

Report No. 78194-PY

# **A Public Expenditure Review for Paraguay**

## **Supplementary volume with selected background papers**

November 25, 2013

Argentina, Paraguay and Uruguay Country Management Unit  
Poverty Reduction and Economic Management  
Latin America and the Caribbean Region



Document of the World Bank

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## **Preface**

This supplementary volume of the Paraguay's Public Expenditure Review provides a number of background papers and material that was prepared as part of this PER. The topics are closely linked with the overarching storyling presented in the first volume of this Public Expenditure Review. The preparation of the PER also included a medium term debt management strategy (MTDS) mission to Paraguay and the preparation of the corresponding MTDS report. Given that the audiences of the present report and the MTDS report may differ, it is not included into this volume.

- 1) *Paraguay: Estimation of the Structural Fiscal Balance and Fiscal Rule Proposal, Guillermo Le Fort V., Gonzalo Escobar and David Contreras*
- 2) *Paraguay: Agriculture Commodity Prices and Tax Revenue Collection, Edgardo Favaro, Friederike (Fritzi) Koehler-Geib, Nathalie Picarelli, Agustin Inaci*
- 3) *Evolution and Composition of Tax Revenue in Paraguay. Effects of the Tax Reform of 2004, Osvaldo Schenone*
- 4) *Assessing the Poverty and Social Impact of Fiscal Policies and External Shocks in Paraguay, Carolina Diaz-Bonilla, Martin Cicowiez*
- 5) *Social Spending, Taxes and Income Redistribution in Paraguay, Sean Higgins, Nora Lustig, Julio Ramirez, Billy Swanson*
- 6) *Equality of Opportunities and Public Spending in Paraguay, Jose Cuesta and Pablo Suarez Becerra*
- 7) *Paraguay's BOOST database, a description, Massimo Mastruzzi, Eduardo Andrés Estrada, Renato Busquets, and Francisco Vazquez Ahued*

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# **Chapter 1. Paraguay: Estimation of the Structural Fiscal Balance and Fiscal Rule Proposal, by Guillermo Le Fort V., Gonzalo Escobar and David Contreras.**

## **Executive Summary**

This article presents a proposal for the development of a structural fiscal policy for Paraguay, including an assessment of structural revenues and the derivation of a primary balance goal on the basis of a target for public net worth. The structural fiscal framework is based on a set of macroeconomic variables that are used for the estimation of the structural fiscal revenue and balance, and also for the derivation of a target for the structural primary balance. These include the long-term real interest rate relevant for the public debt and the GDP growth trend. The GDP growth trend was estimated using a Cobb-Douglas aggregate production function, resulting in a 4.5 percent to 4.8 percent annual growth estimate, while the long-term interest rate was estimated on the basis of international references and Paraguayan risk. The GDP gap, defined as the logarithmic difference between GDP and GDP trend, is a key variable for the estimation of structural fiscal revenues.

In the estimation of structural fiscal revenues, cyclical variations of actual fiscal revenues were linked only with GDP since we did not find a price of a commodity export or weather related variable presenting a statistically significant relationship with Treasury revenues since fiscal revenues are mainly composed of indirect taxes. In the estimation of structural fiscal revenues, actual fiscal revenues were linked only with GDP since we did not find a price of a commodity export presenting a statistically significant relationship with Treasury revenues. A co-integration model was used to estimate the elasticity of total fiscal revenues with respect to GDP, which resulted in a value of 1.8 implying that economic growth allows for more than proportional increases of fiscal revenue, that is, revenues, as a share of GDP, increase with economic growth. The large incidence of indirect taxes stands out from historical data; however, this should be modified with the strengthening of direct taxes that intends to be addressed by the introduction of an income tax. Total public revenues exhibit a strong pro-cyclical behavior so that when the GDP gap is positive there are temporary positive revenues that expand total income over structural revenues; the opposite happens when the gap is negative. Public expenditure does not show a similar behavior; its evolution is neutral to the GDP cycle, confirming that the estimation of a structural balance only requires a correction of revenues and not of expenditures.

The equation for public debt, expressed as a percentage of GDP, links the future level of public debt with its initial level, with the structural primary fiscal balance and with the key macroeconomic variables: real long-term GDP growth and the real interest rate relevant to the Paraguayan public debt. The structural primary fiscal balance is the policy target to be chosen so that public debt reaches a certain goal in a certain number of years; it is calculated free of the effects of the economic cycle, which, in the medium and long term average zero; but, should be checked annually by computing the actual primary structural balance on the basis of the estimates that connect the GDP gap with fiscal revenues. Structural fiscal revenue for one particular year represent the level fiscal revenue would have reached had the GDP gap been zero in that year.

The assumptions used for the development of the structural fiscal policy proposal include a long-term real GDP growth equivalent to 4.5 percent per annum and a relevant real interest rate of 6.5 percent per annum. Given that Paraguay does not have a developed public debt market, the relevant interest rate estimated for Uruguay, 5.75 percent, was used as a reference; 75 b.p. were added due to the difference of three grades between the risk rating of the two economies. The assumption of a constant interest rate during the entire period under consideration could be reviewed to the extent that Paraguay improves its public debt indicators and, as a consequence, risk for investors decreases; this would lead to a lower real interest rate as its risk rating improves. . The issue of Paraguayan public debt in the international financial markets could facilitate disseminate information on the use of a fiscal rule in Paraguay and confirm a lower risk perception. If the relevant interest rate decreases, the target for the primary fiscal balance could be less demanding, or, the goal for the fiscal net worth could be achieved in a shorter period.

For the derivation of the structural primary fiscal balance target different alternatives are considered regarding the long-term goal for public net worth and for the time horizon to achieve it. As proposal for the net worth objective it was considered a range between the current level of net debt, a negative net worth equivalent to 20 percent of GDP, and one in which the net debt becomes negative, reaching a positive public net worth equivalent to 10 percent of GDP. A range between 5 to 25 years is considered as possible horizons to achieve the long-term goal; if the public debt goal is to maintain the current level of indebtedness, 5 years are more than enough, while 25 years seem appropriate in order to reach the most ambitious goal of a negative net public debt.

A structural fiscal primary surplus of 0.43 percent of GDP is the target consistent with the less demanding long-term fiscal goal of maintaining the current level of debt. That small primary surplus allows for the payment of interests and no additional debt would be required, but, does not reduce current levels of indebtedness, for which a higher primary surplus would be needed. A structural primary fiscal surplus of 1.2 percent of GDP is required in order to achieve the complete elimination of public debt in a period of 20 years. Of course, there are still more ambitious alternatives for the fiscal policy goal. However, an objective of zero debt in the medium term appears to be very achievable and provides significant guarantees of stability since it generates a protective cushion of savings against crisis and the sustainability of fiscal policy appears to be significantly secured with the objective of zero fiscal net worth. With an indebtedness of 20 percent of GDP, similar to the current level, it is more likely that negative shocks may cause the debt to increase up to unsustainable levels. Economic disturbances affecting GDP and other variables as a result of domestic or external shocks can produce significant impact on the fiscal results and the level of public indebtedness.

Once the fiscal net worth objective is reached it will be necessary to define another target for the primary fiscal balance, this time for the indefinite future. If for example, the initial long-term goal considered was a zero fiscal net worth, after it has been achieved it will be necessary to compute, using the same parameters, a new target for the primary structural fiscal surplus, this time, for the indefinite future. In the case of the example considered, it would be a primary surplus of 0 percent of GDP for the long term, rather than a 1 or 2 percent of GDP surplus. That is, a country with zero net public debt does not need to generate a primary surplus in order to pay

interest or to reduce its public debt; it is enough to keep a permanent zero balance to avoid incurring on positive net indebtedness.

