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Manna from Heaven

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Abstract*

This paper examines the impact of the availability of fiscal revenues from nonrenewable resources on other revenues of LAC resource-exporting countries. It compares the performance of nonresource revenues in these countries to that in other countries in the region. The effect of resource revenue on nonresource revenue is found to be negative and statistically significant, with structural breaks both over time and across countries. Nonresource revenues have risen considerably, but they are still lower on average than in comparator countries, and the wedge between both groups of countries has widened over time. They also tend to be more volatile. The paper also analyzes the composition of nonresource revenues. It finds that the performance of VAT and nonresource income taxes of resource exporters has been similar to that of other countries, but revenues from other taxes (including excises) have been lower. The paper's findings have important policy implications. Especially for resource exporters with fiscal vulnerabilities to shocks and sustainability issues, strengthening nonresource revenues would be important to create adequate fiscal space to meet expenditure needs. Oil exporters should also consider phasing out their costly, inefficient, and poorly targeted petroleum subsidies, with compensating measures to protect vulnerable groups.

Keywords: Latin America; Nonrenewable resources; Oil revenues; Mineral revenues; Domestic revenue effort; Nonresource revenues; Value-added tax; Income tax; Petroleum subsidies.

JEL Classifications: E62; H20; H21; H55; O13; O23; Q30; Q33

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1. Introduction

In a number of Latin American countries, revenues arising from the production and export of nonrenewable resources—oil, gas, and minerals—are a significant component of fiscal revenues. Countries endowed with nonrenewable resources (henceforth, "resources") can benefit substantially from them, and many Latin American and Caribbean (LAC) resource exporters have done so.

Resource revenues, however, differ in a number of ways from other sources of revenue, and can pose challenges to fiscal policy. They are more volatile and uncertain than other revenues, which complicates fiscal planning and execution; they originate largely from abroad and are injected into the domestic economy through the nonresource fiscal deficit, with implications for macroeconomic stabilization; they arise from the exploitation of resources that have a limited time horizon and can become technologically obsolete, which raises long-term sustainability and intertemporal equity issues; and in many countries they have been associated with procyclical fiscal policies, public spending of poor quality, and rent-seeking. Many papers have studied the implications of resource revenue dependence for fiscal policy in nonrenewable resource-exporting countries (RECs).[1]

There has been much less emphasis in the literature on a key aspect of reliance on resource revenue (RR): the relationship between the availability of these revenues and the performance of nonresource revenue (NRR). In LAC the importance of RR for fiscal policy in RECs has long been recognized, even though resource dependence is generally lower than in many highly resource-dependent countries elsewhere in the world. Several questions therefore arise: does manna from heaven reduce the incentive to collect other revenues in RECs in the region? Is there an offset between RR and other revenues? Is part of the resource rent reaped by the public sector transferred to the private sector in the form of reduced nonresource taxation, rather than higher public spending or net accumulation of financial assets? Does NRR performance deteriorate during resource booms because collection incentives weaken?

[1] Challenges of fiscal management in oil-producing countries are discussed in several chapters in Davis, Ossowski, and Fedelino (2003), Medas and Zakharova (2009) and Sturm, Gurtner, and González Alegre (2009). Dabán and Hélis (2010) discuss the implications of large nonrenewable resource revenues for public financial management. Villafuerte, and López Murphy (2010) look at the cyclicality of fiscal policy in oil-producing countries. Sinnott, Nash, and De La Torre (2010) provide a comprehensive overview of commodity-related policy issues in LAC. Villafuerte, López Murphy, and Ossowski (2010) examine fiscal policy cyclicality in RECs in LAC, as well as the role of resource funds and fiscal rules in the region.

Much of the discussion about whether reliance on RR is likely to dampen incentives to raise other revenues has taken place in the context of political economy and institutional theories of the resource curse. In particular, a number of researchers have focused on the relationship between governance, accountability, democracy, and taxation—areas where deep controversies have arisen. Some researchers have found evidence that resource abundance has an adverse impact on institutional capacity and governance, and that this, in turn, exerts a negative impact on growth (Sala-i-Martin and Subramanian, 2003; Collier and Hoeffler, 2005; Isham et al., 2005; Ramsay, 2009). But these findings are by no means undisputed (Mehlum, Moene, and Torvik, 2006; Brunnschweiler and Bulte, 2008; Alexeev and Conrad, 2009; and Arezki and van der Ploeg, 2010).[2]

In many interpretations, a key channel through which resource abundance is thought to hamper governance and the government's accountability to citizens is through the "taxation effect." Taxation is seen as a catalyst for more responsive and accountable governments and for expanding state capacity, and governments less reliant on domestic tax revenue are seen as prone to be less accountable, responsive, and efficient. Against this background, it has been argued that governments with large RR do not need to make much of an effort to raise NRR, and are therefore relatively relieved of accountability pressures, as the public's demand for democratic accountability and the public scrutiny of government is reduced (Collier, 2006; Moore, 2007; Bräutigam, Fjeldstad and Moore, 2007; OECD, 2008; 2010).

Empirical evidence of the impact of RR on other revenues in RECs is limited. The most comprehensive study is by Bornhorst, Gupta, and Thornton (2009), who examined a panel consisting exclusively of oil-exporting countries. They found that the ratio of non-oil revenue to GDP is inversely related to the ratio of oil revenue to GDP.[3] The effect is statistically significant. The estimated offset between the oil revenue and non-oil revenue ratios to GDP is about 20 percent. The authors also found that non-oil revenue as a share of non-oil GDP is inversely related to oil revenue as a share of oil GDP. The share of fiscal oil revenue in oil GDP depends

[2] There is also a debate in the literature about the relationship between nonrenewable resources and democracy. Some researchers find that oil income is associated with low levels of democracy (Ross, 2001; Moore, 2007), but this evidence has recently been challenged (Haber and Menaldo, 2011; Blair, 2011). To the extent that oil may have anti-democratic effects, they seem to vary over time and across regions (Ross, 2009), and they do not hold in Latin America (Dunning, 2008; Ross, 2009).

[3] Throughout this paper the term "oil" is used as substitute for the more encompassing term "hydrocarbon." Gas is an important resource in Bolivia and Trinidad and Tobago.

mainly on the fiscal regime in place for the sector, and the result therefore suggests that NRR is inversely related to the effective tax rate in the oil sector.

The IMF reports that unpublished results from Sub-Saharan Africa suggest a similar effect to that found by Bornhorst, Gupta, and Thornton (2009) for all forms of resource wealth (IMF, 2011a). Ross (2009) finds that in countries with more oil income per capita, taxes on goods and services make up a smaller share of total revenue.[4] There is some evidence that oil revenue in Mexico has been negatively correlated with non-oil revenue (Oviedo-Cruz, 2005). Erbil (2011), on the other hand, found that non-oil revenue in oil-producing developing countries is strongly procyclical (especially in middle-income countries), which he ascribes to positive spillover effects from increased oil revenue.

Foreign aid to developing countries shares some characteristics with RR. Aid is also a volatile and uncertain external resource flow. Grants are a free external resource, while official loans are typically highly concessional. This said, aid may be earmarked, it may involve the need for cofinancing by the recipient government, and it may be subject to conditionality. Nevertheless, it has a potentially dampening effect on the revenue effort by reducing needs and creating disincentives to strengthen performance for fear of offsetting reductions in future foreign aid.

The empirical evidence on whether some kinds of aid might displace own revenues is mixed. A major study by Gupta et al. (2003) found that concessional loans are associated with higher domestic revenue mobilization, but grants have a dampening effect on domestic revenues—and in countries plagued by weak institutions and high levels of corruption, increases in grants are completely offset by the decline in revenues. A broad review of the evidence, however, led Moss, Pettersson, and van de Walle (2006) to note the diversity of empirical results and country experiences: while a clear bivariate relationship appears to exist between high levels of aid and low levels of taxation, this could be due to other factors. Finally, research by Knack (2008) shows that aid and (to a lesser extent) rents from natural resources reduce the quality of tax systems.

[4] While this shows that a rise in a country's oil income tends to reduce its reliance on taxes on goods and services, it does not necessarily imply a weaker performance of these taxes compared to other countries, as discussed below.

This paper contributes to the empirical research on fiscal revenues in LAC and extends previous analyses in a number of directions. It looks at the impact of the availability of RR on other revenues from several angles:

- What is the overall revenue performance of RECs compared to countries without such resources? How volatile is revenue in RECs compared to other countries, and how volatile is NRR compared to RR?
- Does RR "displace" NRR; that is, is NRR performance lower than in other countries?
- How does access to RR affect the design and composition of tax systems?
- Does RR alter the incentives for the efficient collection of value-added tax (VAT), the main nonresource tax in LAC?
- Have there been structural breaks in the above relationships during the most recent resource boom?

The paper focuses on a sample of RECs in LAC where fiscal revenues from nonrenewable resources are significant and where there is available information to construct long time-series for fiscal revenues broken down into RR and NRR. The sample comprises eight countries. Six countries—Bolivia (also a mining exporter), Colombia, Ecuador, Mexico, Trinidad and Tobago and Venezuela—are mainly or exclusively oil exporters, while two countries—Chile and Peru—are mineral exporters. These countries comprised about 45 percent of regional GDP and 57 percent of regional exports in 2011, according to IMF data.

Fiscal revenues in these eight countries will be compared and contrasted with the fiscal revenues of seven LAC comparator countries that either do not collect revenues from resource activities, or where those revenues are less significant: Argentina, Brazil, Costa Rica, El Salvador, Honduras, Paraguay, and Uruguay.[5]

Although the analysis focuses on broad trends and groups of countries, the significant diversity of the countries in the two sub-samples should be borne in mind. In particular, country-specific factors that show significant differences among RECs include level of development, macroeconomic trends, diversification of the economy, fiscal dependence on RR, and the stock of resource reserves in the ground. The comparator countries also show important differences, particularly as regards level of development.

[5] Suitably long time-series for fiscal revenue from oil, gas, and mining in Argentina and Brazil could not be obtained.

The rest of the paper is organized as follows. Section 2 presents the analytical framework, discusses a number of specific methodological issues that arise in the analysis of revenue in RECs, and provides information on fiscal coverage and the scope and sources of the data. Section 3 discusses the resource dependence of LAC resource exporters, sets out the main resource and nonresource revenue trends over the sample period, compares revenue performance in both groups of countries, provides an analysis of revenue volatility, and briefly reviews broad fiscal trends in RECs during the resource boom. Section 4 presents the empirical model to test whether RR displaces other revenues in RECs, the econometric methodology, and the results. Section 5 provides a detailed analysis of the factors that explain differences in revenue performance between both groups of countries, including the main nonresource taxes. Finally, Section 6 summarizes the paper and discusses the policy implications of the results.

2. Analytical Framework and Data

2.1. Revenues, Resource GDP and Nonresource GDP

The analysis of NRR in RECs and comparisons with revenues in other countries need to take into account key implications of the existence of the resource sector in the economy. Specifically, in RECs it is important to distinguish value added in the resource sector from value added in the nonresource sector because of the significant differences between these sectors and the nature of the revenues collected from them. In the national accounts from the production side, this is achieved by splitting aggregate value added into resource GDP (RGDP) and nonresource GDP (NRGDP).[6]

RGDP in RECs can be a substantial but highly volatile component of GDP. Several specific factors shape its trajectory. International resource prices are among the most important ones, and they are highly volatile and unpredictable. In the case of oil, the international market is characterized by long lags in the response of demand and supply, which generates price volatility and uncertainty. On the demand side, it takes years for consumers to switch to less energy-intensive technologies in response to higher prices, and future demand is difficult to predict. On

[6] In common with general national accounts practice in LAC, RGDP is defined as the primary oil, gas, and mining sector, that is, upstream activities; it does not include the secondary and tertiary sectors. In Trinidad and Tobago, however, the official RGDP is defined including downstream oil and gas activities. Data for Trinidad and Tobago's RGDP were adjusted to exclude those activities, to ensure comparability with the other countries.

the supply side, investment is expensive and there are long gestation lags before it translates into higher production capacity. Further complications arise because of the structure of oil production, with close to 40 percent of output and 80 percent of reserves under the control of a cartel, and part of production in the public sector and part in private hands.

Other factors that determine RGDP are changes in production volumes and costs; the fiscal regime applied to the sector, which influences resource production and investment but is different from the system applied to tax the nonresource sector; and the real exchange rate. Together with resource prices, these factors are to a large extent a distinguishing feature of the resource sector and are distinct from those that influence NRGDP.

