 2011, among others) claim that the growth experience in Venezuela is related to the fact that the country is an oil abundant economy.[4] These papers recognize that the direct cause of the collapse in Venezuela was due to the bad growth performance in the non-oil sector, claiming that the main cause of this bad performance in the non-oil sector is related to oil rents.

---

[4] An exception is Bello and Restuccia (2003). They focus on distortion in the allocation of resources due to the larger share of state enterprises. Their work points to rent seeking and public economic policy failures as the factors behind the behavior that has characterized the Venezuelan economy in the last fifty years.

Nevertheless, these articles differ on the channel through which oil rents might have affected the economy. In their hypotheses, Hausmann (2003), Hausmann and Rodríguez (2011), Manzano and Rigobón (2003) and Rodríguez and Sachs (1999) agree that the decline in per capita oil rents was one of the causes of the collapse. Hausmann (2003) claims that the decline in per capita oil rents and the *exogenous* increase in the real interest rates led to a decrease in non-oil GDP (through a fall in capital per worker). Hausmann and Rodríguez (2011) conclude that the decline in per capita oil rents and the low export flexibility explain the collapse of the Venezuelan economy, also through a low accumulation of physical capital. Manzano and Rigobón (2003) claim that when oil prices decline, access to international credit falls, thus leading to a decrease in investment and hence production in the non-oil sector. Unlike the other previous authors, who assume the decline of per capita oil rents to be exogenous, Rodríguez and Sachs (1999) argue that the decline in oil rents is because oil resources are non-renewable. They find that the good and bad growth experience is not surprising, taking into account that exhaustible resource industries cannot expand at the same rate as other industries. In the steady state, production of the natural resource will tend to zero, but during the transition to this state, the natural resource allows an economy to afford extraordinary consumption possibilities.

In this paper, we show that the growth performance of the GDP in Venezuela during the whole period, 1950-2006, can be explained by the growth experience of the non-oil sector, except in the 1974-1977 period. In particular, during the 1950-1974 expansion period, the growth of the GDP in Venezuela is mainly determined by the growth of the GDP in the non-oil sector, since the average annual growth rate of the GDP in the oil sector was much lower (by 4 percentage points) than the average annual growth rate in the non-oil sector. In consequence, during the 1950-1974 expansion period, oil GDP lost participation in total GDP. The dynamics of the GDP during most of the recession period, 1977-2003, was also determined by the non-oil sector, since the oil sector was a low proportion of the total GDP in the Venezuelan economy.

We also perform a growth accounting exercise for the 1950-2006 period to quantify the extent to which the economic performance of the non-oil sector in Venezuela can be explained by physical capital accumulation or by the evolution of its TFP. We obtain that in both periods – the 1950-1974 expansion period and the 1974-2006 depression period - the changes in the TFP were chiefly responsible for the growth experience in the non-oil sector in Venezuela. Therefore, the decline in TFP explains the poor performance of the Venezuelan economy in the 1974-2006 period, rather than the slight decline in the physical capital accumulation that also occurred in this period. This

result is in line with Arreaza and Pedauga (2006) and Bello and Ayala (2004), among others, whose work shows that even though private investment decreased, the investment/GDP ratio in Venezuela was similar to the 10 countries worldwide that economically performed best in the 1960-1985 period as reported by Chari et al. (1997).

Finally, we also check whether oil rents are positively correlated with non-oil sector activity. We calculate the correlation between oil rents and non-oil physical capital and TFP. We find that oil rents are positively correlated with both the stock of physical capital and the TFP of the non-oil sector during the good performance period, but negatively correlated during the depression period. In particular, oil rents not only increased during the 1950-1974 period, in which Venezuela experienced a high economic growth rate, but also during the depression period, 1974-2003. Therefore, unlike a vast literature that concludes that the depression period suffered in Venezuela is due to the fall in the oil rents, we find that the magnitude of the oil rents has nothing to do with it. It seems that bad policies might be behind the bad performance of the non-oil sector.

The rest of the paper is organized as follows: In Section II, some stylized facts are provided to describe the Venezuelan economy. In Section III a growth accounting exercise is performed to quantitatively assess the factors that explain not only the good performance of the Venezuelan economy in the 1950-1974 period, but also the collapse of growth in the 1974-2006 period. Some statistical analyses of oil rents and the non-oil sector are performed in Section IV, while conclusions are presented in Section V.

II. Data and stylized facts

The primary database used in the paper was provided by the Central Bank of Venezuela (BCV), in particular the National Accounts Statistics of Venezuela (1940-1999) and the Macroeconomic Aggregates of Venezuela (1994-2006). We gathered information on total, oil and non-oil GDP at constant prices (at different base years) in the local currency. An adequately linked GDP series in constant terms (1997 base year) for the Venezuelan economy, a stock of physical capital series and employment data for the 1950-2006 period (for oil and non-oil sectors) were provided by Arreaza and Pedauga (2006).[5] The National Institute of Statistics of Venezuela (INE) provided

[5] The primary data for the linked GDP series was taken from Palacios et al. (2005) following Rodríguez (2006)'s criteria. The physical capital series are estimated following the rigorous methodology of Palacios et al. (2005).

data about total working age population for the whole period. We use the *Total economy database* of the Conference Board and the Groningen Growth and Development Centre (June 2009 version) to gather information about: (i) GDP per capita in 1990 US$ (converted at Geary Khamis PPPs), to compare Venezuela at the international level, and (ii) Venezuela's average annual hours worked, in order to perform the growth accounting exercise for the 1950-2006 period.