A structural fiscal policy such as the proposal is a long term State policy that transcends and sets a framework for the specific fiscal policies implemented by the different Governments during their term. In that sense, the technical parameters defining such policy should be determined outside the political contingency by technical groups that provide guarantees of impartiality. The estimates of the macroeconomic variables could be carried out by a Committee of independent experts. For example, highly regarded economists that represent different points of view related to the Paraguayan fiscal policy. This Commission should calculate the macro variables and the structural primary balance goal associated with the fiscal wealth target and the period of time to achieve it. These include estimates of the relevant real interest rate and the GDP long-term growth rate; it should also review the estimations of structural revenue and the annual expenditure budget consistent with it and, therefore, with the long-term fiscal goal. The decision of a long-term fiscal goal should be democratically adopted and maintained during the selected period. The technical group should review the value of the relevant parameters from time to time, for example, every five years. A technical report must be submitted by the authority to Parliament and the public explaining the methodology and the results obtained in the estimation of structural revenue and structural balance.

Fiscal transparency, as for example, the availability of data and information, is an additional requirement for a proper operation of the fiscal rule. Such a fiscal policy must be supported by the timely availability of high quality data on the public sector: fiscal operations, earnings data, accrued expenses and others related to national accounts, as well as information on assets and liabilities, properly endorsed by informative sources. The information should be detailed and public through accessible media (web page). In addition, a better knowledge of the contingent liabilities of the public sector is required.

In addition, the development of a public debt market, both domestic as well as international, is advisable for Paraguay. An international Paraguayan public debt market would enable the information regarding the fiscal policies under execution to be disseminated, and, in case of adopting a structural fiscal policy, would allow further benefits as country risk decreases. This would be of benefit not only for the public sector as its financing cost decreases, but also for the Paraguayan private sector that could see an increased availability of external financing. The development of a domestic public debt market might have a very positive effect on the diversification of the treasury's financial risk; for example, developing instruments denominated in local currency. It would also be beneficial for the private sector since that is the basis for the development of a local capital market.

## Introduction

**In establishing a structural fiscal policy the goal is to contribute to macroeconomic stability generating predictability of the fiscal policy and strengthening the solvency of the public debt.** The purpose of this work is to recommend policy measures that facilitate the development of a structural fiscal policy in the Paraguayan economy, which generate predictability and credibility that may contribute to the stabilization of the cycle and may decrease the likelihood of insolvency. For this purpose, this report presents a brief review of the Paraguayan fiscal situation, as well as estimates to determine a structural fiscal balance, and, proposes elements for a structural fiscal rule.

**This report on a structural fiscal policy for Paraguay is divided into three sections.** In the first one, the Paraguayan macroeconomic data as well as the fiscal accounts statistics that were used are described and interpreted; the second section offers estimates and projections for the structural fiscal balance, proposing that the origin of the deviations is in the gap between actual GDP and trend GDP. The third section provides a design and simulation of a structural fiscal policy for Paraguay, including a goal for the structural balance that seems most appropriate for the country as well as its effects on the level of public debt in the medium and long term; in addition, some recommendations for the implementation of a fiscal rule that contributes to the improvement of the country's macroeconomic stability are presented.

**Time series were constructed based on three different sources of information; despite not being necessarily and fully compatible, all of them are considered to be reliable.** Data from different sources was compiled seeking to ensure its compatibility; but, despite our best efforts, there are limitations that could affect the results. The database was assembled with information from reliable sources such as ECLAC, the International Monetary Fund and the World Bank; however, there is no guarantee that these series are fully compatible. In addition, due to the lack of data in the series, it was necessary to estimate and interpolate certain variables and parameters that may be inaccurate, particularly, in the case of the labor market.

**The second part of this report presents the development of the analytical framework used to estimate the trend GDP, the GDP gap and the fiscal variables used to determine the structural fiscal rule.** This second section also describes the estimates and projections of the structural fiscal balance and fiscal revenue of Paraguay, which were estimated based on the trend GDP which in turn was derived from a Cobb-Douglas type of production function and from time series that can be traced back to the 1960s for the stock of capital, the labor force, unemployment and total factor productivity. Considering that the main source of volatility and deviations from the trend of fiscal revenue in Paraguay corresponds to the GDP cycle, this second part presents an analytical framework to define and estimate the trend GDP and the corresponding structural fiscal variables, building on structural fiscal policy experiences in other countries such as Chile.

**The third part of this report presents a proposal for a structural fiscal target that would enable the public debt sustainability in the medium and long term by reducing the public sector vulnerability to shocks affecting its solvency.** That is, a proposal, design and simulation of a structural fiscal policy is described, including a measure for the structural balance that seems most appropriate for Paraguay. Since the objective of establishing a structural fiscal target is to

generate predictability that ensures the solvency or sustainability of the financial position of the public sector—or at least to reduce its historical vulnerability—a proposal for a long-term goal for the public sector net worth is also presented.

**Finally, certain policy measures are proposed for the implementation of the rule in order to improve fiscal transparency and thus contribute to macroeconomic stability.** The report presents some recommendations on policy reforms that contribute to transparency and are necessary for the proper implementation of a stabilizer structural fiscal policy.

1. Descriptive Statistics of the Paraguayan Economy

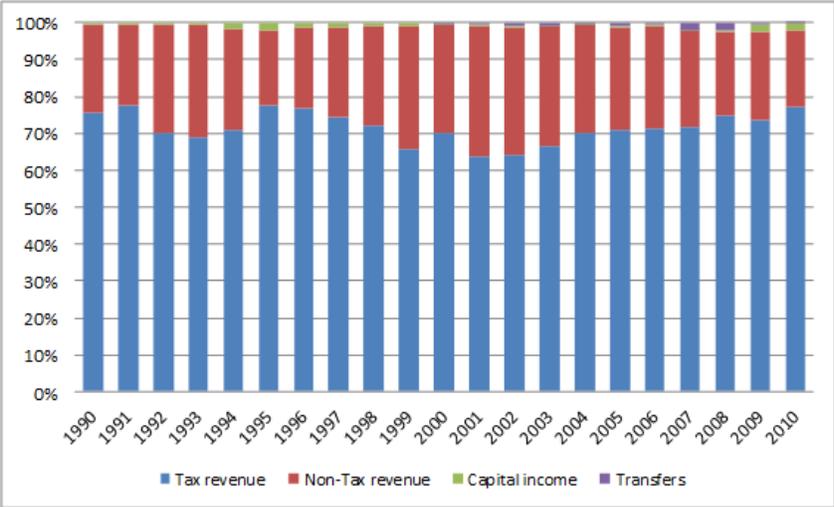
**The objective of this chapter is to provide a simplified review of the evolution experienced by the Paraguayan economy in the last two decades.** The performance of the productive activity as well as the evolution of the fiscal condition during this period is shown; this will be used as the basis for the development of the proposal for a structural fiscal policy explained later.

Paraguay’s Public Sector<sup>1</sup>

Fiscal Revenue and Spending

**In the past 20 years tax collection has represented, on average, 71 percent of the public sector revenue being this the main source of fiscal income; but, this collection is equivalent scarcely to 13 percent of GDP on average.** The remaining third is explained by non-tax income as is the case of royalties from hydroelectric plants in the basin of the Paraná River, capital revenue, and, in lower amount, external grants. (Figure 1.1 and 1.2)

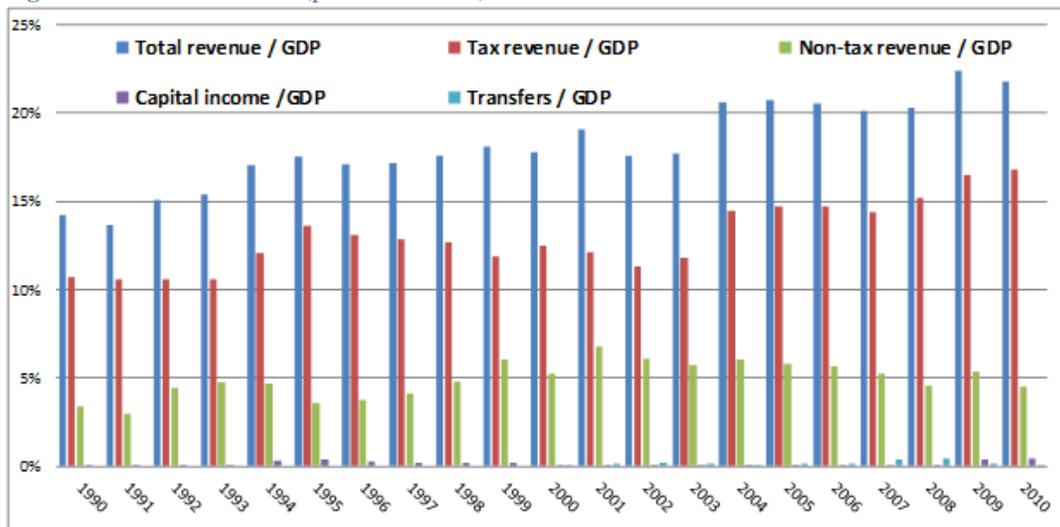
Figure 1.1: Fiscal Revenue Composition



Source: LE&F based on data from ECLAC and the World Bank

<sup>1</sup> All the information of the public sector considers the Central Government.