For example, and key to the issues discussed in this paper, the resource price boom in the last decade led to a marked increase in nominal RGDP and its share in total GDP in LAC RECs. The average share of RGDP in GDP rose from about 8 percent in 1994–98 to 10 percent in 1999-2004 (the first phase of the resource price boom) before surging to 15 percent in 2005–10 (the second and more substantial phase of the boom, with a brief interruption from late 2008 to mid-2009 associated with the global financial crisis and recession).[7]

NRGDP, in turn, is influenced by RGDP through linkages and spillover effects.[8] First, the government typically intermediates a large share of resource rents: the taxation of the resource sector finances in part expenditures in the nonresource sector. In many countries, procyclical fiscal policies have transmitted resource price volatility and uncertainty to the nonresource sector (Villafuerte and López Murphy, 2010). Second, the resource sector's operations have spillovers into the nonresource sector via input links and wage (and in some cases equity dividend) income that the recipients largely spend in the nonresource sector. Third, to the extent that a resource boom is perceived as long lasting, it may lead to lagged wealth effects that raise consumption and activity in the nonresource sector.

[7] The period 1994–98 featured relative price stability in 1994–95, a mini oil price boom in 1996–97, and a collapse of prices in 1998. The period 1999–2004 included an initial surge in oil prices in 1999–2000 followed by relative stability at the higher prices through 2003. Prices began to rise strongly again in 2004, and the period 2005–10 was characterized by very large price increases through 2008, a fall in prices from late 2008 to mid-2009, and a strong recovery in prices thereafter.

[8] Klein (2010) looks at the intersectoral linkages between the oil and non-oil sectors in a cross-country perspective through a panel VAR approach.

2.2. Resource and Nonresource revenues

Resource revenue is collected from the resource sector and in this paper it is defined as fiscal revenue arising directly from taxing the exploitation of oil, gas, and minerals. The fiscal regime applied to the resource sector comprises tax and nontax instruments used to obtain the government take from the sector.[9] The main instruments used to get the government take are: (i) tax instruments: corporate income taxes, withholding taxes, progressive profit taxes, windfall profit taxes, and export taxes; (ii) nontax instruments: royalties, fees and signature bonus payments, production sharing and service contracts, and income from state equity participation in the resource sector, including dividends and transfers from national oil companies (NOCs).[10]

Table 1. Fiscal Regimes for the Resource Sector

Instrument	Oil exporters						Mining exporters		
	BOL	COL	ECU	MEX	T&T	VEN	BOL	CHI	PER
Tax instruments									
Corporate income tax	✓	✓	✓	✓	✓	✓	✓	✓	✓
Windfall profit tax	✓		✓		✓	✓	✓		
Withholding tax	✓	✓	✓	✓	✓	✓	✓	✓	✓
Nontax instruments									
Fees and bonuses		✓	✓		✓	✓			✓
Production sharing or service contracts	✓	✓			✓				
Equity participation			✓			✓			
Royalties									
Specific					✓				
Ad-valorem	✓		✓		✓	✓			
Sliding scale		✓					✓	✓	✓

Source: Varsano (2011).

[9] See Sunley (2003) and Daniel, Keen, and McPherson (2010).

[10] Since VAT is intended as a tax on final domestic consumption, it should in principle have little impact on resource operations, which are typically largely for export (VAT on inputs and capital goods purchased by the resource sector is credited or, if there is not enough tax liability, it is refunded), and the incidence of VAT is on the consumers. Therefore, VAT is not included in RR. Excise taxes on domestic petroleum products are not included in RR either, because they are also collected in countries that do not export oil, and moreover the incidence is on the consumers. Finally, other taxes paid by the resource sector in the course of its normal operations, such as import duties and financial transaction taxes if applicable, or those where the sector acts purely as withholding agent, such as personal income taxes levied on employees in the sector, are not included in RR.

Fiscal regimes for the resource sector differ across the LAC RECs covered in this study. Varsano (2011) provides information on the structure of the fiscal regimes in the individual countries in recent years. This is reported in Table 1.

In four RECs (Bolivia, Ecuador, Mexico and Venezuela), the upstream oil and gas sector is reserved for NOCs. In Ecuador and Venezuela, private oil companies may participate in the oil sector, but only as partners of the NOCs, Petroecuador and PDVSA, respectively. In Bolivia they can do so only through service contracts with YPFB.

NRR is defined as revenues other than those collected directly from the resource sector as defined above. It includes corporate income taxes levied on the nonresource sector, personal income taxes, VAT, excises, taxes on international trade (excluding any export taxes on resource exports), nonresource nontax revenue, and social contributions collected by the general government.

2.3. The Impact of Resource Revenue on Nonresource revenue and Measurement Issues

Resource revenue could impact the collection of other revenues in various ways. For example, the availability of RR may be associated with a lower *NRR ratio to GDP* than the total revenue ratio to GDP in countries not endowed with resources. However, the *total revenue ratio to GDP*, and thus the ability to finance public expenditure without borrowing, could be higher or lower than in other countries, depending on the relative magnitudes of RR and the extent to which the NRR ratio is lower than the revenue ratio in other countries.

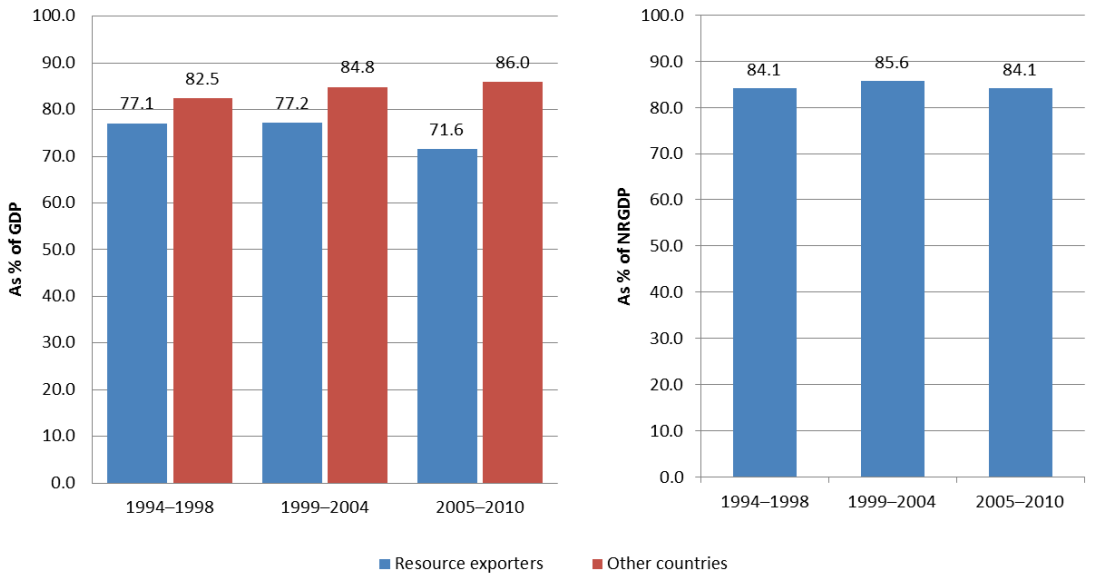
The interpretation of normalized revenue variables in RECs needs to take into account the special characteristics of RGDP discussed above. In other countries, revenue ratios are routinely expressed and discussed as a share of GDP. In RECs, however, the NRR ratio to GDP can be significantly affected by the volatile and unpredictable movements in RGDP discussed earlier, which can be quite large and make the NRR ratio to GDP volatile and possibly hard to understand. This would suggest the use of NRGDP, which is much less volatile, as an alternative and superior normalization variable.

Moreover, NRGDP is an admittedly imperfect but arguably closer aggregate proxy for the overall nonresource taxable base in RECs than total GDP. It is a reasonable approximation to the base that can be tapped for the taxation of the nonresource sector.

It might be argued that the taxable base of some important nonresource taxes such as VAT or excises is consumption or parts thereof, which depends on disposable income including resource income. However, the bulk of RGDP does not accrue directly to households or the nonresource corporate sector as income but is rather intermediated through the government via government spending or lower nonresource taxes than in other countries. In principle, the larger the resource dependence and the share of public sector wages and transfers to the private sector, the larger would be the impact of RR on aggregate consumption.

Moreover, as an empirical matter, in LAC RECs the ratio of consumption (C) to NRGDP has been significantly more stable than the ratio of C to total GDP. The average coefficient of variation of the ratio C/NRGDP in 1992–2010 was lower by more than a third than the average coefficient of variation of the ratio C/GDP. Indeed, it was even lower than the average coefficient of variation of the C/GDP ratio in the comparator countries. The average C/GDP ratio in RECs fell dramatically during the recent resource boom, from 77.1 percent in 1999–2004 to 71.6 percent in 2005–10 (Figure 1). This development was associated with a strengthening of the external current account of RECs during the boom by about 5 percentage points of GDP on average as resource exports surged in value, and some increase in the investment ratio. In contrast, the ratio C/NRGDP remained stable throughout the period.

Figure 1: Consumption in Resource Exporters and Other Countries



Source: Authors' calculations based on data from official national sources and Inter-American Development Bank.

Hence, there are theoretical and empirical arguments for concluding that NRGDP is a good alternative variable for the normalization of revenue aggregates and a reasonable overall proxy for the nonresource taxable base in RECs, and that for a number of analytical purposes it is better than total GDP. Indeed, non-oil GDP is being increasingly used as a standard scaling variable for fiscal policy analysis and formulation in oil-exporting countries.[11] Therefore, NRR performance in RECs will be discussed in terms of its ratios to total GDP and NRGDP.

This approach can lead to revealing insights that would be lost if only ratios to GDP were assessed. For example, a falling NRR ratio to GDP over time may be masking strengthening revenue performance. Chile's NRR rose by one percentage point of NRGDP during 2001–07, but the NRR ratio to GDP fell by a full 3 percentage points of GDP because of the surge in mining GDP (and its share in GDP) largely associated with the boom in international metal prices.

When NRR performance in RECs is weaker than total revenue performance in other countries with similar tax capacity, RR is said to *displace* NRR. This would happen because, relative to those countries, revenue effort is lower. A lower revenue effort may be due to tax

[11] See, for instance, the discussion of fiscal developments in oil-exporting countries in the IMF's September 2011 *Fiscal Monitor (*IMF, 2011b). In the IMF's *Regional Economic Outlook: Middle East and Central Asia*, non-oil revenue in oil-exporting countries is assessed in terms of non-oil GDP (IMF, 2011c).

policy decisions—some nonresource tax handles are not exploited, or tax rates are lower, or parts of the revenue bases are given away through tax expenditures—or to a less effective NRR administration.

Alternatively, the NRR ratio to GDP may be higher in a REC than in comparator non-exporting countries. In this case, because of the additional RR, total revenue would be higher than in those countries. RR would not be displacing NRR, and NRR performance would arguably be *stronger* than in other countries. For example, Bolivia's NRR ratio to GDP in 2003–10 was similar to Costa Rica's, but its NRR performance was considerably stronger when measured against NRGDP. Compared to other countries and other things being equal, RECs could use the higher level of total revenue to finance larger governments without recourse to borrowing, and/or to accumulate more net financial assets.

Different strategies for NRR could, in turn, have different implications for efficiency and long-run growth, income distribution, and institutional development. These issues, however, will not be covered in this paper.

2.4. Coverage of the Fiscal Sector, Data Description and Sources

The focus of the paper is on general government tax and nontax revenues excluding grants. The general government comprises the consolidated central government, subnational governments, and social security contributions to state-run social security systems that may accrue directly to the various levels of government or to special state funds.

The choice of tax and nontax revenues of the general government for fiscal coverage is predicated on the fact that the study aims at a comprehensive coverage of revenues and that the comparison of revenue levels is a key aspect of the study. In several countries, such as Argentina, Colombia, and Brazil, subnational revenues are significant, and narrowing fiscal coverage to the central government would lead to comparability issues. Covering tax and nontax revenues is particularly important for RR, because the choice of the specific instruments to get the government take from the sector is largely idiosyncratic, and in several countries a large share of RR is collected by means of nontax instruments such as royalties.

Data on general government revenues were assembled for 11 countries: Bolivia, Chile, Colombia, Ecuador, Mexico, and Peru (RECs, where revenues are broken down into their resource and nonresource components as defined above) and Argentina, Brazil, El Salvador,

Honduras, and Uruguay (nonresource countries). In some of these cases, at the subnational level only state or provincial revenue data are available, with no data for local governments. In four countries, only central government and social security data were available: Trinidad and Tobago and Venezuela (RECs), and Costa Rica and Paraguay (nonresource countries).[12] The period covered is 1994–2010.