This section provides some significant facts mentioned in the Introduction regarding the growth experience in Venezuela. Particular attention is given to oil rents since Venezuela is an oil abundant economy and belongs to OPEC. As shown in Table 1 for the year 2006, Venezuela —the only American member of OPEC— was the world's fifth largest net oil exporter and the ninth largest overall world oil producer, with vast proven total oil reserves. Accordingly, Venezuela is considered to be an oil abundant country.

Figure 1 shows GDP at constant prices (1997 base year) in local currency for oil and non-oil sectors as a percentage share. As shown, the ratio of the oil sector to total GDP was 26 per cent on average during the whole period. We can also see that the oil sector has lost weight, dropping from 48.1 per cent, in 1950, to 17 per cent in 1975, keeping at 15.4 per cent, on average, over the last three-odd decades.

Figure 2 shows the real GDP per capita in 1990 US$ (converted at Geary Khamis PPPs) for Mexico, for a sample of LA countries,[6] for Norway (since it is an oil abundant economy as we have seen in Table 1) and for the USA. Until the seventies, Venezuela had a higher income per capita than the average of LA countries, Mexico and even Norway. We can also see that Mexico followed a similar pattern to the average of LA countries, and that the pattern for Norway is similar to the USA, despite both countries being rich in oil.[7] However, Venezuela's position has worsened in the last four-odd decades.

In Table 2 we show the relative GDP per capita of Venezuela with respect to the average of LA countries, Mexico and Norway, as well as the relative GDP per capita of the average of LA countries with respect to the United States, for the beginning and end years of each sub-period. We also include 2003, as this is the year when Venezuela began its road to recovery. Venezuela lost relative average income firstly

---

[6] LA countries include: Argentina, Barbados, Bolivia, Brazil, Chile, Colombia, Costa Rica, The Dominican Republic, Ecuador, Guatemala, Jamaica, Mexico, Peru, St. Lucía, Trinidad & Tobago, Uruguay and Venezuela.

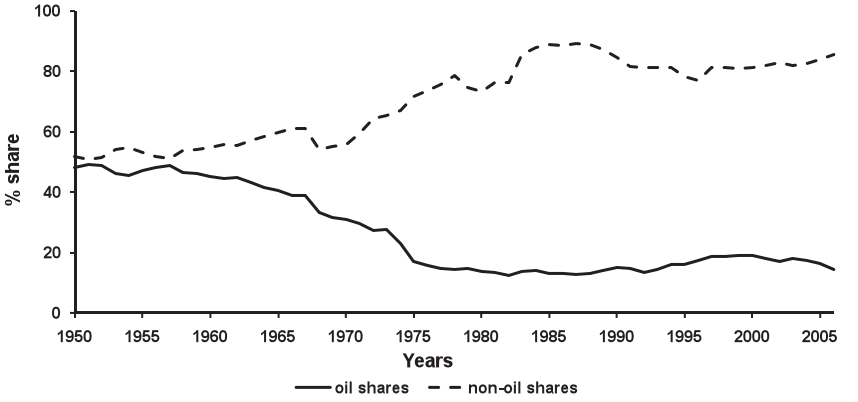
[7] We compare Norway to the U.S. economy since USA is considered to be the industrial leader in twentieth century (Kehoe and Prescott 2007, p. 8).

Table 1. Top world oil net exporters, 2006

Country[1]	OPEC	Production	Consumption	Net oil exporter	Proven oil reserves	
		Million barrels per day			Billion barrels	Per cent[2]
Saudi Arabia	Yes	10.72	2.07	8.65	266.81	20.64
Russia	No	9.67	3.10	6.57		
Norway	No	2.79		2.54		
Iran	Yes	4.12		2.52	132.46	10.25
U. Arab Emirates	Yes	2.94		2.52	97.80	7.56
Venezuela	Yes	2.81	0.65	2.20	79.73	6.17
Kuwait	Yes	2.67		2.15	101.50	7.85
Nigeria	Yes	2.44		2.15	35.88	2.78
Algeria	Yes			1.85		
Mexico	No	3.71	2.03	1.68		
OPEC					1.008.80	78.03

Notes: [1] Ranked by its exports. [2] As a percentage of total world. Source: Energy Information Administration (EIA).