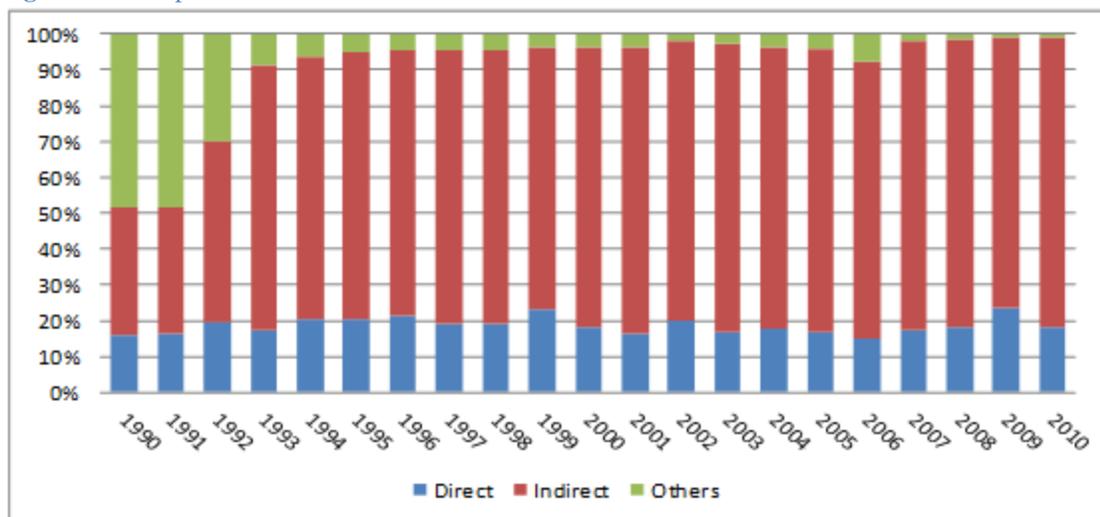
**Figure 1.2:** Fiscal Revenue (percent of GDP)



Source: LE&F based on data from ECLAC and the World Bank

**Almost ¾ of tax revenues correspond to indirect taxes.** When breaking down tax revenues, it is possible to determine that since 1992 up to date the indirect taxes component is the one that generates the highest contribution to total fiscal revenue with an average of 71 percent of total tax collections in the last two decades. (Figure 1.3)

**Figure 1.3:** Composition of Tax Revenue



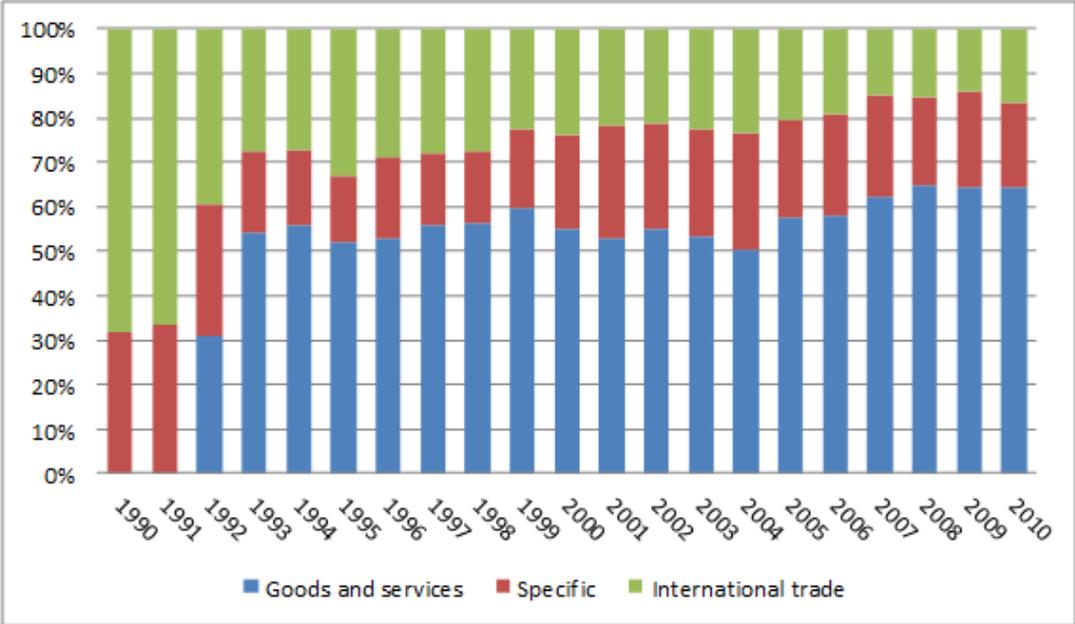
Source: LE&F based on data from ECLAC and the World Bank

**Indirect tax revenues depend mainly on taxes associated with consumption.** Within excise a large proportion is originated in the collection of levies applied to the consumption of goods and services; these taxes represent 4.7 percent of GDP. The high weight of these taxes is the result of

a tax reform carried out in 1991, the effect of which is reflected starting 1992, reaching in 2010 80 percent participation within total tax revenues, a figure that was equivalent, that same year, to 12.3 percent of GDP. This level of participation clearly shows a huge dependence of tax revenues on taxes associated with domestic private spending.

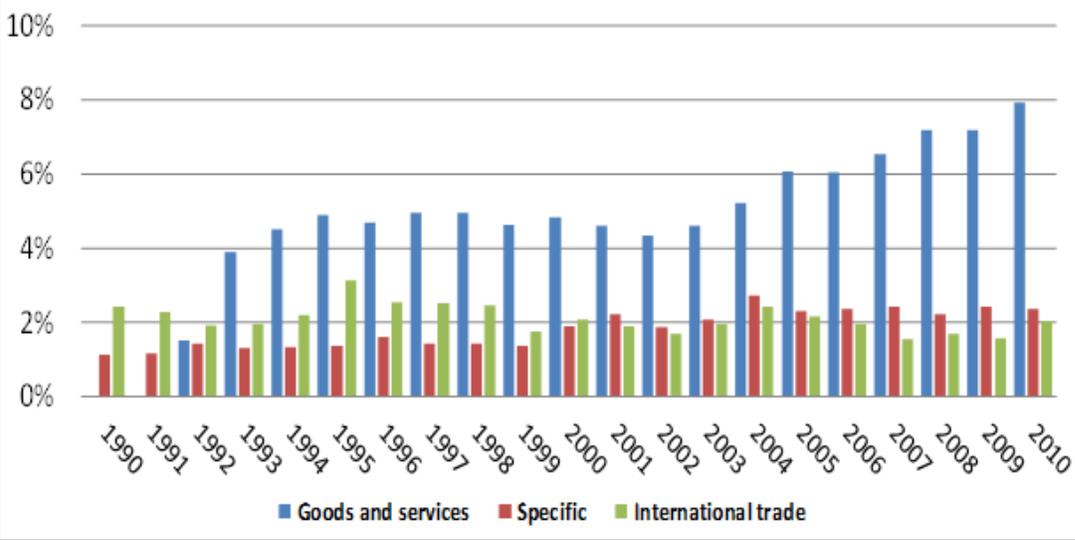
This situation can be modified in the short term with the entry into force of a recent tax reform which introduced beginning in 2013 an income tax. (Figure 1.4 and 1.5)