Revenue data were assembled from a variety of sources. They included official data available from the countries' ministries of finance, revenue administration agencies and central banks, as relevant; the CEPAL/OECD/CIAT/IDB database for LAC tax revenues; and IMF data from the World Economic Outlook database and individual country reports. Adjustments to the data were made where possible for known changes in classification or methodological treatment in the original time series, to ensure consistency over time.

Macroeconomic data and data for the control variables used in the regressions (see below) were assembled from the World Bank's World Development Indicators and the IMF's World Economic Outlook databases, and the International Country Risk Guide (ICRG) database.

3. Resource Dependence and Comparison of Revenue Developments and Revenue Volatility and in LAC Resource Exporters and Other LAC Countries

3.1. Fiscal Resource Dependence

On average, the public finances of oil exporters in LAC are significantly less dependent on oil revenues than the most heavily dependent oil-exporting countries in the world. The average fiscal oil revenue dependence of the six LAC oil exporters in 2000–07 was about 28 percent, compared to close to 55 percent for the 31 oil exporters with the highest oil revenue dependence (excluding LAC).[13] This is mainly due to the fact that, on average, the economies of LAC oil exporters are more diversified than those of other oil exporters. The share of oil GDP in the GDP

[12] In Venezuela, central government transfers make up the bulk of the revenue of the states and most of the revenue of the municipalities. Therefore central government revenue and social security contributions are very close to general government revenue.

[13] This comparison should be treated with caution and as indicative of broad orders of magnitude. Fiscal coverage in the comparator group of resource exporters varies. There may also be country-specific variation in the definition of RR. Source for comparator country data: Daniel, Keen, and McPherson (2010).

of LAC's six oil exporters in 2005–08 at the height of the boom was 16 percent, compared to 44 percent in other oil exporters.

The fiscal resource dependence of LAC oil exporters increased in the recent oil price boom despite a strengthening of non-oil revenues (see below). The average ratio of oil revenue to total revenue rose from 24 percent in 1994–2004 to 31 percent in 2005–10 (Table 2). But the averages mask divergent developments. Oil dependence increased markedly in Bolivia, Mexico, and Trinidad and Tobago, while it declined in Ecuador despite changes in the fiscal regime that raised the government take from the oil sector. The average resource dependence of the mining exporters, Chile and Peru, surged from 3–4 percent to 16 percent over the same period.

LAC oil exporters can be classified into three broad groups according to fiscal resource dependence. Trinidad and Tobago and Venezuela are the most oil-dependent countries, with dependence ratios of 45–55 percent in 2005–10. A middle group of countries comprises Bolivia, Ecuador and Mexico, with dependence ratios of about 25 to 35 percent. Finally, Colombia, at about 7 percent, shows much lower dependence. Chile's mining revenue dependence surged in recent years and by 2005–10, at 25 percent, was approaching that of the LAC middle group of oil producers. Peru's mining dependence, while also showing large increases in the last few years, is much lower (8 percent).

Table 2. General Government Revenue

	Percent of GDP					
	1994–98		1999–2004		2005–10	
	Resource exporters	Other countries	Resource exporters	Other countries	Resource exporters	Other countries
Total revenue	21.0	22.1	22.2	23.6	26.4	26.5
Resource revenue	3.9	--	4.2	--	7.5	--
Nonresource revenue	17.1	22.1	18.0	23.6	18.8	26.5
Revenue	15.3	18.0	16.2	19.8	16.9	22.0
Tax revenue	12.2	14.6	12.8	16.0	13.6	18.1
Nontax revenue	3.2	3.4	3.3	3.8	3.3	3.8
Social security revenue	1.8	4.1	1.8	3.9	1.9	4.5
Memorandum items						
Total revenue	19.3	18.0	20.4	19.8	24.4	22.0
Resource revenue as % of total revenue	19	…	18	…	27	…
Oil-exporting countries	24	…	23	…	31	…
Mineral-exporting countries	4	…	3	…	16	…

	1994–98		1999–2004		2005–10	
	Resource exporters (% of NRGDP)	Other countries (% of GDP)	Resource exporters (% of NRGDP)	Other countries (% of GDP)	Resource exporters (% of NRGDP)	Other countries (% of GDP)
Nonresource revenue	18.6	22.1	19.9	23.6	22.2	26.5
Revenue	16.7	18.0	17.9	19.8	19.9	22.0
Tax revenue	13.3	14.6	14.3	16.0	16.1	18.1
Nontax revenue	3.4	3.4	3.7	3.8	3.9	3.8
Social security revenue	1.9	4.1	2.0	3.9	2.2	4.5

	Decomposition of Differences in Total Revenue		
	1994–98	1999–2004	2005–10
Total revenue			
Resource exporters	21.0	22.2	26.4
Other countries	22.1	23.6	26.5
Difference	-1.1	-1.4	-0.1
Resource revenue	3.9	4.2	7.5
Nonresource revenue	-5.0	-5.6	-7.7
Revenue performance 1/	-3.5	-3.7	-4.3
Resource GDP effect 2/	-1.5	-1.9	-3.3

Source: Authors' calculations based on data from official national sources, International Monetary Fund, and Inter-American Development Bank.

Resource exporters: Bolivia, Chile, Colombia, Ecuador, Mexico, Peru, Trinidad and Tobago, and Venezuela. Central government revenue for Trinidad and Tobago and Venezuela.

Other countries: Argentina, Brazil, Costa Rica, El Salvador, Honduras, Paraguay, and Uruguay. Central government revenue for Costa Rica and Paraguay.

1/ Difference between nonresource revenue of resource exporters in percent of NRGDP and revenue of other countries in percent of GDP.

2/ Difference between nonresource revenue of resource exporters in percent of NRGDP and in percent of GDP.

3.2. Revenue Comparisons and Trends: Stylized Facts

Total revenues rose significantly in both groups of countries since the mid-1990s. Table 2 shows data for average revenue aggregates for the RECs and other countries for three sub-periods: the initial sample period 1994–98, and the first and second phases of the resource price boom,

namely 1999–2004 and 2005–10, as described above. Econometric analysis confirms the existence of structural breaks in the relationship between RR and NRR in the sample countries in these periods (see Section 4).

The main factors shaping the revenue increases in the two groups of countries were different. In the RECs, the main driver of the increase in overall revenue was a doubling of RR from 3.9 percent of GDP on average in 1994–98 to 7.5 percent in 2005–10. NRR also increased as a share of GDP, but less than overall revenue in the comparator group. As a result of these developments, the revenue ratio rose by over 5 percentage points of GDP in RECs. In the comparator countries, total revenue rose by over 4 percentage points.[14]

Favorable revenue developments were associated with sharply higher resource prices, strong output growth, and policy measures. During 2003–10, oil prices in U.S. dollars rose on average by over 15 percent a year, and copper prices by 18 percent a year. Nonresource economic activity expanded strongly: in RECs the annual average rate of growth of NRGDP rose from 2.6 percent a year in 1999–2004 to 4.3 percent a year in 2005-10. The average annual rate of growth of real GDP in the comparator countries increased from 1.6 percent to 4.7 percent over the same period. Besides reflecting the impact of stronger economic activity, the increases in NRR in RECs and total revenue in other countries were also due to increases in tax rates, better tax compliance (partly associated with improved macroeconomic conditions), and in some cases the introduction of new taxes (Gómez Sabaini and Jiménez, 2009).

Total revenue in 2005–10 was similar on average in both country groups—26.4 percent of GDP—although this masks wide country variation. However, revenue from social security contributions is much higher on average in the comparator countries than in RECs. The total revenue ratio of RECs excluding social security contributions is higher than in comparator countries.

Turning to NRR performance (excluding social security contributions), the average NRR ratio to GDP is significantly lower in RECs than the total revenue to GDP ratio in other countries. The NRR ratio to NRGDP in RECs is also smaller than the total revenue ratio in other countries. In 2005–10, this ratio was highest in Colombia (24 percent of NRGDP), followed by a group of

[14] Unweighted averages for the variables in the REC group and in the comparator group are used in this paper, because Mexico and Brazil account for 48 percent and 81 percent of the combined GDPs of the REC group and the comparator group, respectively (2006–10). Weighted averages would give these countries disproportionate weights.

countries in the 21–23 percent range (Bolivia, Chile, and Ecuador), Peru, Trinidad and Tobago and Venezuela at around 18 percent, and lagging well behind, Mexico at about 12 percent.

The difference in NRR performance between RECs and the comparator countries widened to about 5 percent of GDP and 2 percent of NRGDP in 2005–10, as revenues increased more in the comparator countries than in the RECs. This masks important differences among the RECs. Far and away the largest increases in NRR (measured as the percentage change of the NRR ratio to NRGDP between 1994–98 and 2005–10) were recorded in Ecuador and Venezuela, where NRR surged from about 11 percent of NRGDP in the mid-1990s to 21 percent and 18 percent, respectively, in 2005–10. Bolivia and Colombia also registered significant increases, on the order of 5 percentage points of NRGDP. In Peru, NRR increased much more moderately. In Chile and Mexico, NRR was broadly unchanged, and in Trinidad and Tobago, which had the highest NRR among the RECs in 1994–98, it fell significantly over the period.

Finally, increases in the NRR ratio to NRGDP were larger than the increases in the ratio to total GDP. This is related, among other things, to the fact that, as discussed earlier, the share of RGDP in total GDP doubled over the period, largely as a result of the boom in resource prices, and this increasingly depressed the NRR ratio to GDP.

The fact that the NRR ratios to GDP and NRGDP in RECs are lower than the total revenue ratio to GDP in the comparator countries is prima facie evidence of NRR displacement by RR. It would seem that the availability of RRs might be exerting a dampening effect on NRR in these countries. This hypothesis will be formally tested in the next section, after first looking at the volatility of revenues and broad fiscal trends in RECs during the resource boom.

3.3. Revenue Volatility

The volatility of fiscal aggregates in LAC has traditionally been relatively high by international standards. This has been ascribed to an underlying macroeconomic environment in LAC that is much more volatile than in industrialized countries, as well as policy-related volatility. This said, fiscal volatility in LAC declined in the last decade.[15] An index of LAC fiscal balance volatility estimated by the OECD shows a decline by a third from 1990–94 to 2000–06, with LAC

[15] See Gavin et al. (1996); Singh (2006); and Clements, Faircloth, and Verhoeven (2007).

standing just 6 percent above the level in the OECD in the latter period. Over the same period, the OECD estimates that revenue volatility in Latin America fell by a quarter (OECD, 2009).

Table 3. Revenue Volatility Indicators

	Volatility 1/			
	Resource exporters		Other countries	
	Revenue	Adjusted revenue 2/	Revenue	Adjusted revenue 2/
Total revenue excluding social security	11.0	9.3	6.9	5.5
Resource revenue	44.7	…	--	…
Non-resource revenue	8.6	7.5	6.9	5.5
Tax revenue	8.9	7.5	7.2	5.7
Non-tax revenue	25.0	25.4	29.4	29.1
Real Non-resource GDP	3.8	…	3.6	…

Source: Authors' calculations.
1/ Volatilities defined as standard deviation of percentage changes of the relevant variable in real terms.
Revenue variables for resource producing countries deflated by the NRGDP deflator.
Revenue variables for other countries deflated by the GDP deflator.
2/ Revenue adjusted for the NRGDP cycle (RECs) and for the GDP cycle (other countries).

The comparison of revenue volatility between RECs and other countries provides important insights. Table 3 presents the volatility of revenues in RECs and other countries in the sample. Several points are worth noting.

Total revenues are markedly more volatile in RECs than in the comparator countries. The average volatility of total revenue excluding social security contributions (measured as the standard deviation of percentage changes of revenue in real terms) of the RECs in the region was 60 percent higher than that of other LAC countries.[16]

The large revenue volatility of RECs is mainly due to the enormous volatility of RR. The main contributing factor is the massive volatility of international resource prices, but other factors such as changes in production volumes and costs, modifications to the fiscal regimes applied to the resource sectors (including privatizations and nationalizations), and fluctuations in

[16] Gavin et al. (1996) estimated the volatility of central government revenues of 13 LAC countries in 1970–94 at 15.2 using the same definition of volatility. The volatility of revenue of the combined sample in this study (RECs and other countries) was 9.1. This decline in revenue volatility is in line with the results of other studies.

the real exchange rate also contribute to volatility.[17] To put things in perspective, the arithmetic average annual percent change of RR in real terms was 17 percent over the period, and the standard deviation of annual percentage changes was 45 percent.