Figure 1. Percentage share of crude oil in total GDP



at the Latin American level. From the 1950s to the mid-seventies, Venezuela had a much higher per capita income than the average of LA countries, and a per capita income that was three times higher than Mexico. In 2003, however, Venezuela fell to the same levels as the average of LA countries and Mexico. Secondly, as an oil country, Venezuela had higher output per capita in 1950 than Norway (another oil abundant economy). In 2003, however, the GDP per capita in Venezuela was only

Figure 2. Venezuela at the international level (per capita GDP)

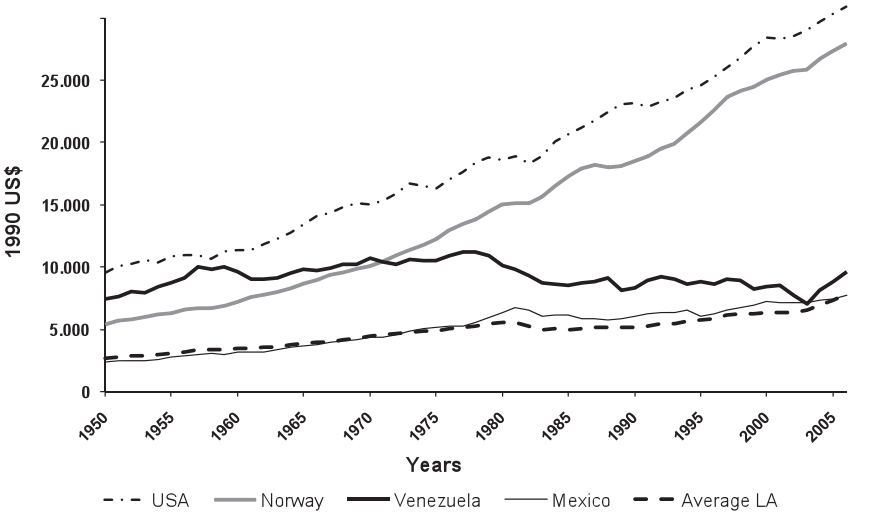


Table 2. Relative GDP per capita (PPP)

Country, Region	1950	1974	2003	2006
Venezuela/Average LA	2.75	2.15	1.07	1.24
Venezuela/Mexico	3.16	2.10	0.98	1.24
Venezuela/Norway	1.37	0.90	0.27	0.35
Average LA/USA	0.28	0.30	0.23	0.25

Source: authors' calculations

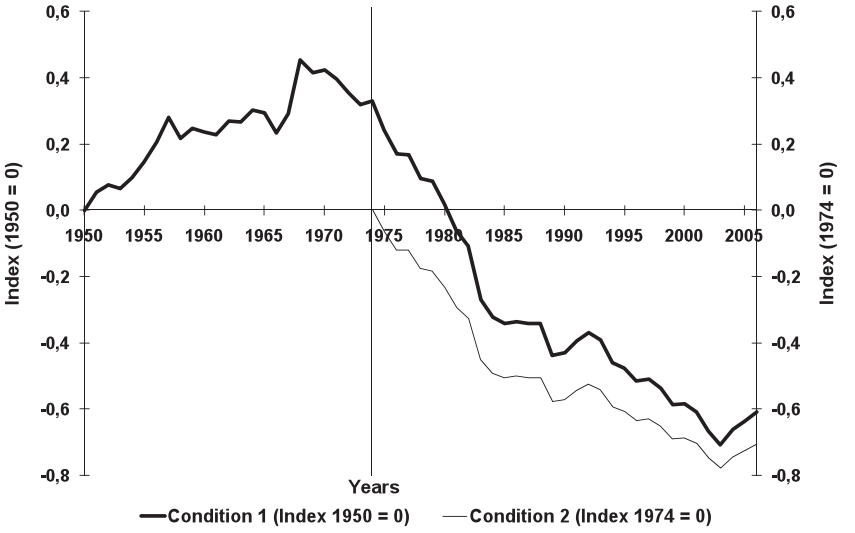
one-fourth of Norway's (one-third in 2006). We should also highlight that the average output per capita in the LA countries with respect to the USA remained more or less constant along the whole period, increasing 2 percentage points during the 1950-1974 period and decreasing just 5 percentage points in the 1974-2006 period.

Therefore, from Figure 2 and Table 2, we can conclude the following: (i) the LA countries, on average, decreased their relative income per capita with respect to the USA during the 1974-2006 period, confirming their underperformance in the last two decades mentioned by authors such as Cole et al. (2005); (ii) the underperformance in Venezuela in the 1974-2006 period was much worse than the average of other countries in the same region; and (iii) the underperformance in Venezuela did not occur in some of the other oil abundant economies such as Mexico or Norway.

Since the work of Kehoe and Prescott (2002), a technical definition of "great depression" is employed to measure the drop in the GDP in several countries (see Kehoe and Prescott, 2007). We use this definition to quantify the extent of the disaster occurring in Venezuela over the last four decades. The Venezuelan economy had an almost null average growth rate of 0.30 per cent in the 1950-2006 period, with a high positive economic growth rate in the 1950-1974 expansion period and a low economic growth rate in the 1974-2006 implosion period. In particular, the growth rate of GDP per working-age population (wap)[8] in Venezuela was positive, 3.17 per cent, for the expansion period and negative, -1.86 per cent, for the implosion period.

The thick line in Figure 3 reports Venezuela's GDP per wap as a deviation from its trend since 1950, which has been taken to be 2 per cent.[9] The GDP per wap was above its trend in the 1950-1974 period and peaked in 1968 at about 45 per cent above its trend, but from the eighties onwards the economy has been significantly below its trend values, falling 70 per cent below its trend in 2003.

Figure 3. Depression conditions according to Kehoe and Prescott's definition (Deviation respect to trend)



[8] GDP per working-age population (wap), i.e. GDP over the economically active population (among others see Hayashi and Prescott 2002).

[9] The average annual growth rate of GDP per capita among LA countries in the 1950-2006 period was 2%.