Figure 1.4: Composition of indirect taxes



Source: LE&F based on data from ECLAC and the World Bank

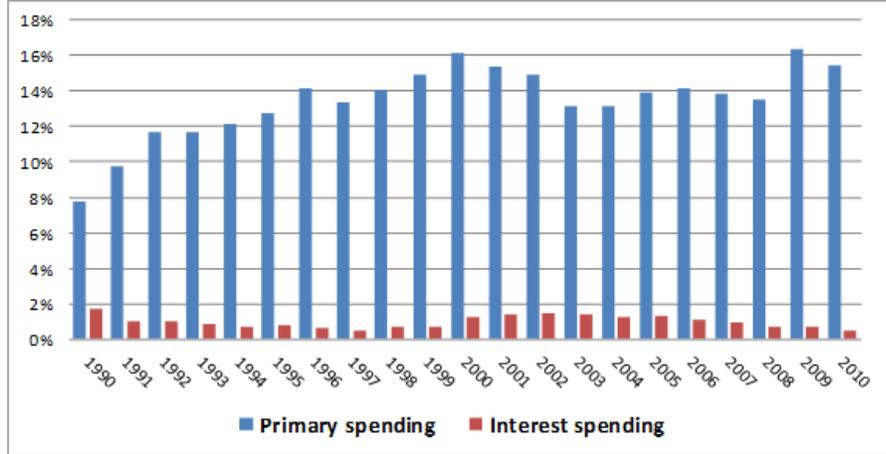
Figure 1.5: Indirect Taxes as percent of GDP



Source: LE&F based on data from ECLAC and the World Bank

**Primary spending accounts for near 13 percent of GDP while interest expenditure has fallen from 1.5 percent to 0.5 percent of GDP.** Primary fiscal expenditure represents on average, from 1990 to 2012, around 13 percent of GDP, reaching its maximum level in the years 2000 and 2009 with shares above 16 percent of GDP. Meanwhile, interest spending on these two decades has represented, on average, around 1 percent of GDP, exhibiting its maximum level in 2002 with a 1.5 percent of GDP; however, since then interest expenditure has fallen reaching only 0.5 percent in the 2010 fiscal year. This favorable evolution is explained both by the reduction of the interest rate applicable to the Paraguayan debt as well as by the reduction of the public debt as a percentage of GDP. (Figure 1.6)

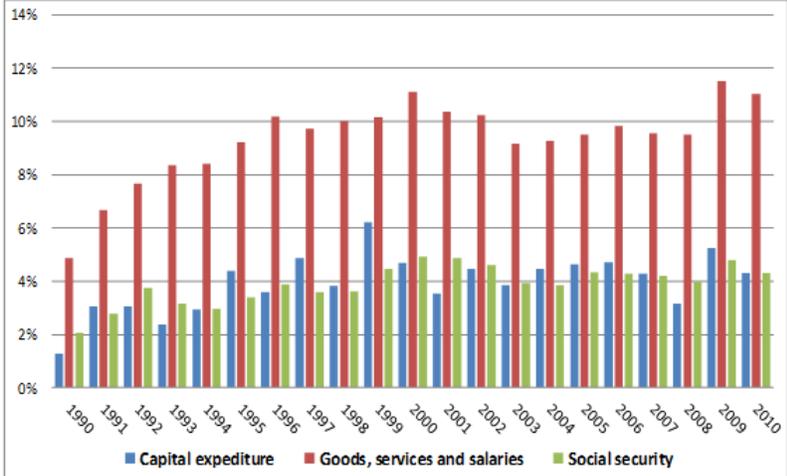
Figure 1.6: Fiscal Spending as percent of GDP



Source: LE&F based on data from ECLAC and the World Bank

**Consumption of goods and services, together with wage payments, represent the bulk of public expenditure.** The breakdown of government spending shows that the consumables item, including disbursements for goods, services and wages, constitute the bulk of the central government expenditure: spending on consumables is up to 9.3 percent of GDP, followed by expenditure on social benefits with 3.9 percent of GDP. (Figure 1.7)

Figure 1.7: Primary Fiscal Expenditure as percent of GDP

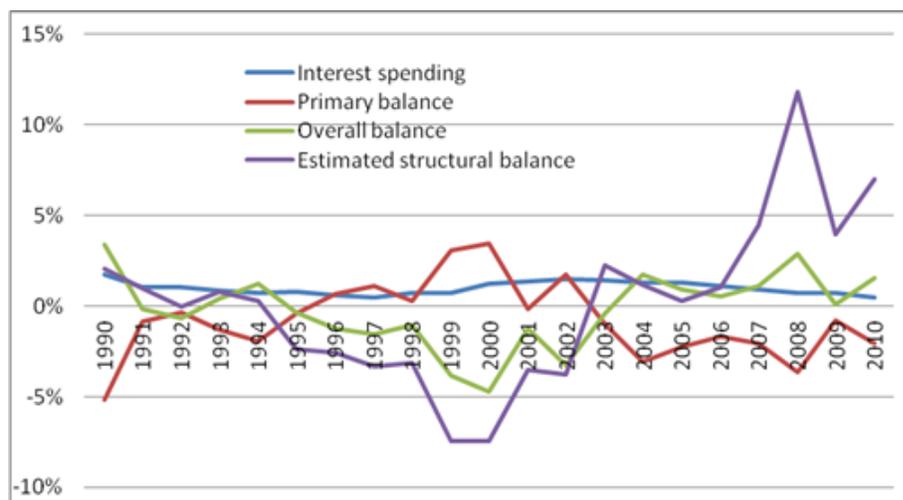


Source: LE&F based on data from ECLAC and the World Bank

## Fiscal Results

**Since 2003 to date the public sector of the Paraguayan economy has consistently presented primary surpluses.** Between the years 1996 to 2002 Paraguay exhibited, continuously throughout the period, primary deficits; in 2000, as a result of a deep banking crisis that had started in 1995, the country experienced its highest primary deficit: the equivalent of 3.5 percent of GDP. Since 2004, public finances have shown surplus balances, both at the primary and global level, even during the period of 2008 to 2009 when the country faced a severe drought; despite this shock, public finances resisted and maintained a positive balance, while interest payments remained stable throughout the period. (Figure 1.8)