Perhaps more interesting, the volatility of NRR in RECs is close to 30 percent higher than the volatility of revenues in comparator countries. And in both groups of countries, the volatility of nonresource nontax revenues is significantly higher than the volatility of nonresource tax revenues, with the volatility higher in the comparator countries. Nonresource nontax revenue includes highly volatile and sometimes bulky items such as transfers from the central bank, transfers and dividends from public enterprises, investment income, revenue from rents and concessions, and nonrecurrent capital revenues from the sale of tangible and intangible government assets.

Revenues move in response to changes in the macroeconomic environment (particularly cyclical changes in output) and policy and revenue administration actions. To what extent is the volatility of NRR associated with the nonresource economic cycle? To look into this question, NRR in RECs was adjusted by the NRGDP cycle, and comparator country total revenues were adjusted by the GDP cycle. The economic cycle (in RECs, the nonresource economic cycle) was estimated by quantifying the output gap (in RECs, nonresource output gap) applying the standard Hodrick-Prescott filter to the NRGDP (RECs) and to the GDP (comparator countries) series in real terms. NRR is assumed to have an elasticity of one relative to the nonresource output gap.[18]

It turns out that the nonresource economic cycle only explains a relatively limited share of NRR volatility. Cyclically adjusted NRR is about 15 to 20 percent less volatile than actual revenues and therefore substantial volatility remains in the adjusted revenue series. The economic cycle explains a somewhat larger share of revenue and tax revenue volatility in the comparator countries (about 20 percent) than in RECs (about 15 percent). It should be noted that

[17] Changes in the fiscal regime aimed at increasing government take were introduced in several countries, including Bolivia, Chile, Ecuador and Venezuela. Bolivia privatized its NOC, YPFB, in the mid-1990s and renationalized it in 2006.

[18] This assumption is often made in studies covering many countries in the absence of detailed information on the individual elasticities of revenue components for each country. See, for example, the IMF's *Fiscal Monitor* (IMF, 2011b). Girouard and André (2005) estimated the elasticities of some tax categories in OECD countries. The average elasticity of personal income taxes is 1.3, that of corporate income taxes 1.5, the elasticities of indirect taxes are assumed to be 1, and the elasticity of social security contributions is estimated at 0.7. This would yield an aggregate revenue elasticity of about 1 including social security contributions, and slightly higher than 1 if they are excluded. However, Sancak, Velloso, and Xing (2010), find that there is a positive and significant relationship between tax revenue efficiency and the output gap, implying revenue elasticities that vary over the cycle.

the volatility of real NRGDP in RECs is broadly similar to the volatility of real GDP in the comparator countries.

The larger volatility of cyclically adjusted NRR in RECs than in other countries is related to other macroeconomic factors besides the nonresource cycle that introduce volatility, such as the real effective exchange rate (which tends to be more volatile in RECs). It is also likely to be due to policy measures including those undertaken as a response to the impact of massive fluctuations in RR.

3.4. The Resource Boom and the Overall Fiscal Positions of Resource Exporters

The resource boom and higher NRR placed important fiscal resources at the disposal of governments. How were these resources used? It turns out that during 2004–10, on average, RECs increased expenditure by more than the increase in revenues.[19] Public expenditure rose on average by over 5 percentage points of GDP (oil exporters by over 6 percentage points) over the period. Expenditure in real terms increased on average by 8 percent a year, compared to the average annual rate of growth of NRGDP of 4.7 percent mentioned earlier. In addition, the currencies of some resource exporters appreciated in real effective terms, reducing the domestic purchasing power of resource revenues.

As a result of these developments, the average fiscal balance of resource exporters deteriorated by over 2 percentage points of GDP over the period, despite the fact that oil prices increased by 110 percent in U.S. dollars and copper prices by 160 percent, that nonresource revenues rose, and that the estimated average cyclical position of NRGDP was stronger in 2010 than in 2004. In 2010, half of the resource exporters in the sample were running overall public sector deficits of over 3 percent of GDP despite elevated resource prices. While the average net public debt of the five countries for which data are available declined by 16 percentage points of GDP over the period, as a result of the higher RR dependence and weaker overall fiscal positions the fiscal vulnerability of several countries to decreases in resource prices was estimated to have been higher in 2010 than just prior to the resource boom (Villafuerte, López Murphy, and Ossowski, 2010).

[19] This analysis is based on IMF country data. In most countries the fiscal coverage corresponds to the nonfinancial public sector.

4. Testing Differential Nonresource revenue Performance: Empirical Model and Econometric Results

4.1. Empirical Model

The econometric approach in the present study builds on the literature that aims at identifying the determinants of the level of taxation across countries.[20] This paper extends the standard analysis to include RR as an explanatory variable of NRR performance.

Previous studies of measures of revenue performance found that they are correlated with a range of development, structural, and institutional indicators of country characteristics (Gupta, 2007; IMF, 2011a). The most common determinants of revenue identified in the literature are measures of level of development, openness of the economy, the share of agriculture in GDP, and the quality of governance and institutions.

To determine whether the availability of RR influences NRR performance in the LAC in the sample, we use a panel dataset that covers the 15 countries mentioned earlier over the period 1994–2010. The basic equation that we estimate is:

$$NRR_{it} = \alpha + \beta_1 RR_{it} + \beta_2 GDPpc_{it} + \beta_3 Openness_{it} + \beta_4 ICRG_{it} + \mu_{it} \qquad (1)$$

where i=1,…,15 stands for each country in the sample and t=1994,…, 2010 are the years. NRR_{it} is a NRR variable (RECs) or revenue variable (other countries without resources) for country *i* in the year *t*, which will vary depending on the specific model being tested. In the basic model the dependent variable is nonresource tax revenue (RECs) or tax revenue (other countries), normalized by NRGDP (RECs) and GDP (other countries). Checks for robustness will be carried out by extending the dependent variable to include nonresource nontax revenue (RECs) and nontax revenue (other countries), and further by including social security contributions, and also by normalizing revenue variables by GDP in the RECs. RR_{it} is resource revenue as percent of GDP. The control variables are: the log of NRGDP per capita in PPP (RECs) or of GDP per capita in PPP (other countries) ($GDPpc_{it}$) as a proxy for the level of development of each country; openness to international trade ($Openness_{it}$) measured by the sum of nonresource exports and imports of goods and services as a percent of GDP; and the *International Country*

[20] Examples include Gupta (2007); Le, Moreno-Dodson, and Rojchaichaninthorn (2008); and Fenochietto and Pessino (2010).

Risk Guide's index of political risk ($ICRG_{it}$) as a proxy for governance, institutional quality, and political stability.[21]

The purpose of Equation (1) is to find whether there are statistically significant relationships between NRR and a reduced set of key variables representing the most relevant characteristics of the countries.

The coefficient β_1 indicates the marginal effect of an additional percentage point of RR on NRR performance. Negative values for β_1 would mean that higher RR is associated with lower NRR.

In standard studies of the determinants of revenue performance, income per capita is a proxy for the level of development and is expected to be positively correlated with revenue. The demand for government services is income-elastic and therefore countries with higher income per capita will have proportionately higher levels of revenue to finance higher expenditure (Wagner's law). In this study, income per capita is defined in most regressions in terms of NRGDP per capita for the RECs. This definition takes into account that RGDP is markedly volatile, that it is highly correlated with RR, and that from a sustainability point of view it is akin to an exchange of assets (money for resource reserves in the ground) rather than income. This said, RR in RECs also finances government expenditure and money is fungible. Hence, at least conceptually the relationship between NRGDP per capita (or GDP per capita) and NRR in RECs is ambiguous, because the level of RR may be so high that the desired level of spending and net accumulation of financial assets for a given level of development might be financeable with lower NRR. This would seem to be the case, for instance, in some high-income oil-exporting countries in the Gulf.

Openness to international trade is generally found to contribute positively to the tax yield, mainly through its beneficial effects on productivity and growth. Gupta (2007), however, notes that the effect of trade liberalization on revenue mobilization may be ambiguous. Revenue losses arising from reduction in taxes on international trade may not be fully compensated, at least initially, by higher domestic revenues.

Finally, we expect a positive coefficient for the quality of governance and institutions. In some previous studies, the key variable used to proxy institutional levels is corruption. In this

[21] This index is produced by the PRS Group and aims to provide a measure of the political stability of the countries covered on a comparable basis.

study a broader variable of institutional quality is used, because revenues from the exploitation of nonrenewable natural resources can constitute a source of large rents that could adversely affect NRR through the impact of weak institutions and political instability as well as corruption on tax policy, revenue administration, and enforcement.[22]

The approach sketched out above is similar to the study of the impact of RR on NRR by Bornhorst, Gupta, and Thornton (2009), but with some significant differences that make comparison of the estimates with those in that study somewhat difficult. First, in most of the specifications in this paper, NRR is normalized by NRGDP, whereas Bornhorst, Gupta, and Thornton normalized it by GDP. The differences between both normalizations were discussed in previous sections. Second, Bornhorst, Gupta, and Thornton focused their empirical analysis on a panel that consisted exclusively of oil-exporting countries, whereas this study includes RECs (including mining countries) and other countries without resource revenues.

Summary statistics for the key variables are reported in Table 4. The statistics are shown for the full sample (all 15 countries) and the two groups of countries—RECs and other countries.

Table 4: Summary Statistics for Selected Variables, 1994–2010

Variable	Full sample				RECs		Other countries	
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Mean	Std. Dev.
NR tax revenue as % of GDP	14.4	4.3	6.3	25.9	12.7	3.0	16.3	4.7
NR tax + nontax revenues as % of GDP	17.9	5.0	7.8	31.3	15.9	3.8	20.0	5.3
NR total revenue* as % of GDP	20.9	5.9	8.2	38.3	18.0	3.8	24.2	6.1
NR tax revenue as % of NRGDP	15.3	4.2	6.8	25.9	14.4	3.5	16.3	4.7
NR tax + nontax revenues as % of NRGDP	19.0	4.8	9.6	31.3	18.1	4.1	20.0	5.3
NR total revenue* as % of NRGDP	22.1	5.5	10.4	38.3	20.3	4.0	24.2	6.1
RR as % of GDP	2.9	4.3	0.0	21.1	5.4	4.5	0.0	0.0
RR as % of GDP: 1994–98	0.6	1.9	0.0	13.7	1.1	2.5	0.0	0.0
RR as % of GDP: 1999–2004	0.8	2.3	0.0	11.6	1.5	2.9	0.0	0.0
RR as % of GDP: 2005–10	1.5	3.8	0.0	21.1	2.8	4.9	0.0	0.0
RR as % of GDP: low dependence countries	0.1	0.4	0.0	2.5	0.2	0.5	0.0	0.0
RR as % of GDP: medium dependence countries	1.4	2.7	0.0	12.0	2.6	3.3	0.0	0.0
RR as % of GDP: high dependence countries	1.4	3.9	0.0	21.1	2.6	5.1	0.0	0.0
Log of per capita GDP in PPP	8.9	0.5	7.9	10.1	9.0	0.5	8.8	0.5
Log of NR per capita GDP in PPP	8.8	0.4	7.9	9.8	8.9	0.4	8.8	0.5
NR openness of goods as services as % of GDP	51.6	27.3	13.5	127.9	41.3	14.9	63.3	33.0
ICRG's index of political risk	65.5	7.9	46.5	82.5	63.9	8.6	67.3	6.6

Source: Authors' calculations based on data from official national sources, Inter-American Development Bank, and International Monetary Fund.

Note: The number of observations is 255. RR: resource revenue, NR: nonresource.

* Total revenue includes tax, nontax, and social contributions.

[22] In several studies of the determinants of revenue performance, the share of agriculture is included as a proxy for ease of collection. In our sample this variable is highly correlated with GDP per capita and was not included.

4.2. Econometric Methodology

The econometric approach in this study is based on panel data techniques. The key advantage of a panel data set over a cross-section is that it allows significant flexibility in modeling differences in behavior across individuals and over time (Greene, 2008).

The literature has typically approached this type of analysis with OLS panel techniques, largely because in many cases the number of countries in the sample far exceeded the number of years. However, the data available for this study include a larger number of years (time series) than countries (cross-section). This type of panel increases the likelihood of finding serial correlation. Indeed, the Wooldridge test for serial correlation in panel data rejects the null hypothesis and we conclude that the data have first-order serial correlation. Second, cross-sectional dependence can lead to bias in the results of statistical significance. Pesaran's test of cross-sectional independence shows that the hypothesis of presence of cross-sectional dependence in our data cannot be rejected.[23]

Following Hoechle's analysis of cross-sectional dependence (Hoechle, 2007), we use the Driscoll and Kraay estimator (Driscoll and Kraay, 1998).[24] This econometric technique also deals with serial correlation: it allows for the inclusion of one lag of the dependent variable in the regression to control for first-order serial correlation.