Since the beginning of the implosion period in 1974, the Venezuelan economy has declined in both a marked and rapid manner, so much so that Venezuela is considered to have been in a great depression for the last thirty-odd years, as defined by Kehoe and Prescott (2002, 2007). We have computed the three conditions stated by these authors, choosing 1974 as the initial year of the depression period. First, there is a deviation of at least 20 per cent below trend in some years after the start of the recession (in fact, there is a deviation of 70 per cent below the trend). Second, detrended GDP per wap falls by at least 15 per cent between 1974 and 1984. Since 1980, the economy has been at least 20 per cent below trend. In the first decade from the start of the depression, in particular from 1978 onwards, the economy fell by more than 15 per cent. Figure 3 shows these two technical conditions. Third, the deviation is sustained, that is, the growth rate of GDP per wap in Venezuela has not grown at the 2 per cent trend during any decade in the depression period.

Figure 4 shows GDP per wap at constant prices (1997 base year) broken down into the oil and non-oil sectors. It provides information about the dynamics of the GDP per wap in Venezuela. Three points must be highlighted. First, 1974 marks the turning point in the evolution of Venezuela's total output per wap during the 1950-2006 period,[10] even though the turning point for non-oil GDP is 1977. Second, except for the 1974-1977 sub-period,[11] the dynamics of total GDP were determined by non-oil sector dynamics: in the 1950-1974 period, the non-oil sector in Venezuela grew at a much higher rate (4.2 per cent) than the oil sector (0.1 per cent), therefore the weight of the oil sector in total GDP dropped from 48.1 per cent in 1950 to 23.0 per cent in 1974; since 1974, the weight of the oil sector has hovered around 15.4 per cent. Third, the average annual growth rate of GDP in the 1974-2006 period was clearly negative (-1.9 per cent), even though the economy made an impressive comeback in the 2003-2006 sub-period (11.5 per cent), a result of non-oil sector performance (12.9 per cent) since the recovery of the oil sector was much lower (3.8 per cent).

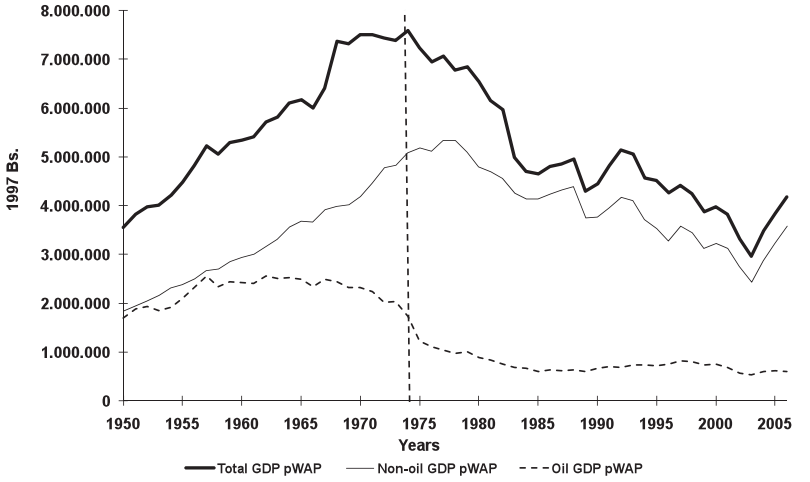
Therefore, the factors behind both the good times and the bad times or depression experienced in Venezuela could be the same factors that explain the evolution of non-oil. This result is in line with Arreaza and Dorta (2004), Hausmann (2003) and Rodríguez (2006), who show that, in the case of Venezuela, non-oil growth is a more adequate measure of economic performance.

---

[10] The peak year of the total GDP per wap is 1974, and in per capita terms the peak year is 1977.

[11] The average annual growth rate of the total GDP per wap was -2.3%: despite a 1.7% growth in the non-oil sector, the oil sector contracted 17.3%.

Figure 4. Venezuela's GDP per wap



III. Growth accounting

In this section we perform a growth accounting exercise for the 1950-2006 period to analyze the factors that explain not only the good performance of the Venezuelan economy in the 1950-1974 period, but also the collapse of growth in the 1974-2006 period.[12] Our aim is to quantify how far the economic performance of the non-oil sector in Venezuela can be explained by physical capital accumulation or by the evolution of total factor productivity. The results are shown in four periods, with the first corresponding to the expansion period and the last three to the depression period.

As mentioned in the previous section, the growth experience in Venezuela in the 1950-2006 period was mainly driven by the non-oil sector. Moreover, since oil production in Venezuela depends on OPEC quotas and on oil discoveries, and the added value of the oil sector depends mainly on international prices rather than domestic market conditions, we focus only on an analysis of the non-oil and total GDP.[13] This approach is fairly widespread in the relevant literature (among

[12] It is well-known that the growth accounting exercise is based on neoclassical assumptions, insofar as all markets are competitive (see Solow's seminal paper of 1957).

[13] We present the growth accounting exercises for the non-oil and total GDP because, as we have already shown, the total GDP of the Venezuelan economy is driven by non-oil production. Therefore, we would expect that the factors driving total output are those behind non-oil output.

others, see Schliesser and Silva 2000; Haussmann 2003; Arreaza and Dorta 2004 and Rodríguez 2006).