**Figure 1. 8:** Public Sector Balance (percent of GDP)

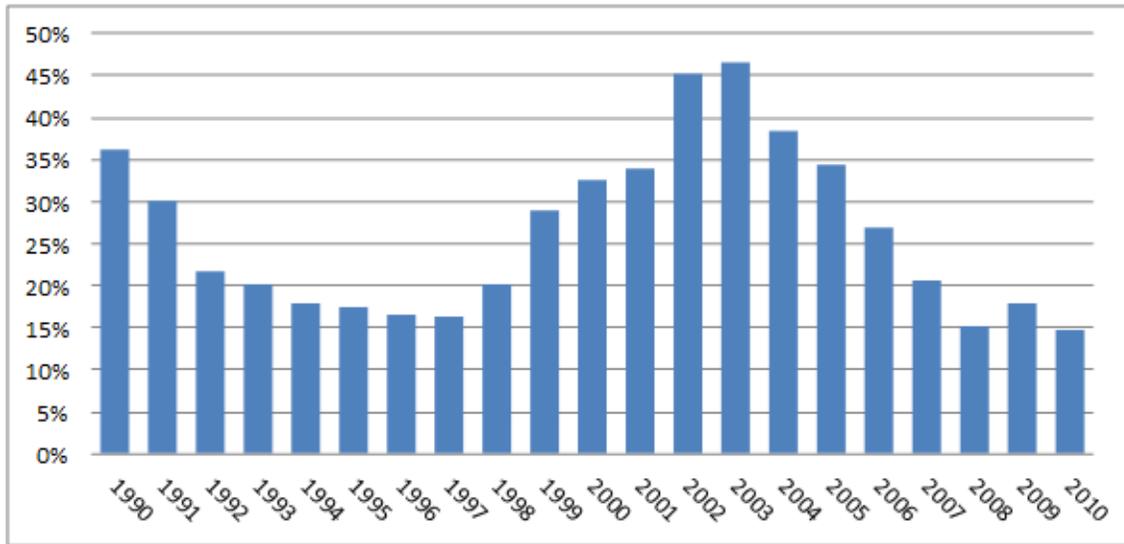


Source: LE&F based on data from ECLAC and the World Bank

## Public Debt

**Paraguay's public debt has declined from a 45 percent of GDP in 2003 to less than 20 percent in 2010.** During the last two decades public debt has fluctuated between 15 percent and 45 percent of GDP. The crisis that took place in the years 1995 and 2002 should be considered when analyzing the level of public indebtedness in Paraguay; in both cases, the impact on the banking and financial system caused the public debt to raise considerably, from levels under 20 percent of GDP in 1994 to over 45 percent of GDP in 2002. Faced with this scenario the tax reform in 2003/04 had a positive impact on the fiscal result; the public sector improved its solvency, and the level of public indebtedness fell reaching in 2010 a level close to 15 percent of GDP. (Figure 1. 9)

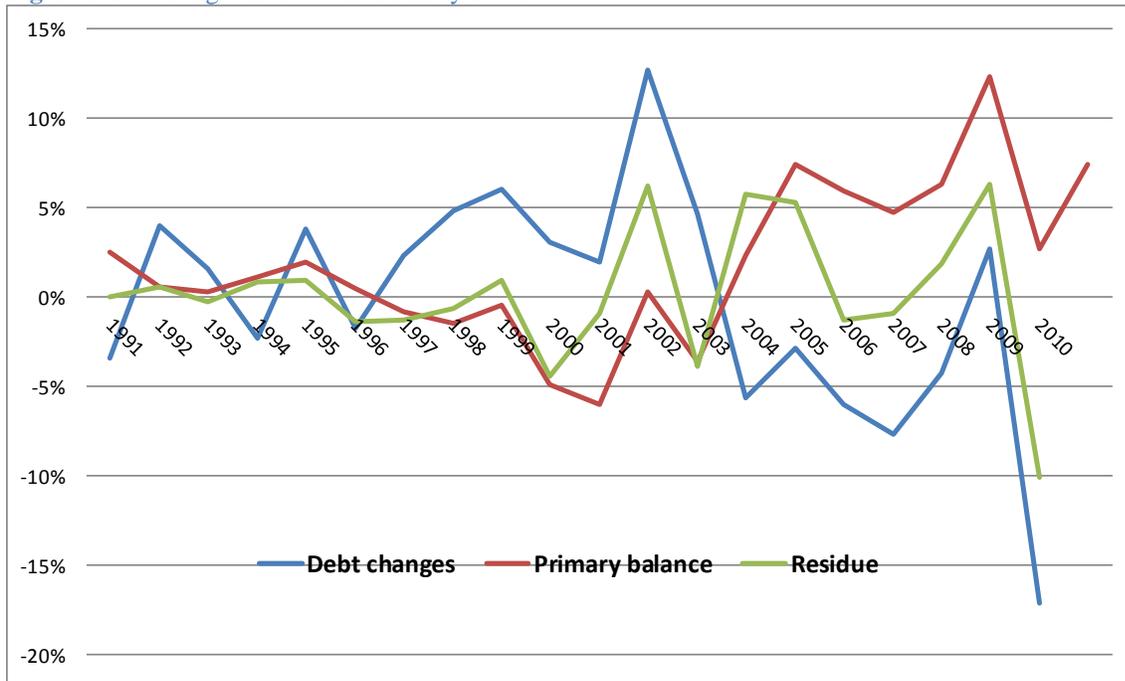
**Figure 1. 9:** Public Debt (as percent of GDP)



Source: LE&F based on data from ECLAC and the World Bank

**Increases in the level of indebtedness come along with primary budget deficits.** When reviewing the evolution experienced by the public sector borrowing it is clear that the biggest fluctuations were generated between the years 1997 to 2002, period that matches the financial crisis experienced by Paraguay and that were also reflected in the primary deficit observed in the same period. (Figure 1.10)

**Figure 1.10:** Changes in Debt and Primary Balance



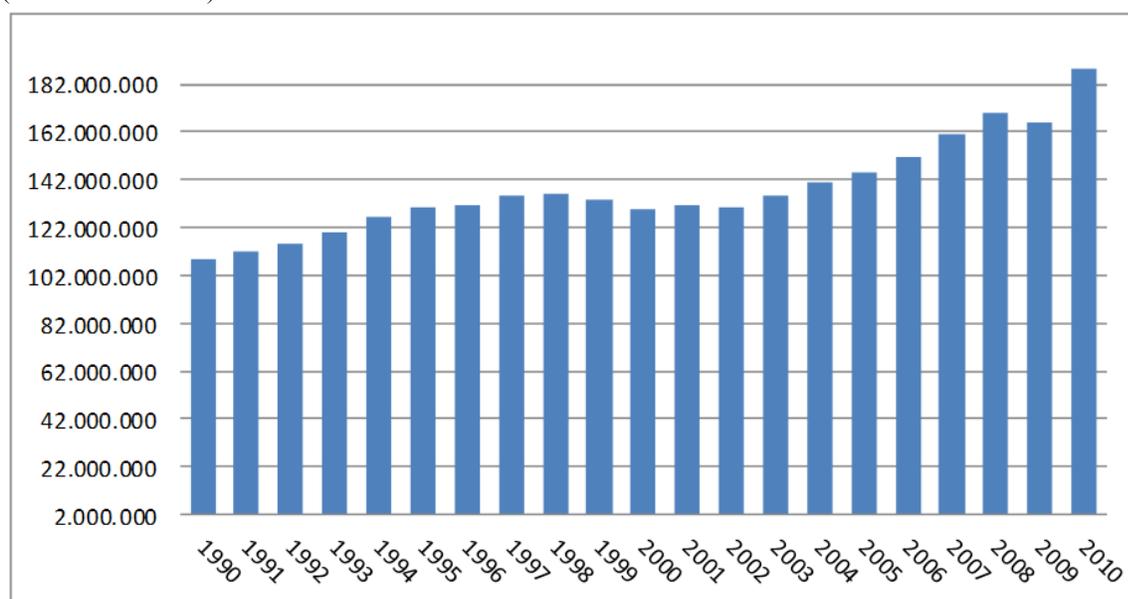
Source: LE&F based on data from ECLAC and the World Bank

## Paraguay's Economic Growth<sup>2</sup>

### Fiscal Real GDP and its Components<sup>3</sup>

**At the beginning of the new millennium the Asian crisis and the crisis in Argentina generated direct contagion effects on the Paraguayan economy, either through international trade or through the financial system.** In particular, the crisis experienced by the Argentinian banking and financial system had a strong impact in Paraguay's financial system. During the period from 1998 to 2002 the Paraguayan economy presented an average GDP growth rate of -0.4 percent per annum, well below the 3 percent averaged between the years 1990 to 2010. (Figure 1.11)