Finally, time-fixed effects were tested. A joint F-test rejects the null hypothesis that the coefficients on the dummies for each year are jointly equal to zero. Therefore, time-fixed effects are included in all the regressions.

4.3. Econometric Results

The regression results are reported in Tables 5, 6, and 7. All regressions reveal that the effect of RR on NRR is negative and statistically significant in all specifications. The results are robust to changes in the scope of the nonresource revenues included in the dependent variable, changes in the normalization variables, the inclusion of the control variables, and the use of fixed or random effects. The results also show statistically significant structural breaks over time related to the epochs of the resource boom, and across countries related to their level of resource dependence.

[23] The Wooldridge test of serial correlation is 201.32 (F-test), which has a probability of 0.0012. Pesaran's test of cross-sectional independence is -2.514 and the associated probability is 0.0119.
[24] Command ***xtscc*** in Stata 11.

Table 5 shows regressions with nonresource tax revenue as a share of NRGDP as dependent variable. The first two columns report the results for bivariate regressions of NRR and RR under fixed and random effects. The two specifications yield similar outcomes, with a coefficient on RR (i.e., NRR displacement) of about -0.2. The Haussman test and the Breusch-Pagan test show that random effects are statistically significant in our model, whereas fixed effects (i.e., time-invariant, country-specific effects) are not. Therefore, henceforth the regressions will only include random effects.

Column 3 reports the results including all the control variables. All the coefficients are statistically significant. The level of income and the quality of governance and institutions have a positive effect on NRR. In our sample, however, openness is negatively related to NRR, a result observed in all the regression specifications. Inspection of the data reveals that a number of countries with low revenues, such as countries in Central America, Mexico, and Paraguay have high or relatively high levels of openness. Conversely, several of the countries with the highest revenue ratios, such as Argentina, Brazil, Colombia, and Uruguay, are less open.

In column 4 the possibility of structural breaks over time is explored. Consistent with the findings discussed in the previous sections, in particular the strong increases in RR during the 2000s, we find that different regimes are observed during the period of analysis. For the selection of time breaks, we tested sequentially the significance of dummies on the fitness of the model using the F-statistic. The best results were obtained using the periods 1994–98, 1999–2004, and 2005–10. Hence, we split the key RR variable into those three periods and estimated the model to test whether the coefficient is the same over time. The results show that the coefficients are statistically different, with the size of the epoch-specific coefficients falling as the resource boom gets under way around the turn of the millennium (1999–2004) and strengthens significantly over time (2005–10).

These reductions of the coefficient over time should not be understood as a reduction of the effect of RR on NRR in later periods because, while the coefficient declines, RR increases over time. The complete effect of RR on NRR is the product of the coefficient and the value of the RR variable in each period. Compared to the initial period, the complete effect declines marginally in the second period and increases in the last period that encompasses the more substantial resource price boom.

Table 5: PANEL REGRESSION: BASELINE AND CONTROLS

	Baseline & Random Effects	Baseline + Fixed Effects	Baseline + Controls	Baseline + Controls + Structural break over time	Baseline + Controls + Structural break across countries	Baseline + Controls (using GDP)	Baseline + Controls + Structural Break over time	Baseline + Controls + Structural break across countries
							(Cyclically adj. revenues)	
	NR Revenue as % of NRGDP						CA NR Rev. as % of NRGDP	
Resource revenue as % of GDP	-0.194***	-0.207***	-0.245***			-0.266***		
	(0.028)	(0.032)	(0.027)			(0.035)		
Resource revenue as % of GDP - 1994–98				-0.354***			-0.307***	
				(0.026)			(0.027)	
Resource revenue as % of GDP - 1999–2004				-0.309***			-0.307***	
				(0.015)			(0.015)	
Resource revenue as % of GDP - 2005–10				-0.197***			-0.205***	
				(0.014)			(0.011)	
Resource revenue as % of GDP - low dependence					-2.296***			-2.289***
					(0.346)			(0.393)
Resource revenue as % of GDP - medium dependence					-0.439***			-0.429***
					(0.072)			(0.081)
Resource revenue as % of GDP - high dependence					-0.219***			-0.220***
					(0.027)			(0.021)
Ln (per capita GDP in PPP)						1.358**		
						(0.515)		
Ln (nonresource per capita GDP in PPP)			1.488***	1.519***	0.636		1.545**	0.703
			(0.501)	(0.495)	(0.628)		(0.594)	(0.673)
Nonresource openness of goods and services			-0.0443***	-0.0445***	-0.0601***	-0.0448***	-0.0432***	-0.0585***
			(0.008)	(0.008)	(0.010)	(0.008)	(0.009)	(0.012)
ICRG			0.106***	0.102***	0.111***	0.111***	0.0952***	0.103***
			(0.019)	(0.019)	(0.023)	(0.019)	(0.021)	(0.026)
Constant	17.54***	20.73***	(0.215)	(0.371)	8.759*	0.669	(0.422)	8.393
	(0.104)	(1.630)	(4.168)	(4.191)	(4.958)	(4.292)	(4.822)	(5.235)
Observations	255	255	255	255	255	255	255	255
R-squared	0.13		0.31	0.32	0.35	0.31	0.30	0.33
Number of groups	15	15	15	15	15	15	15	15
F-test of equality of coefficients				0.02	0.00		0.04	0.00

Source: Authors' calculations.
Notes: low dependence: Peru and Colombia; medium dependence: Bolivia, Chile, Ecuado, and Mexico; high dependence: Trinidad and Tobago and Venezuela.
low dependence: Peru and Colombia; medium dependence: Bolivia, Chile, Ecuado, and Mexico; high dependence: Trinidad and Tobago and Venezuela.
Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1
All models includes time effects.

Column 5 looks at structural breaks across countries. As discussed in earlier sections, the resource dependence of RECs differs widely across the sample, from countries with dependence ratios in the 40–50 percent range during the 2000s (Venezuela and Trinidad and Tobago) to those in the 1–10 percent range (Colombia and Peru). We therefore split RECs into three groups: low, medium, and high resource dependence. The results show evidence of structural break across these groups of countries. The coefficients on RR decline as resource dependence increases and the differences between the three groups of countries are statistically significant. However, the complete effect of RR on NRR (that is, taking into account the size of RR in each group) is slightly higher in the groups comprising countries with medium and high RR dependence than in the low dependence group.

Column 6 reports the results using GDP per capita instead of NRGDP per capita for the RECs. The results are similar to those of previous models. Finally, in columns 7 and 8 the dependent variable is nonresource tax revenue as a share of NRGDP adjusted by the estimated nonresource output gap (and equivalent concepts for the other countries, see Section 3) to test the impact of RR on cyclically-adjusted NRR. The results are very similar to those reported in columns 4 and 5.

In Table 6 the dependent variable is nonresource tax revenue as a share of GDP. As will be recalled from earlier sections, the average differences between NRR normalized by GDP in RECs and total revenues in other countries are larger than the differences when NRR in RECs is normalized by NRGDP. Therefore, the coefficients in these regressions can be expected to be larger (more negative) than the coefficients discussed above, and their statistical significance stronger, because of the higher correlation between RR and GDP (compared to the correlation between RR and NRGDP), and this is indeed what is observed.

Table 7 explores the relationship between broader NRR aggregates as a share of NRGDP as dependent variables and RR. In columns 13 through 15, the dependent variable is nonresource tax and nontax revenue, in columns 16 through 18 it is nonresource tax revenue and social security contributions, and finally in columns 19 through 21 the dependent variable is expanded further to include all three components (nonresource tax and nontax revenues and social security contributions).

Table 6: PANEL REGRESSION: ALTERNATIVE SPECIFICATIONS

	Baseline + Controls	Baseline + Controls + Structural break over time	Baseline + Controls + Structural break across countries	Baseline + Controls + Structural break over time
				(Cyc.adj.rev.)
	NR Revenue as % of GDP			CA NR Rev as % of GDP
Resource revenue as % of GDP	-0.467***			
	(0.022)			
Resource revenue as % of GDP - 1994-1998		-0.524***		-0.477***
		(0.029)		(0.028)
Resource revenue as % of GDP - 1999-2004		-0.542***		-0.552***
		(0.028)		(0.032)
Resource revenue as % of GDP - 2005-2010		-0.429***		-0.431***
		(0.013)		(0.014)
Resource revenue as % of GDP - Low dependence			-2.980***	
			(0.368)	
Resource revenue as % of GDP - Medium dependence			-0.674***	
			(0.059)	
Resource revenue as % of GDP - High dependence			-0.451***	
			(0.025)	
Ln (per capita GDP in PPP)				
Ln (nonresource per capita GDP in PPP)	1.185***	1.224***	0.329	1.248***
	(0.310)	(0.313)	(0.481)	(0.405)
Nonresource openness of goods and services	-0.0429***	-0.0430***	-0.0608***	-0.0418***
	(0.005)	(0.005)	(0.007)	(0.007)
ICRG	0.106***	0.101***	0.105***	0.0948***
	(0.018)	(0.018)	(0.022)	(0.018)
Constant	2.147	1.969	11.77***	1.886
	(2.528)	(2.574)	(3.649)	(3.220)
Observations	255	255	255	255
R-squared	0.37	0.37	0.42	0.36
Number of groups	15	15	15	15
F-test of equality of coefficients		0.04	0.00	0.05

Source: Authors' calculations
Notes:
Low dependence: Peru and Colombia; Medium dependence: Bolivia, Chile, Ecuador, Mexico; High dependence: Trinidad and
Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1
All models includes time effects.

The results in Table 7 are broadly in line with those of previous models. The regressions with tax revenue and social security contributions as dependent variable (columns 16–18) have the best goodness of fit (R-squared) of all the models where the dependent variable is scaled by NRGDP. The coefficients on RR are larger than in earlier models scaled by NRGDP. This appears to be due to the fact that, on average, revenue from social security contributions in RECs is markedly lower than in the comparator countries (Section 3), which reinforces the tendencies already observed for tax revenues.

The inclusion of nontax revenue (columns 13–15 and 19–21 in Table 7) introduces more noise in the model. This can be seen in the lower goodness of fit in the models and the fact that income per capita and the ICRG index are no longer statistically significant in columns 13 through 15. As will be recalled from Section 3, nonresource nontax revenue is highly volatile over time and across countries. The results are somewhat stronger with total revenue (columns 19–21) that with tax and nontax revenue because of the displacement effect from social security contributions.

Table 7: PANEL REGRESSION: ALTERNATIVE SPECIFICATIONS (2)

	Baseline + Controls	Baseline + Controls + Structural break over time	Baseline + Controls + Structural break across countries	Baseline + Controls	Baseline + Controls + Structural break over time	Baseline + Controls + Structural break across countries	Baseline + Controls	Baseline + Controls + Structural break over time	Baseline + Controls + Structural break across countries
	NR revenue (tax and nontax) as % of NRGDP			NR revenue (tax and SC) as % of NRGDP			NR total revenue as % of NRGDP		
	(13)	**(14)**	**(15)**	**(16)**	**(17)**	**(18)**	**(19)**	**(20)**	**(21)**
Resource revenue as % of GDP	-0.345***			-0.470***			-0.570***		
	(0.052)			(0.044)			(0.066)		
Resource revenue as % of GDP - 1994–98		-0.556***			-0.682***			-0.884***	
		(0.039)			(0.038)			(0.048)	
Resource revenue as % of GDP - 1999–2004		-0.515***			-0.558***			-0.764***	
		(0.021)			(0.026)			(0.029)	
Resource revenue as % of GDP - 2005–10		-0.236***			-0.388***			-0.427***	
		(0.011)			(0.027)			(0.013)	
Resource revenue as % of GDP - low dependence			-1.308***			-3.624***			-2.636***
			(0.194)			(0.420)			(0.205)
Resource revenue as % of GDP - medium dependence			-0.479***			-0.645***			-0.645***
			(0.084)			(0.080)			(0.092)
Resource revenue as % of GDP - high dependence			-0.310***			-0.515***			-0.606***
			(0.044)			(0.043)			(0.058)
Ln (nonresource per capita GDP in PPP)	0.440	0.526	(0.226)	2.906***	2.947***	2.605***	1.858***	1.954***	1.742***
	(0.513)	(0.525)	(0.597)	(0.423)	(0.412)	(0.525)	(0.416)	(0.430)	(0.501)
Nonresource openness of goods and services	-0.0468***	-0.0471***	-0.0564***	-0.0419***	-0.0422***	-0.0583***	-0.0444***	-0.0448***	-0.0545***
	(0.008)	(0.008)	(0.010)	(0.006)	(0.006)	(0.008)	(0.006)	(0.006)	(0.009)
NRG	-0.018	-0.030	-0.007	0.106	0.0991***	0.0773***	-0.019	-0.033	-0.0404*
	(0.024)	(0.026)	(0.027)	(0.020)	(0.021)	(0.021)	(0.020)	(0.023)	(0.023)
Constant	21.81***	21.40***	27.98***	-8.576***	-8.795***	(2.168)	13.45***	12.98***	17.05***
	(3.760)	(3.922)	(4.530)	(3.406)	(3.420)	(4.274)	(3.301)	(3.450)	(4.190)
Observations	255	255	255	255	255	255	255	255	255
R-squared	0.22	0.24	0.23	0.40	0.41	0.45	0.30	0.32	0.32
Number of groups	15	15	15	15	15	15	15	15	15
F-test of equality of coefficients		0.02	0.00		0.01	0.00		0.01	0.00

Source: Authors' calculations

Notes:

Total revenue includes: Tax + Nontax + Social Contributions

Low dependence: Peru and Colombia; medium dependence: Bolivia, Chile, Ecuador, and Mexico; high dependence: Trinidad and Tobago and Venezuela.