We consider a neoclassical technology that can be represented by a Cobb-Douglas production function:

$$\Psi_t = A_t K_t^{\alpha} \Lambda_t^{1-\alpha}, \tag{1}$$

where Ψ_t is final output, K_t is physical capital, Λ_t is labor, and A_t is Total Factor Productivity (TFP).

We consider that the labor force is the product of employment times the average hours worked (per year):

$$\Lambda_t = \eta_t E_t, \tag{2}$$

where E_t denotes employment and η_t denotes average hours worked (per year). We can express the production per wap in the following way:

$$\psi_t = A_t(\kappa_t)^{\alpha} (\eta_t \varepsilon_t)^{(1-\alpha)}, \tag{3}$$

where $\psi_t \equiv (\Psi_t / N_t)$ is Gross Domestic Product per wap, $\kappa_t \equiv (K_t / N_t)$ is the stock of physical capital per wap, $\varepsilon_t \equiv (E_t / N_t)$ is the employment rate factor and N_t is the working-age population.

We obtain the evolution of TFP, A_t, once we have accounted for the growth in inputs, which are appropriately adjusted. In particular, we have considered the growth in physical capital and also its utilization rate, while for labor we have also considered changes in human capital or labor quality.

On the one hand, the stock of physical capital per wap is adjusted by an index of energy consumption estimated by Arreaza and Pedauga (2006) obtaining κ_t^a. On the other hand, we follow Hall and Jones (1999) in using the Mincer index to estimate labor adjusted by human capital per wap, $\eta_t \varepsilon_t^a$.

$$\varepsilon_t^a = \varepsilon_t \, e^{\Phi_t \, \xi_t}, \tag{4}$$

where ε_t^a is the adjusted employment rate factor per wap, Φ_t is rate of return to schooling and ξ_t is the average years of schooling. For Mincerian return to schooling (Φ_t and ξ_t) both databases are estimations provided by Arreaza and Pedauga (2006). Therefore, after adjustments, the production function per wap is given by:

$$\psi_t = A_t(\kappa_t^a)^{\alpha} (\eta_t \varepsilon_t^a)^{(1-\alpha)}. \tag{5}$$

We can obtain the value for Total Factor Productivity as follows:

$$A_t = \psi_t / [(\kappa_t^a)^{\alpha}(\eta_t \varepsilon_t^a)^{(1-\alpha)}]. \quad (6)$$

Regarding the choice for α, we consider the standard value of 0.36 used in the real business cycle literature. This contrasts with the figure used in some growth accounting exercises performed for Venezuela, in which the capital share is much higher (see Table 42 in Elías 1992). However, as already highlighted by Saez and Puch (2004) among others, the labor share in some countries might be underestimated as it is not adjusted to include self-employed or family workers when calculating the share of total income accounted for by labor. As Bergoeing et al. (2002) point out, a high share of capital in total GDP implies an implausibly high value for the return on physical capital.

Given the adjusted series for κ_t^a and $\eta_t \varepsilon_t^a$, and our choice for capital share, α, we can calculate the TFP per wap series, A_t. Taking the natural logarithms of the production function per wap, we have:

$$\ln A_t = \ln \psi_t - \alpha \ln \kappa_t^a - (1-\alpha) \ln \eta_t \varepsilon_t^a. \quad (7)$$

In the growth accounting exercise, we have followed Bergoeing et al. (2002), who in turn follow Hayashi and Prescott (2002). In order to isolate the effect of total factor productivity and the accumulation of physical capital per wap on the growth of output per wap, we follow Hayashi and Prescott (2002), who state that on a balanced growth path, the growth of output per wap is equal to the growth of total factor productivity and the capital-output ratio is constant. Dividing expression (5) by ψ_t^{α}, we obtain the following expression (see Hayashi and Prescott 2002):

$$\psi_t = A_t^{(1/1-\alpha)}(\kappa_t^a/\psi_t)^{(\alpha/1-\alpha)} \eta_t \varepsilon_t^a. \quad (8)$$

Thus, from expression (8) we have decomposed the growth rate of GDP per wap into the contribution of changes in TFP, in adjusted physical capital-output ratio, and in adjusted labor per wap:

$$(\ln \psi_{t+s} - \ln \psi_t)/s = \left(\frac{1}{1-\alpha}\right)(\ln A_{t+s} - \ln A_t)/s + \left(\frac{\alpha}{1-\alpha}\right)(\ln(\kappa_{t+s}^a/\psi_{t+s}) - \ln(\kappa_t^a/\psi_t))/s + (\ln(\eta_{t+s}\varepsilon_{t+s}^a) - \ln(\eta_t \varepsilon_t^a))/s. \quad (9)$$

In Table 3 below, we present the results of the growth accounting exercise performed for the Venezuelan economy (non-oil and total) for the 1950-2006 period. Table 3 shows that the growth in non-oil GDP per wap, ψ_t, is chiefly accounted for by changes in the TFP, A_t, except for the 1974-1977 period. As we have seen in section II, only in the 1974-1977 period was the growth of total GDP driven by the oil sector, which suffered an abrupt decline, leading to a drop in total GDP.[14] See also Figure 5, where it is clearly shown that the growth experience in non-oil GDP per wap in Venezuela over the period is driven by the evolution of the productivity factor, while the adjusted labor per wap, $\eta_t\varepsilon_t^a$, and the κ_t^a/ψ_t change only slightly.