**Figure 1.11: Real GDP\***  
(USD '000 of 1994)



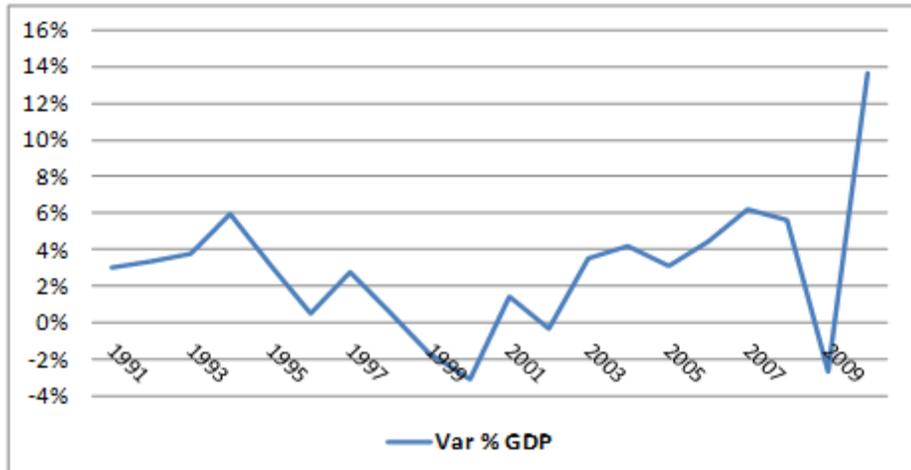
\*Until 2012, GDP figures do not include the binational power plants at Itaipu and Yacyreta. Source: LE&F based on data from ECLAC and the World Bank

**Since 2000 the Paraguayan economy has shown a positive growth rate, except for the year 2009 as a result of a severe drought.** In the eight years following the Argentinian crisis and until 2010, the economy has displayed sustained growth at average rates of 4.9 percent per year, with the exception of 2009 when, as a result of a severe drought, the economy exhibited a contraction close to 4 percent. (Figure 1.12)

<sup>2</sup> All the information of the public sector considers the Central Government.

<sup>3</sup> The information used in this study considers ECLAC as its main source of information. Accordingly, the binational hydroelectric plants are included in the estimate for Paraguay's GDP. Source: <http://www.lanacion.com.py/articulo/42901-bcp-corrige-a-la-baja-el-crecimiento-del-2010-al-incluir-a-binacionales.html>

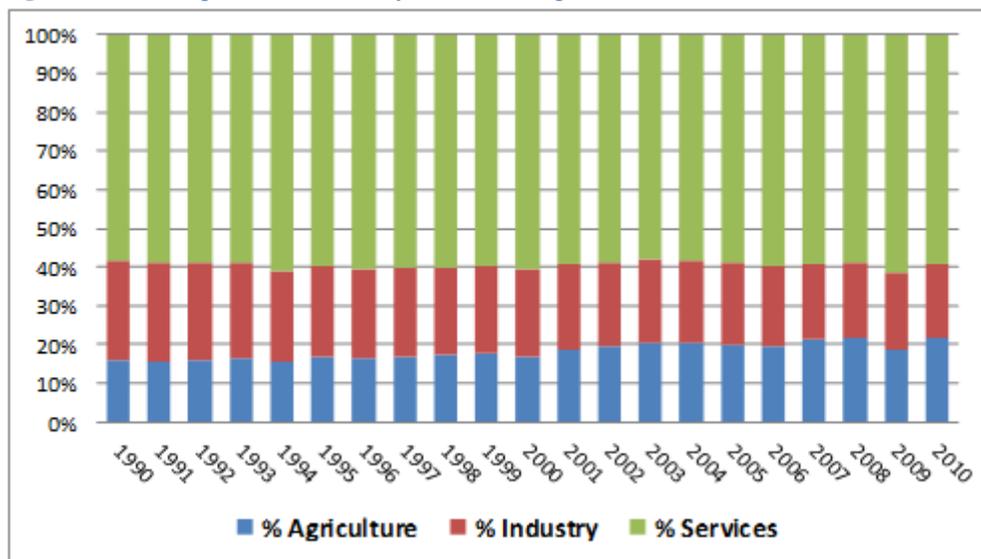
Figure 1.12: Real GDP - percent changes



Source: LE&F based on data from ECLAC and the World Bank

**The service sector contributes with 60 percent of Paraguay’s GDP.** When the Paraguayan GDP is broken-down a bias toward the service or tertiary sector can be observed; it represents near 60 percent of GDP. The secondary sector, mainly constituted by the industrial segment, is responsible for a 22.3 percent of total activity in Paraguay; the remaining 18.2 percent corresponds to the primary sector, particularly related to agriculture. (Figure 1.13)

Figure 1. 13: Composition of GDP by Sector of Origin



Source: LE&F based on data from ECLAC and the World Bank

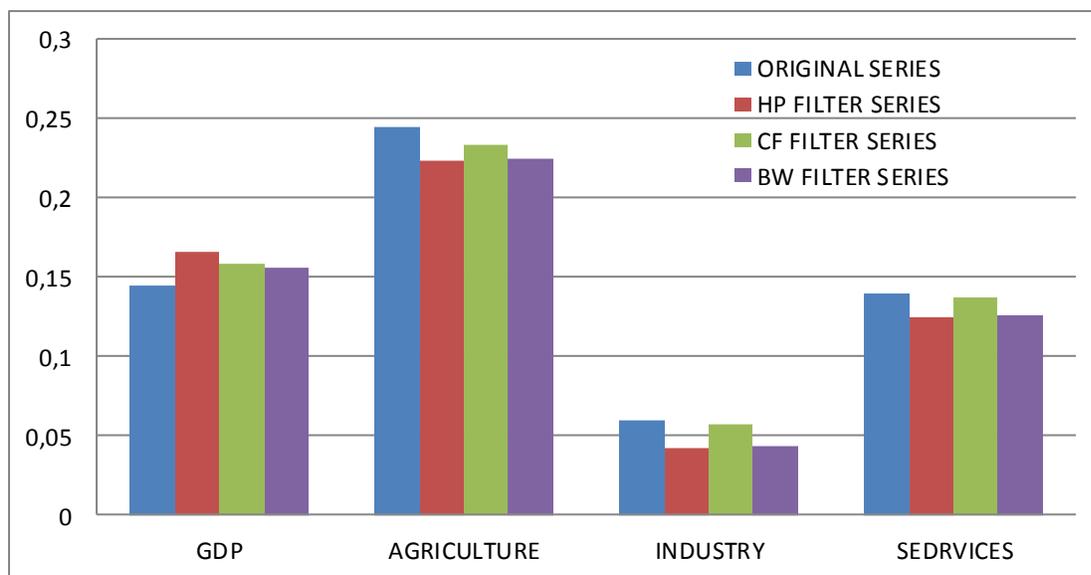
### Real GDP Volatility

**The volatility of the service sector is slightly lower than the one displayed by total GDP.** The coefficient of variation<sup>4</sup>, for total GDP and for the main sectors of origin, is used in order to measure the GDP variability; the procedure was applied to the original series, as well as to the

<sup>4</sup> Ratio between the standard deviation of a variable and its average; allows to compare volatility.

series depicting the cycle; the latter were obtained by filtering in the original series so as to obtain trends and then calculate gaps around the trend movements<sup>5</sup>. The primary sector presents the highest volatility with a coefficient close to 0.25, over the 0.15 of total GDP; the primary sector concentrates the main export products. The secondary sector, the least volatile segment, presents a 0.06 indicator, while the coefficient associated with the service sector shows a value of 0.14, similar to total GDP. (Figure 1.14)