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

All models includes time effects.

5. What Explains the Differences in Nonresource Revenue Performance?

The formal econometric analysis in the previous sections revealed differences in overall NRR between RECs and other comparable countries. What are the factors that help explain these differences over time and across countries?

Table 8. General Government Nonresource Revenue

	1994–98		1999–2004		2005–10		
	Resource exporters	Other countries	Resource exporters	Other countries	Resource exporters	Other countries	Difference
	(In percent of GDP)						
Nonresource revenue	17.2	22.1	18.1	23.7	19.0	26.4	7.4
Tax revenue	12.2	14.6	12.8	16.0	13.6	18.1	4.5
VAT	4.7	5.9	5.2	6.3	5.8	7.3	1.5
Income taxes	3.4	3.0	3.5	3.2	4.4	4.6	0.2
Corporate income tax	1.8	1.9	1.9	2.0	2.7	2.8	0.2
Personal income tax	1.6	1.1	1.6	1.4	1.7	1.7	0.0
Excises	1.4	1.7	1.5	2.1	1.0	2.0	1.0
of which, petroleum products	0.7	0.6	1.0	0.9	0.4	0.8	0.4
Other tax revenue	2.7	4.1	2.6	4.3	2.3	4.3	2.0
Nontax revenue	3.2	3.4	3.4	3.8	3.4	3.8	0.4
Social contribution revenue	1.8	4.1	1.9	3.9	2.0	4.5	2.5
	(In percent of nonresource revenue excluding social security contributions)						
Tax revenue	79	81	79	81	80	83	…
VAT	31	33	32	32	34	33	…
Income taxes	22	17	22	16	26	21	…
Corporate income tax	12	10	12	10	16	13	
Personal income tax	10	6	10	7	10	8	
Excises	9	9	9	11	6	9	…
of which, petroleum products	5	3	6	5	3	4	…
Other tax revenue	17	23	16	22	14	20	…
Nontax revenue	21	19	21	19	20	17	…
	(In percent of NRGDP [RECs] and GDP [other countries])						
Tax revenue	13.3	14.6	14.3	16.0	16.1	18.1	2.0
VAT	5.2	5.9	5.8	6.3	6.9	7.3	0.4
Income taxes	3.7	3.0	3.9	3.2	5.2	4.6	-0.6
Excises	1.5	1.7	1.7	2.1	1.2	2.0	0.8

Source: Authors' calculations based on data from official national sources, Inter-American Development Bank, and International Monetary Fund.
Notes: Resource exporters: Bolivia, Chile, Colombia, Ecuador, Mexico, Peru, Trinidad and Tobago, and Venezuela. Central government revenue for Trinidad and Tobago and Venezuela.
Other countries: Argentina, Brazil, Costa Rica, El Salvador, Honduras, Paraguay, and Uruguay. Central government revenue for Costa Rica and Paraguay.

The overall average structure of NRR collections shows differences between the two groups of countries (Table 8). In both groups, VAT and nonresource income taxes (income taxes in the comparator countries) are the pillar of collections—and their relative importance increased in the last few years. But these taxes have played a greater role in the NRR of RECs than in the total revenue of comparator countries. They comprised 53–54 percent of NRR (excluding social security contributions) in RECs compared to 48–49 percent of revenue in other countries in 1994–2004, and these shares rose to 60 percent and 54 percent, respectively, in 2005–10. Together, VAT and nonresource income taxes account for fully three-quarters of nonresource tax revenue in RECs, compared to two thirds in the other countries. On the other hand, revenue from excises and from other taxes is significantly lower on average in RECs than in the other countries.

Given the key role that VAT and nonresource income taxes play in NRR in RECs and in total revenues in other countries, the revenue displacement found in RECs might have been expected to be significantly explained by differential performance in these taxes. The reality, however, is more complex.

5.1. Value-added Taxes

The value-added tax (VAT) is the most important source of NRR in RECs and of total revenue in the other countries. It accounts for a third of NRR (excluding social contributions) in RECs and of total revenue (also excluding contributions) in other countries. VAT revenues increased strongly in both groups of countries since the 1990s. The share of VAT in NRR increased in NRECs. In the other countries it remained broadly unchanged. In both groups of countries there is evidence of significant increases in the productivity and efficiency of VAT. They have been associated with reductions in tax evasion and widening of tax bases (Gómez Sabaini and Jiménez, 2009).

The average VAT ratio to GDP is significantly lower in RECs than in other countries, and it is slightly lower when normalized by NRGDP in RECs.[25] But when the relevant factors

[25] For Brazil, and in common with some other studies, VAT revenue has been defined in this paper to comprise revenues from the ICMS—the state-level VAT on intra- and inter-state sales of goods and most services—and from the federal IPI, which has some crediting mechanisms.

that could contribute to this result are assessed, it is found that this seemingly poorer performance is not due to relatively weaker VATs on average in RECs (Table 9).

First, the average basic VAT rate has been the same in both groups of countries (15.5 percent).[26] There appears to be some moderate negative correlation among RECs between the basic VAT rate and resource dependence. Chile and Peru had the highest basic VAT rates among RECs on average in 2005–10 (19 percent), while Ecuador and Venezuela had the lowest (12 percent). Basic VAT rates in the comparator countries are highly differentiated between two distinct groups of countries: Argentina and Uruguay with rates of 21 to 24 percent, and other countries at 10–13 percent. Basic rates in the REC group are somewhat more homogeneous. Average VAT rates in both groups of countries are somewhat lower than average VAT rates in high-income, upper middle-income, and lower middle-income countries around the world (about 17 percent in 2005; IMF, 2011a).

Table 9. Value-Added Tax

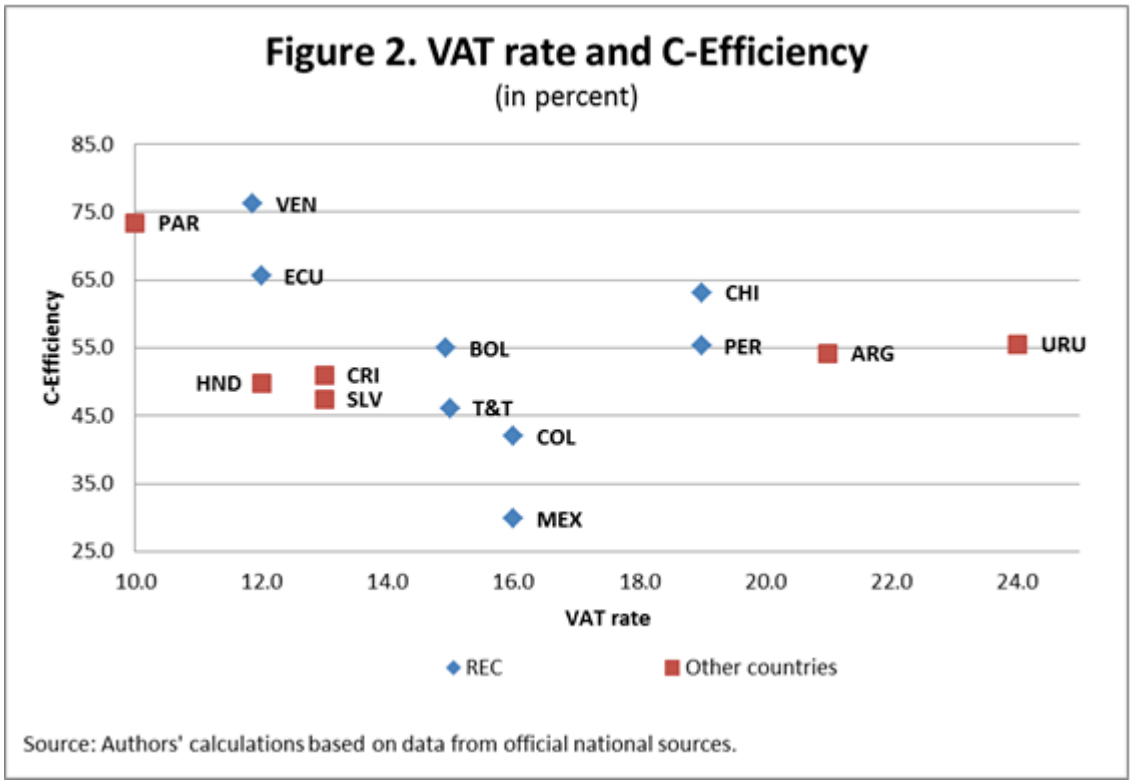
	1994–98		1999–2004		2005–10	
	Resource exporters	Other countries	Resource exporters	Other countries	Resource exporters	Other countries
Value-added tax						
In percent of GDP	4.7	5.9	5.2	6.3	5.8	7.3
			(In percent)			
VAT C-efficiency 1/	…	…	44.3	50.2	54.2	55.3
Average basic VAT rate 2/	…	…	15.7	15.1	15.5	15.5
Share of consumption						
In GDP	77.1	82.5	77.2	84.8	71.6	86.0
In NRGDP	84.1	…	85.6	…	84.1	…

Source: Authors' calculations based on data from official national sources, International Monetary Fund, and Inter-American Development Bank.
Notes: Resource exporters: Bolivia, Chile, Colombia, Ecuador, Mexico, Peru, Trinidad and Tobago, and Venezuela. Central government for Trinidad and Tobago and Venezuela.
Other countries: Argentina, Brazil, Costa Rica, El Salvador, Honduras, Paraguay, and Uruguay. Central government for Costa Rica and Paraguay.
1/ Ratio of VAT revenue to the product of the basic VAT rate and consumption. Excluding Brazil.
2/ Excluding Brazil.

[26] Excluding Brazil from the comparator countries. The ICMS is levied at different rates by different states and the rates have huge dispersion.

Second, analysis of the standard measure of the effectiveness of a VAT, its C-efficiency (the ratio of VAT revenue to the product of consumption (the taxable base) and the standard rate) reveals that the average C-efficiency of the VATs of RECs is similar to that of the comparator countries, and indeed, it is also similar to the efficiency of VATs of high-income countries around the world (IMF, 2011a; Bird and Gendron, 2006).[27] Among RECs, there is some low positive correlation between C-efficiency and resource dependence. The highest estimated C-efficiencies in 2005–10 were recorded in Venezuela (76 percent), and Ecuador and Chile (about 65 percent). At the other end, Mexico is an outlier: its estimated C-efficiency of only 30 percent is significantly lower than that of any other country in the combined sample, and indeed it is lower than the average C-efficiency of low-income countries around the world. Widespread domestic zero-rating and exemptions that give away large parts of the taxable base, and multiple rates and reduced rates in border areas that complicate revenue administration, largely explain this outcome. There is greater dispersion in the C-efficiency values of RECs than those of the other countries, which are clustered around 45–55 percent except Paraguay with a high outlier value (Figure 2).

[27] Brazil is excluded from these estimates due to the multiplicity of basic ICMS rates.