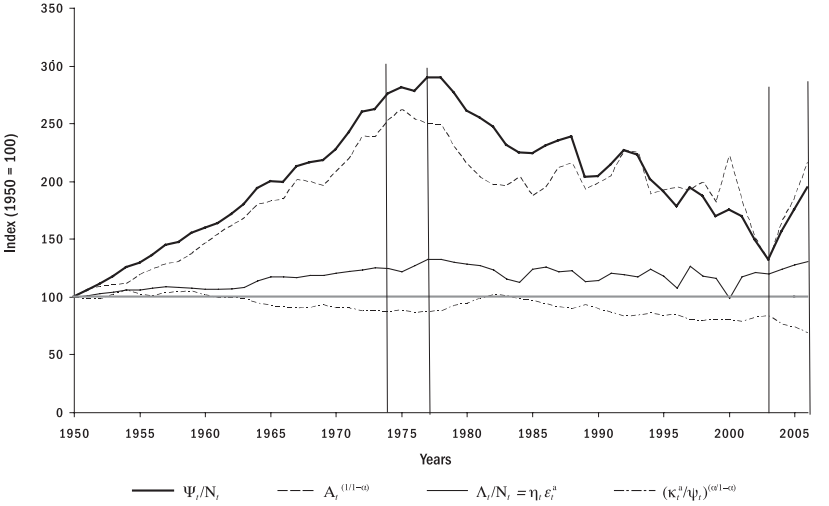
Table 3. Venezuela's growth accounting: average annual changes (per cent)

	Non-oil	Total
1950-1974 period		
Growth ψ_t	4.22	3.17
- due to A_t	3.87	2.81
- due to κ_t^a/ψ_t	-0.57	-0.39
- due to $\eta_t\varepsilon_t^a$	0.93	0.74
1974-1977 period		
Growth ψ_t	1.66	-2.33
- due to A_t	-0.46	-6.39
- due to κ_t^a/ψ_t	-0.07	2.10
- due to $\eta_t\varepsilon_t^a$	2.04	1.97
1977-2003 period		
Growth ψ_t	-3.03	-3.34
- due to A_t	-2.47	-3.01
- due to κ_t^a/ψ_t	-0.17	0.09
- due to $\eta_t\varepsilon_t^a$	-0.39	-0.41
2003-2006 period		
Growth ψ_t	12.94	11.46
- due to A_t	16.64	12.65
- due to κ_t^a/ψ_t	-0.82	-4.05
- due to $\eta_t\varepsilon_t^a$	-0.06	2.86

Source: authors' calculations.

[14] Despite TFP always being the relevant factor, except for the 1974-1977 period, there is a desaccumulation of physical capital in line with Rodríguez (2006) and Arreaza and Pedauga (2006), who point to the fact that Venezuela's low growth in the nineties was caused by a collapse in investment.

Figure 5. Venezuela's non-oil growth accounting (1950-2006)



We can conclude that for the Venezuelan economy, the driving force behind the expansion period is the same as in the depression period. Total factor productivity (TFP) explains the growth experience in Venezuela from 1950 to 2006, accounted for by the non-oil sector, except for the 1974-1977 sub-period, where the performance of the oil sector seems to have driven the sharp drop in total TFP as well as in total GDP per wap.

IV. Oil rents and the performance of the non-oil sector

As mentioned in the Introduction, even though the performance of the Venezuelan economy is driven by the non-oil sector, several papers claim that oil rents have affected the activity in the non-oil sector. Most of these papers conclude that the decline in oil rents since the seventies negatively affected the activity in the non-oil sector through a low accumulation of physical capital (see Hausmann 2003; Manzano and Rigobón 2003; Hausmann and Rodríguez 2011, among others) or through the TFP (Schliesser and Silva 2000 and Arreaza and Pedauga 2006, among others). Furthermore, there is some consensus that there are two distinguishable economic periods (good and bad policies), in particular, until the seventies oil rents were mostly used to modernize the Venezuelan economy. For example, Schliesser and Silva (2000) mention that the urban process underwritten by oil rents increased labor productivity between 1950 and 1973, in contrast to the later 1974-1992 period.

In order to check the above hypotheses, in this section we calculate some correlations to analyze whether oil rents are positively correlated with the non-oil sector factors which explain the growth experience of the Venezuelan economy.

Figure 6 shows the performance of the logarithm of non-oil TFP, the logarithm of the stock of capital in the non-oil sector and the logarithm of oil rents for the whole period from 1950 to 2006. In order to show the series in the same graph, we have indexed all of them to 1974 = 100. It should be highlighted that oil rents increased in the 1950-1974 period coinciding with the good performance of physical capital accumulation and TFP in the non-oil sector. Also, as it is clear in this figure, oil rents did not decline during the whole recession period (1974-2003), but increased during some years, from 1986 to 1998, meanwhile the dynamics of the physical capital in the non oil sector kept its upward trend until the 80s and remained almost constant since the 80s onwards, and TFP in the non-oil sector did not recover until 2003.