**Figure 1.14:** Volatility of GDP by sector

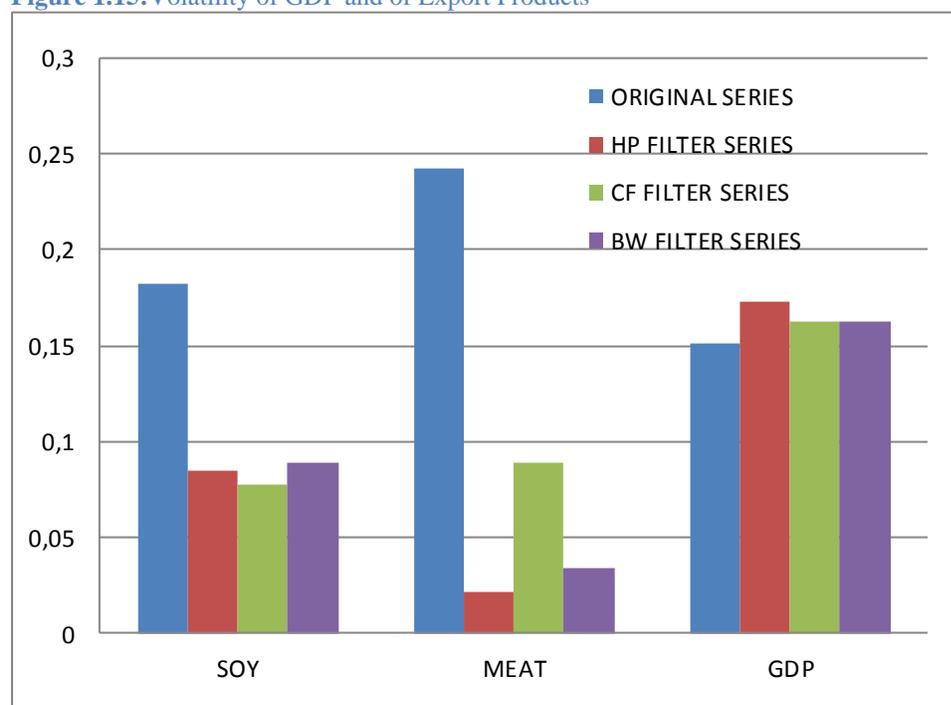


Source: LE&F based on data from ECLAC and the World Bank

**The volatility of the agricultural sector depends directly on the international prices of export products.** The volatility of the agricultural activity can be explained by its dependence on the cycles of international prices, such as those of soybean and meat; the prices of these exports display a higher volatility than GDP in its original series, while the cyclical series corrected by the filters exhibit a lower variability than the 0.15 corresponding to GDP. (Figure 1.15) In addition to international prices, climatic factors also contribute to this volatility.

<sup>5</sup>The following filters were used: Hodrick and Prescott, Christiano and Fitzgerald filters, and the Butterworth filter. The cyclical series, or gaps, were obtained by removing from the original series the trends calculated with the application of these filters.

**Figure 1.15: Volatility of GDP and of Export Products**

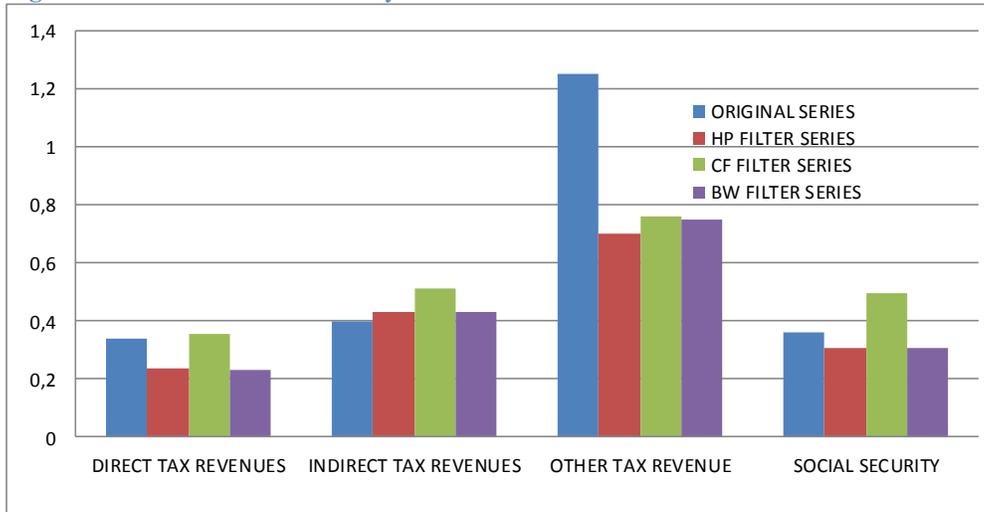


Source: LE&F based on data from ECLAC and the World Bank

### **Volatility of fiscal revenues**

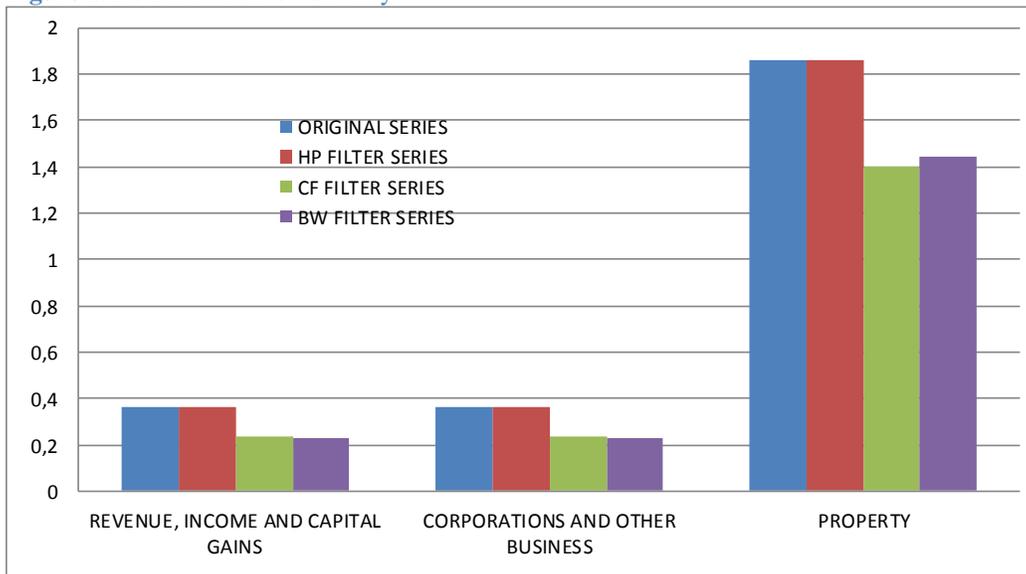
**During the period under analysis fiscal revenues appear to be slightly more volatile than fiscal spending.** Nevertheless, they present less volatility than the majority of individual tax revenues, except for the case of taxes associated with foreign trade. The components of indirect taxes, such as general taxes on goods and services, specific taxes and even the taxes associated with international trade, present a volatility above that of total GDP. This probably reflects that the volatility of domestic demand, and, in particular of consumption, is greater than the GDP volatility, so, changes in the level of economic activity would cause more pronounced variations in the collection of these taxes in comparison to other sources of fiscal revenue. (Figure 1.16, 1.17 and 1.18)

**Figure 1.16: Tax Revenue Volatility**



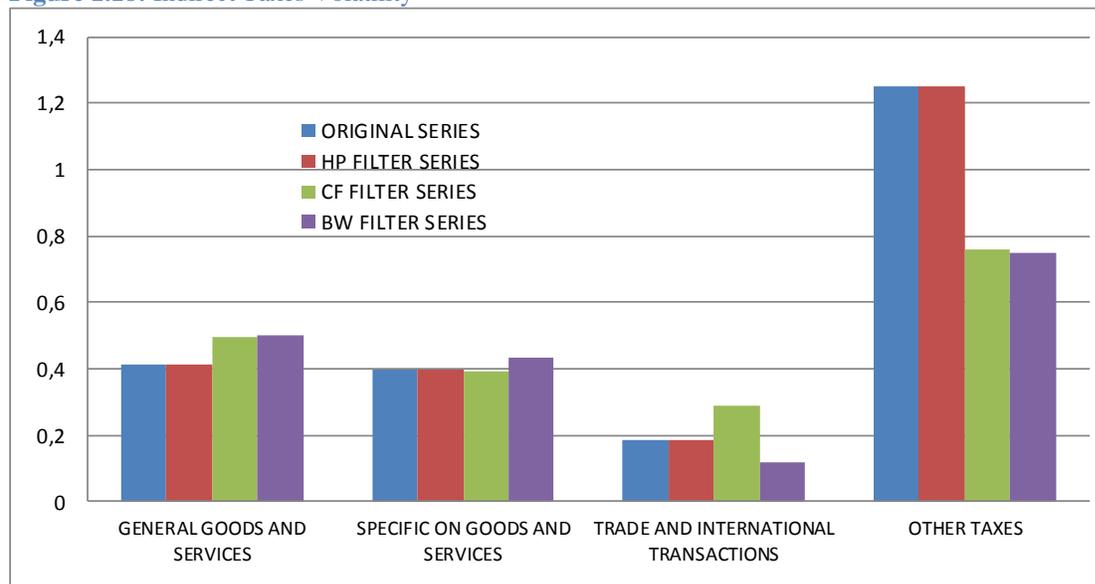
Source: LE&F based on data from ECLAC and the World Bank