The combined sample of countries shows a mildly negative relationship between C-efficiency and the basic VAT rate. This is in line with international evidence that VAT efficiency tends to rise with lower VAT rates, although several other factors, such as the efficiency of the revenue administration, the competition framework in product markets, and governance indicators, also have a bearing (De Mello, 2009).

On average, then, and acknowledging the large diversity of VAT indicators among the countries in the two samples, the standard indicators of VAT performance fail to show that the availability of RR in RECs dampens VAT effort relative to the other countries. If VAT effort is similar on average in both groups of countries, what explains the differential performance as a share of GDP? As reported in Section 3, the share of consumption in nominal GDP has consistently been lower in RECs than in other countries. This leads to lower VAT ratios to GDP (VAT productivity). Furthermore, as discussed in Section 3, the consumption ratio in RECs, while stable in relation to NRGDP, came down precipitously in relation to GDP in 2005–10 as the resource boom took off in earnest. On the other hand, the consumption ratio rose in the comparator countries. Thus the wedge between the average consumption ratios in RECs and in

the other countries grew considerably wider, from 7.6 percentage points of GDP in 1999–2004 to 14.4 percentage points in 2005–10.

This, however, does not mean that consumption was necessarily weaker during the boom in RECs compared to the other countries. In fact, average consumption in real terms in RECs in 2005–10 was higher by 34 percent than in 1999–2004, compared to an average increase of 25 percent in the other countries.

5.2. Nonresource income Taxes

Income taxes (nonresource income taxes in RECs) are the second most important revenue source in both groups of countries. After remaining relatively stable on average in the 1990s, revenue from these taxes began to rise in the early 2000s, and the increase gathered strength during the boom years. Income tax revenue, however, rose significantly more in 2005–10 relative to the previous period in the comparator countries than in RECs.

The performance of nonresource income taxes in RECs in recent years has been broadly similar to that of income taxes in the other countries. Indeed, as a share of NRGDP, average nonresource income taxes of the REC group have been consistently higher than in other countries, though the difference narrowed substantially in 2005–10. The highest nonresource income tax revenue ratios were recorded in Trinidad and Tobago (despite a long-term decline from higher levels in the 1990s), Mexico, and Chile. When comparing 2005–10 with 1994–98, revenues from nonresource income taxes surged in Bolivia, Ecuador, and Venezuela by about 2 to 3 percentage points of NRGDP.

Turning to the breakdown of nonresource income taxes into corporate and personal taxes, the performance of nonresource corporate income taxes in RECs has been similar on average to that of corporate income taxes in other countries, with substantial increases in the last few years in both groups of countries. Among the RECs, Bolivia and Ecuador recorded the largest increases in nonresource corporate income tax revenues. Revenues from personal income taxes have increased more moderately and have been consistently a little higher in RECs than in the other countries, but the differences have narrowed over time. The largest increases in personal income tax revenues took place in Ecuador, Peru and Venezuela.

Many studies have noted that income taxes in LAC are very low by international standards. On average, the direct tax burden in developed countries is higher by ten percentage

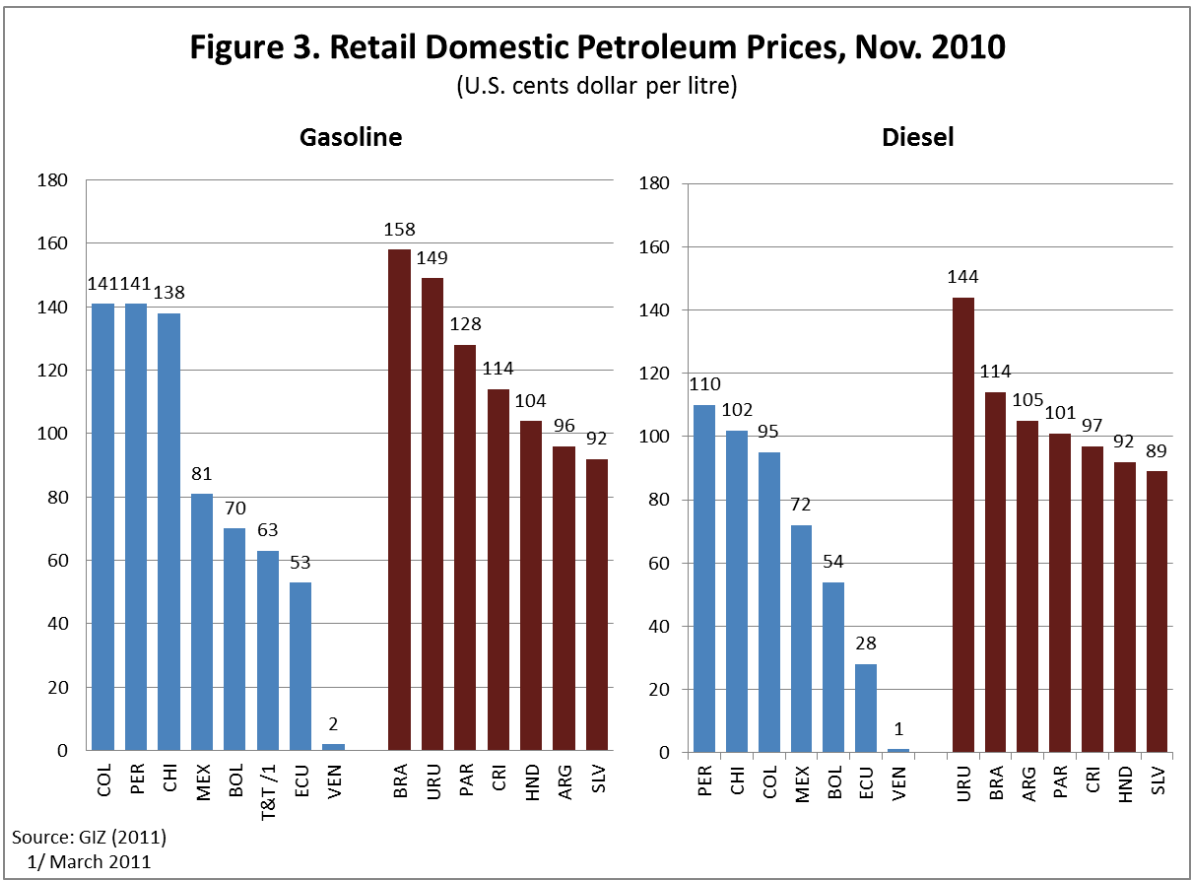
points of GDP than that of Latin America, and the region's revenue from income and property taxes as a share of GDP is the lowest in the world (Perry et al., 2006; Barreix, Villela, and Roca, 2007; Jiménez, Gómez Sabaini, and Podestá, 2010). In particular, many LAC personal income tax systems include large sets of tax allowances, exemptions, and other revenue-eroding elements that significantly reduce the tax bases.

5.3. Excises

Revenue from excises in RECs is significantly lower than in the comparator countries. The difference is explained by two facts: substantially smaller revenues from excises on domestic petroleum products in oil-exporting countries than in other countries, and from excises on other items in RECs compared to the other countries. In 2005–10, revenues from domestic petroleum excises in oil-exporting countries amounted to only one third of those collected in the other countries. Petroleum excises in oil-exporting countries dropped precipitously on average in 2005–10, because governments reduced excises, among other measures, to not fully pass through the sharp increases in international petroleum product prices that began in 2004.

Most LAC oil exporters subsidize the domestic sales of refined oil products, that is, fuel products are sold domestically at controlled prices that are below international prices. In some cases the subsidies are explicit (for example, the subsidies on imported refined products in Bolivia and the negative excise in Mexico). In other countries some or all the subsidies are implicit. Subsidies can coexist with petroleum excises. Venezuela, for example, has the lowest retail refined product prices in the world, yet it also has small positive excises on those products.

The cost of domestic petroleum subsidies is sometimes netted against the NOC's oil revenue as, for instance, in Ecuador and Venezuela. When this happens, the way the subsidies affect government revenue depends on the fiscal regime applied to the NOC. Since royalty payments are independent of profits or losses, whereas income taxes are calculated on profits, fiscal regimes with higher royalty rates and lower income tax rates make the NOC bear a higher share of the subsidy cost in the form of lower retained dividends. This has implications for NOC investment and hence for government oil revenue with a lag. High oil income tax rates transfer more of the burden of the subsidy to the government (Espinasa, 2003).



Retail prices of gasoline and diesel in the RECs and other countries as of late 2010 are shown in Figure 3. Gasoline and diesel prices in the oil-exporting countries in the sample were on average lower by half compared to the prices in the other countries. Venezuela has by far the lowest retail gasoline and diesel prices in the world, and Bolivia, Ecuador, Mexico, and Trinidad and Tobago are in the lowest quintile of countries in the world in terms of these prices (GIZ, 2011).

The fiscal cost of domestic petroleum subsidies can be very large. In Venezuela, these subsidies were estimated at 7 percent of GDP in 2010 (International Energy Agency, 2011), or higher than government expenditure on health and education. In Ecuador, subsidies were estimated to amount to more than 8 percent of NRGDP in 2008. In Mexico, the excise tax on petroleum products acts as a tax or a subsidy depending on whether controlled domestic prices of fuels are higher or lower than international prices. The swing between the revenue collected from the excise in 2002 and the subsidy provided in 2008 amounted to 3.7 percentage points of GDP.

To put this number in perspective, average VAT revenue in Mexico in 2005–10 was 3.6 percent of GDP.

5.4. Other Tax Revenues

The combined revenues from all taxes other than those discussed above made up only 17 percent of nonresource tax revenue in RECs in 2005–10. They were equivalent to only half of the corresponding revenues in other countries (a full 2 percentage points of GDP lower). Here, however, the comparator group of countries is particularly heterogeneous, and this needs to be taken into account in the analysis.

In Argentina, Brazil, and Uruguay, revenues from taxes other than VAT, income taxes and excises are very high (on average, close to 8 percent of GDP in 2005–10). This is partly explained by several highly distortionary taxes in these countries that raise substantial revenues. They include export taxes (Argentina), financial transactions taxes with relatively high tax rates and cascading (Argentina and Brazil), turnover taxes of various types with cascading (provincial and municipal *ingresos brutos* taxes in Argentina; several federal and state taxes in Brazil such as PIS and COFINS, in some cases with limited crediting), and taxes on assets (Argentina and Uruguay). These taxes have raised significant revenues: for example, financial transaction taxes have typically yielded about 1.5–2 percent of GDP, while Argentina's export taxes have collected 2 to 4 percent of GDP.

In contrast to Argentina, Brazil, and Uruguay, in the other comparator countries, revenues from taxes other than VAT, income taxes and excises were equivalent to only 1.6 percent of GDP on average in 2005–10. This was lower than comparable tax revenues in RECs.

It should be noted that several RECs have also implemented some heterodox taxes. For example, Bolivia, Colombia, Ecuador, Peru, and Venezuela have, or have had, financial transaction taxes. However, with the exception of Venezuela, the tax rates and revenues collected from these financial transactions taxes are or were significantly lower (about ½ percent of GDP) than in Argentina and Brazil.

There is a large literature that discusses heterodox taxes in LAC. A number of researchers have concluded that the implementation of these taxes has been a policy response to growing revenue needs given the inability or unwillingness to address political and revenue administration difficulties associated with strengthening standard direct and indirect taxes,

particularly income taxes (Shome, 1999; Tanzi, 2000; Cetrángolo and Gómez Sabaini, 2006; González, 2009). In some cases, governments have created, or increased the rates of, heterodox taxes to bypass formula-based revenue-sharing arrangements with subnational governments and keep the revenues fully in the federal government.

5.5. Social Security Contributions

Revenues from social security contributions accruing to the general government in RECs are on average substantially lower than in the comparator countries. The average difference has been consistently above 2 percentage points of GDP, and has widened somewhat in recent years. Unlike the revenue items discussed above, the complexity of social security systems and the wide variation of such systems across countries in the region make a systematic comparison between the two groups of countries difficult. Indeed, social choice regarding types of pension and health coverage systems is idiosyncratic and country specific, and social security revenues accruing to the public sector reflect many factors that are distinct from the factors shaping other NRRs.

There are several key dimensions of social security systems and revenue modalities where country practice varies. First, social security systems can include various combinations of retirement pensions, disability insurance, survivor benefits, unemployment insurance, and health coverage. Second, as regards public or private management, there are four types of systems in the region: only public, only private, mixed complementary, and mixed parallel.[28] During the 1990s, the region saw a number of processes of partial or full privatization of the social security systems.[29] Finally, participation in the various systems can be mandatory or voluntary.