Table 4 shows that oil rents have a high positive correlation with both the stock of physical capital and TFP in the non-oil sector in the 1950-1974 period, and a negative correlation in the 1974-2003 period. Finally, in the 2003-2006 recovery period, the good performance of the oil sector has a high correlation with the physical capital and TFP in the non-oil sector.

Therefore, oil rents and the non-oil sector (physical capital and TFP) exhibit a positive correlation only during the expansion and recovery periods. The good

Figure 6. Oil GDP, non-oil capital & non-oil TFP

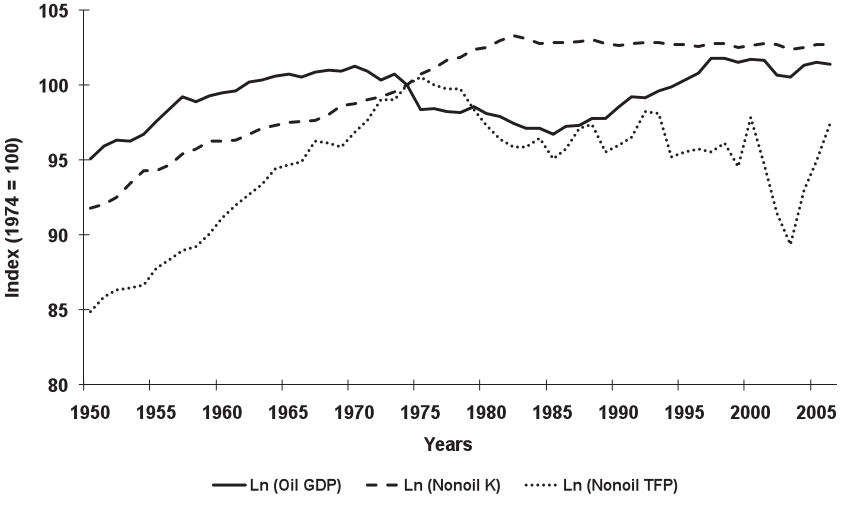


Table 4. Correlations of oil GPD with non-oil sector

Period	Non-oil TFP	Non-oil K_t
1950-1974	0.89	0.93
1974-1977	-0.14	-0.88
1977-2003	-0.32	-0.15
2003-2006	0.85	0.84

Source: authors' calculations.

performance of the Venezuelan economy is not in contradiction with the hypothesis that oil rents had a positive effect in the non-oil sector from the fifties up to the mid-seventies. Secondly, oil rents did not decline during the whole depression period. However, the TFP in the non-oil sector suffered an abrupt decline and a slight decline in adjusted physical capital. This result could support the hypothesis of bad policymaking since the late seventies, but it has nothing to do with the magnitude of the oil rents.

V. Conclusions

This paper focuses on Venezuela´s growth experience over the 56-year period from 1950 to 2006, which was characterized by a high economic growth rate during the 1950-1974 expansion period and a low economic growth rate in the 1974-2006 depression period which has already been noted by other authors. Using the definition of 'depression' by Kehoe and Prescott (2002, 2007), we find that Venezuela has experienced a great depression since the mid-seventies (as also pointed out by Bello and Restuccia 2003).

We show that although Venezuela is an oil abundant economy, its growth experience is accounted for by the evolution of GDP in the non-oil sector of the economy. During the 1950-1974 expansion period, the dynamics in the Venezuelan economy is mainly determined by an impressive high growth of the GDP in the non-oil sector. In consequence, the oil sector lost weight in the total GDP during expansion period, dropping from 48.1 to 17 per cent between 1950 and 1975, settling at an average of just 15.4 per cent during the recession period. Therefore, our first conclusion is that oil sector dynamics in Venezuela has hardly affected the country's growth experience, which was determined by the non-oil sector during the whole 1950-2006 period.

Furthermore, we perform a growth accounting exercise to quantify the extent to which the growth experience in the non-oil sector is due to physical capital accumulation. Our second result shows that most of the growth experience in the

non-oil sector in Venezuela during the whole period 1950-2006 can be accounted for by the evolution of its TFP. Therefore, the collapse in TFP explains the poor performance of the Venezuelan economy in the 1974-2006 period, rather than the slight decline in the physical capital accumulation suffered in this period.

Finally, there is a wealth of literature, which examines the use of oil rents in Venezuela and how they could affect the Venezuelan economic growth in an indirect manner. In particular, there is some consensus that the decline in oil rents since the seventies negatively affected the activity in the non-oil sector through a low accumulation of physical capital (see Hausmann 2003; Manzano and Rigobón 2003; and Hausmann and Rodríguez 2011, among others) or through the TFP (Schliesser and Silva 2000; and Arreaza and Pedauga 2006, among others). We calculate the correlation between oil rents and non-oil physical capital and TFP. Our third result is that there is a clear positive correlation between oil rents and non-oil physical capital accumulation and TFP during periods of good performance in the non-oil sector (1950-1974 and 2003-2006), but a negative correlation in the 1977-2003 depression period.

These results do not support the hypothesis of the relevance of the decline in the oil rents during the depression period, 1974-2006. In particular, we find that oil rents not only increased during the 1950-1974 period, in which Venezuela experienced a high economic growth rate, but also during the depression period, 1974-2006. Therefore, unlike those papers concluding that the depression period suffered in Venezuela is due to the fall in the oil rents, we find that the magnitude of the oil rents has nothing to do with it. Rather, it seems that bad policies might have driven the poor performance of the non-oil sector.