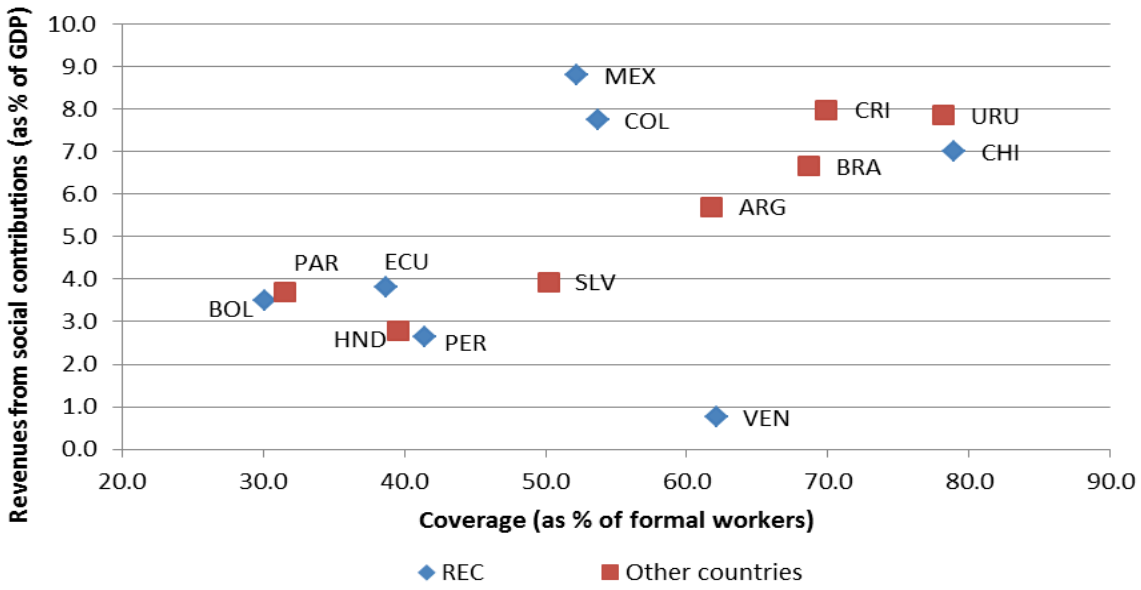
In order to ensure comparability, the analysis that follows is restricted to compulsory contributions to private and public pension and health systems. Figure 4 shows collections from compulsory contributions to those systems against the share of formal workers covered by future retirement pensions linked to previous employment. A general positive relationship can be seen.

[28] Mixed complementary systems provide a basic pension through a public PAYG pillar. This is a defined benefit funded by general taxes and a percentage of contributions. A supplementary pension is paid by a system of defined contributions and is funded from those contributions. In contrast, in mixed parallel systems, workers choose to join either the public or the private system.

[29] In 1981 Chile became the first LAC country to either privatize its social security system or to allow private participation. Seven other countries followed Chile: Argentina (1994), Bolivia (1997), Colombia (1993), Costa Rica (1995), El Salvador (1998), Mexico (1997), Peru (1993), and Uruguay (1996).

This said, while the comparator countries show a fairly consistent tendency where higher total revenues are associated with higher coverage of workers, RECs are more heterogeneous. In particular, three RECs—Colombia and Mexico with high revenues, and Venezuela with low revenues—can be classified as outliers from the general regional tendency.

Figure 4: Revenues from Social Contributions and Coverage, 2005–2010



Source: Authors' calculations based on data from official national sources and Inter-American Development. Bank.
Note: Formal workers are workers entitled to a pension linked to previuos employment upon retirement.

In terms of country preferences for public or private social security systems, Ecuador, Trinidad and Tobago, and Venezuela (RECs) and Brazil, Honduras, and Paraguay (comparator countries) have exclusively public systems. The other countries in the combined sample have private or mixed systems. In these countries, the share of social contributions revenues accruing to private systems has been rising (Table 10). Notably, the share of revenues accruing to private systems in RECs has been systematically higher than in the comparator countries, and in 2005–10 it was double that of the comparators. The higher participation of private systems in total social security contribution revenues appears to be one of the main reasons why RECs' social security revenues accruing to the general government are substantially lower than in the other countries. Indeed, the share of total contributions made to private systems is about 70 percent or

higher in Chile and Colombia, two of the countries with the highest total revenues. Whether the availability of RR dampens incentives to operate public social security systems with revenues from contributions similar to other countries in the region would seem to be an area for further research.

Table 10. Share of Total Social Contributions Made to Private Systems
(as percent of total social contributions)

	1994–98	1999–2004	2005–10
Resource exporters			
Bolivia	26	54	58
Chile	82	80	80
Colombia	39	60	72
México	55	60	59
Perú	21	32	39
Average	**44**	**57**	**62**
Other countries			
Argentina	16	29	14
Costa Rica	17	18	20
El Salvador	25	54	58
Uruguay	8	24	30
Average	**16**	**31**	**30**

Source: Authors' calculations based on data from official national sources and Inter-American Development Bank.

6. Conclusions and Policy Recommendations

This paper examined the impact of the availability of revenues from nonrenewable resources on the performance of other revenues in LAC countries. It compared the performance of nonresource revenues in resource-exporting countries to the performance of revenues in other countries in the region and also looked at the most important nonresource taxes. In interpreting revenue variables, the paper addressed the fact that resource GDP, an important component of GDP in resource exporters, is highly volatile.

We find that although the public finances of resource exporters in LAC are significantly less dependent on resource revenues than the most heavily dependent oil-exporting countries in the world, the fiscal dependence on resource revenues of resource exporters in the region

doubled on average as a result of the resource boom of the last decade. Resource revenue is markedly more volatile than nonresource revenue. Increased dependence on volatile and unpredictable resource revenue has significant implications for overall revenue volatility and fiscal vulnerability to exogenous shocks. It also poses additional challenges to fiscal planning and implementation.

Nonresource revenues increased significantly in the last decade in most resource-exporting countries. While these revenues benefited from an improved external and macroeconomic environment for most of the period, tax policy and revenue administration measures also contributed to the strengthening of nonresource revenue.

The average level of nonresource revenue in the resource-exporting countries is lower than in the comparator countries, whether it is normalized by GDP or by nonresource GDP. Moreover, the wedge between these revenues in both groups of countries widened over time as revenue increases were stronger in the comparator countries.

Econometric analysis shows that the effect of resource revenue on nonresource revenue is negative and statistically significant. This result is robust to alternative econometric specifications, definitions of nonresource revenues, and normalization variables. The results also show structural breaks over time, related to the epochs of the resource boom, and across countries, related to their level of resource dependence. Holding other explanatory variables constant, the total displacement effect of resource revenue on nonresource revenue was stronger during the resource price boom in 2005–10 than in earlier periods (taking into account the increasing size of resource revenue over time), and was slightly stronger for countries with a higher resource revenue dependence than in countries with low dependence (taking into account the different size of resource revenue across resource-exporting country groups).

The paper went on to analyze the performance of individual taxes in both groups of countries to explain these results. This analysis revealed substantial differences across taxes and countries.

The VAT ratio to GDP is lower on average in resource-exporting countries. However, the average basic VAT rates and the average efficiency of the VAT are similar in both groups of countries, although there is wide differentiation of VAT rates and efficiencies among individual countries in each country group. The lower average productivity of the VAT in resource

exporters is largely explained by a lower average consumption ratio to GDP in these countries compared to the other countries.

The nonresource income taxes of resource exporters show broadly similar performance to other countries in the region. While the performance of income taxes improved significantly in some resource-exporting countries, on average income taxes strengthened more in the comparator countries than in resource exporters during the last decade. As documented in many studies, revenue from income taxes in Latin America is low compared to other regions, partly due to generous tax allowances, exemptions, and other revenue-eroding factors—and this also applies to resource exporters in the region.

Revenue from excises on domestic petroleum products is significantly lower in oil-exporting countries than in the comparator countries. Most oil exporters subsidize the domestic prices of petroleum products compared to international prices, and in some cases these subsidies have enormous fiscal costs. Revenues from other excises are also lower in resource-exporting countries.

Revenue from other taxes in resource-exporting countries is also lower on average than in other countries in the region. This result, however, is mainly due to the existence of highly distortionary taxes that yield large revenues in some of the comparator countries.

The findings in this paper have important policy implications. Key issues to be considered are the relationship between nonresource revenues and fiscal vulnerability and long-term sustainability, and income taxes, VAT and excises. The relevance of these issues to the particular sample countries depends on the specific circumstances of the countries.

The literature provides little practical guidance regarding the optimal overall level of taxation. A generally accepted principle is that taxation should be taken to the point at which the marginal social cost of raising an extra dollar equals the marginal social value of the additional expenditure or debt reduction it finances (Selassie et al., 2006). In resource-exporting countries, the analysis of nonresource revenue should incorporate two key issues: fiscal vulnerability to resource shocks and long-term sustainability in the face of future resource depletion or obsolescence.

Increased fiscal dependence on volatile resource revenues may be inevitable in the context of a resource price boom, unless other taxes are increased or the taxation of the resource sector is reduced. The critical issue is what countries do with the additional revenues. Heavier

fiscal dependence on resource revenues may be less problematic in countries that take advantage of the resource windfall to strengthen the government's financial position as needed to deal with future shocks, and where expenditure policies are less procyclical. This said, the fiscal vulnerability of some resource-exporting countries in LAC increased in recent years. Although several resource exporters accumulated financial assets and/or reduced public debt during the boom, as a result of large increases in expenditure and the surge in fiscal dependence on volatile and unpredictable resource revenues, some fiscal positions are very exposed to resource price downturns and other exogenous shocks.

Nonresource revenues have an important role to play in managing fiscal risks. They are significantly less volatile and more predictable than resource revenues. A strong and robust nonresource revenue base can help insulate the budget from resource revenue downturns and other exogenous shocks, which in the past often resulted in the need for large and painful fiscal and exchange rate adjustments. In countries with fiscal vulnerabilities and where nonresource revenues are relatively low, strengthening nonresource revenues would be important if there is a desire to maintain public expenditure at current levels and create fiscal space to meet expenditure needs. Several oil producers in the region face long-term fiscal sustainability challenges. A recent study of LAC oil exporters that incorporated the exhaustibility of oil reserves in the sustainability analysis concluded that there are questions about the long-term sustainability of the fiscal stance in several of these countries (Villafuerte, López Murphy, and Ossowski, 2010). The issue would seem to be particularly important for oil exporters with limited production horizons: Colombia, Trinidad and Tobago, and Mexico have estimated remaining proven reserves equivalent to 7 to 15 years of production at current output levels (BP, 2011). Moreover, several countries also face significant investment, social spending, and long-term age and health-related spending pressures.

In countries facing prospective declines in oil production and long-term spending pressures, consideration should be given to gradually reducing the nonresource fiscal deficit to prevent large fiscal adjustments when resource revenues decline. Depending on specific country circumstances, fiscal strategies may need to include efforts to mobilize additional nonresource revenue. In some pressing cases, early progress in tax reform may be needed, given likely implementation lags.

In common with other countries in the region, a number of resource exporters should make efforts to improve their nonresource income tax systems. Depending on specific country circumstances, eliminating exemptions and special regimes, broadening tax bases, reducing the complexity of the taxes and ensuring a homogeneous treatment of alternative forms of capital income would be desirable reforms. There is also scope to improve VATs, depending on the countries, by broadening bases and improving compliance; a comprehensive reform of Mexico's VAT system, one of the least productive VATs in the region and in the OECD, could yield substantial revenues.

Finally, regarding the subsidization of domestic petroleum products, LAC oil exporters should carefully consider the best use of scarce public resources. Targeted transfers could protect the poor at a fraction of the cost of the current universal subsidies. Domestic petroleum product subsidies are almost invariably poorly targeted, implying a waste of public resources: the higher the household income, the higher the subsidy, because higher-income households consume larger quantities of fuel products. Petroleum subsidies entail significant fiscal costs for most oil exporters in the region. By distorting price signals, these subsidies also distort the allocation of resources and lead to wasteful consumption and inefficient investment choices. By encouraging consumption, subsidization can damage the environment through excessive pollution, carbon emissions, and traffic congestion. Finally, fuel subsidies can also encourage rent-seeking and smuggling. The reform of domestic petroleum pricing and the gradual removal of subsidies should be high on the reform agendas of oil exporters in the region. However, the elimination of subsidies could have an adverse impact on poor and vulnerable sectors, requiring compensating and targeted measures to protect these groups.

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