References

Arreaza, Adriana, and Miguel Dorta (2004), Sources of macroeconomic fluctuations in Venezuela, Serie Documentos de Trabajo 56, Banco Central de Venezuela.

Arreaza, Adriana, and Luis E. Pedauga (2006), Determinants of total factor productivity´s changes in Venezuela, *Ensayos sobre Política Económica, Banco de la República, Colombia* **25**: 120-167.

Bello, Omar D. and Norka Ayala (2004), Hechos estilizados del crecimiento económico en Venezuela, 1950-2000, *Foros*, *Banco Central de Venezuela* **10**: 41-69.

Bello, Omar D., and Diego Restuccia (2003), Venezuela´s growth experience, unpublished manuscript, University of Toronto.

Bergoeing, Raphael, Patrick J. Kehoe, Tim J. Kehoe and Raimundo Soto (2002), A decade lost and found: Mexico and Chile in the 1980´s, *Review of Economic Dynamics* **5**: 166-205.

Chari, Varadarajan V., Patrick J. Kehoe, and Ellen R. McGrattan (1997), The poverty of nations: A quantitative investigation, Staff Report 204, Federal Reserve Bank of Minneapolis.

Cole, Harold L., Lee E. Ohanian, Alvaro J. Riascos, and James A. Schmitz, Jr. (2005), Latin America in a rearview mirror, *Journal of Monetary Economics* **52**: 69-107.

Conference Board (2009), *Total economy database*, *http://www.conference-board.org/economics*, June.

Del Bufalo, Enzo, and Germán Ríos (2005), Venezuela: From stability to turmoil, in A. Solimano, ed., *Political crises, social conflict and economic development. The political economy in the Andean Region*, Northampton, Edward Elgar Publisher.

Elías, Victor J. (1992), *Sources of growth: A study of seven Latin American economies*, International Center for Economic Growth and Fundación del Tucumán Press.

Gylfason, Thorvaldur (2001a), Nature, power and growth, *Scottish Journal of Political Economy* **48**: 558-88.

Gylfason, Thorvaldur (2001b), Natural resources and economic growth: What is the connection?, Working Paper 530, CESifo.

Gylfason, Thorvaldur (2001c), Natural resources, education and economic development, *European Economic Review* **45**: 847-859.

Hall, Robert E. and Charles I. Jones. (1999), Why do some countries produce so much more output per worker than others?. *Quarterly Journal of Economics* **114**: 83-116.

Hayashi Fumio, and Edward C. Prescott (2002), The 1990s in Japan: A lost decade, *Review of Economic Dynamics* **5**: 206-35.

Hausmann, Ricardo (2003), Venezuela's growth implosion: A neo-classical story?, in Dani Rodrick, ed., *In search of prosperity: Analytic narratives on economic growth*, Princeton University Press.

Hausmann, Ricardo, and Roberto Rigobón (2003), An alternative interpretation of the resource curse: Theory and policy implications, in J. M. Davis, R. Ossowski and A. Fedelino, eds., *Fiscal policy formulation and implementation in oil-producing countries*.

Hausmann, Ricardo, and Francisco Rodríguez, (2011), *Venezuela: Anatomy of a collapse*, Penn State University Press, forthcoming.

Johnson, Ronald N. (2006), Economic growth and natural resources: Does the curse of natural resources extend to the fifty U.S. States?, in R. Halvorsen and D. Layton, eds., *Explorations in environmental and natural resource economics*, Chelterham, Edward Elgar Publisher.

Kehoe, Tim J., and Edward C. Prescott (2002), Great Depression of the 20th Century, *Review of Economic Dynamics*, **5**: 1-18.

Kehoe, Tim J., and Edward C. Prescott, editors (2007), *Great depressions of the twentieth century*, Federal Reserve Bank of Minneapolis.

Manzano, Ozmel and Roberto Rigobón (2003), Resource curse or debt overhang?, in D. Lederman and W. F. Maloney, eds., *Natural resources and development: Neither curse nor destiny*, Palo Alto, CA, Stanford University Press.

Palacios, Luis C., Alberto A. Puente, and Frank Gómez (2005), Venezuela, crecimiento y petróleo, unpublished manuscript, Banco Central de Venezuela.

Rodríguez, Francisco (2006), The anarchy of numbers: Understanding the evidence on Venezuelan economic growth, Working Paper 2006-009, Wesleyan Economics.

Rodríguez, Francisco, and Jeffrey D. Sachs (1999), Why do resource-abundant economies grow more slowly?, *Journal of Economic Growth* **4**: 277-303.

Sáez, Francisco J., and Luis A. Puch (2004), Shocks externos y fluctuaciones en una economía petrolera, Serie de Documentos de Trabajo 59, Banco Central de Venezuela.

Schliesser, Reinier, and José I. Silva (2000), La renta petrolera y el crecimiento económico en Venezuela: Análisis del período 1913-1995, Serie Documentos de Trabajo 23, Banco Central de Venezuela.

Solow, Robert M. (1957), Technical change and the aggregate production function, *Review of Economics and Statistics* **39**: 312-320.