**Figure 1.17: Direct Taxes Volatility**



Source: LE&F based on data from ECLAC and the World Bank

**Figure 1.18: Indirect Taxes Volatility**

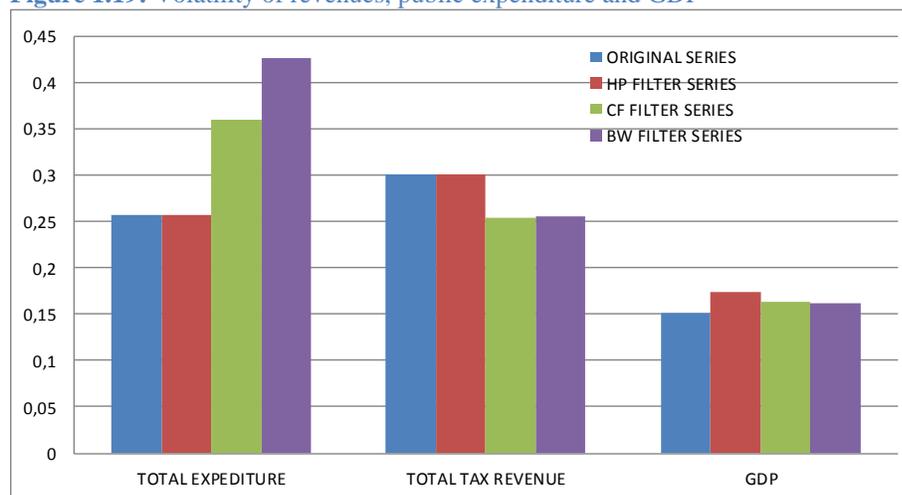


Source: LE&F based on data from ECLAC and the World Bank

### Fiscal spending volatility

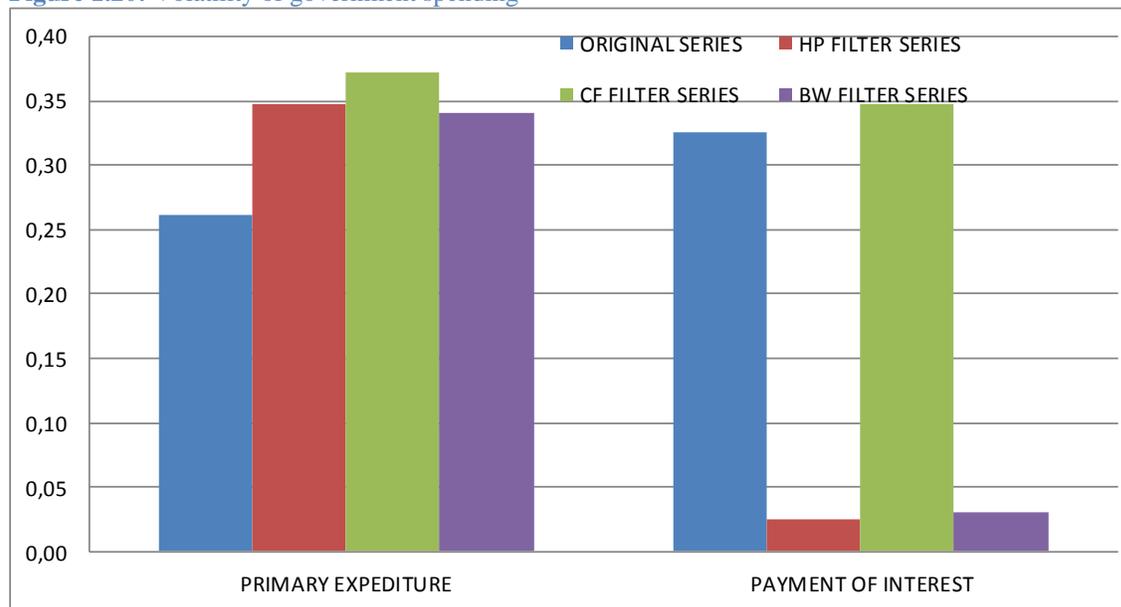
**The item that presents the greatest volatility within public expenditure corresponds to interest spending.** Interest expenditure shows more volatility than primary spending. Considering the components of primary expenditure, spending on goods, services and wages as well as capital spending, all exhibit a similar volatility to social benefits, item that in addition bears a low incidence within the budget of the country. The volatility of interest expenses could be reflecting the fluctuations of the exchange rate and of international interest rates to which the Paraguayan debt is subject. On the other hand, capital expenditure volatility is residual, i.e. it may reflect the efforts to adjust the fiscal balance to available resources. (Figure 1.19, 1.20 and 1.21)

**Figure 1.19: Volatility of revenues, public expenditure and GDP**



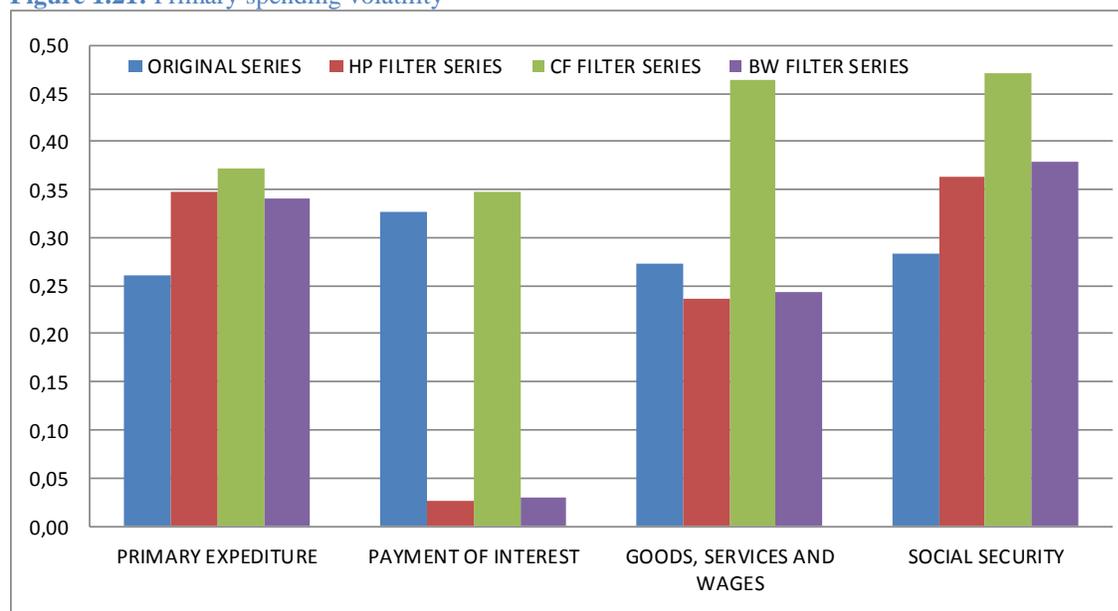
Source: LE&F based on data from ECLAC and the World Bank

**Figure 1.20: Volatility of government spending**



Source: LE&F based on data from ECLAC and the World Bank

**Figure 1.21: Primary spending volatility**

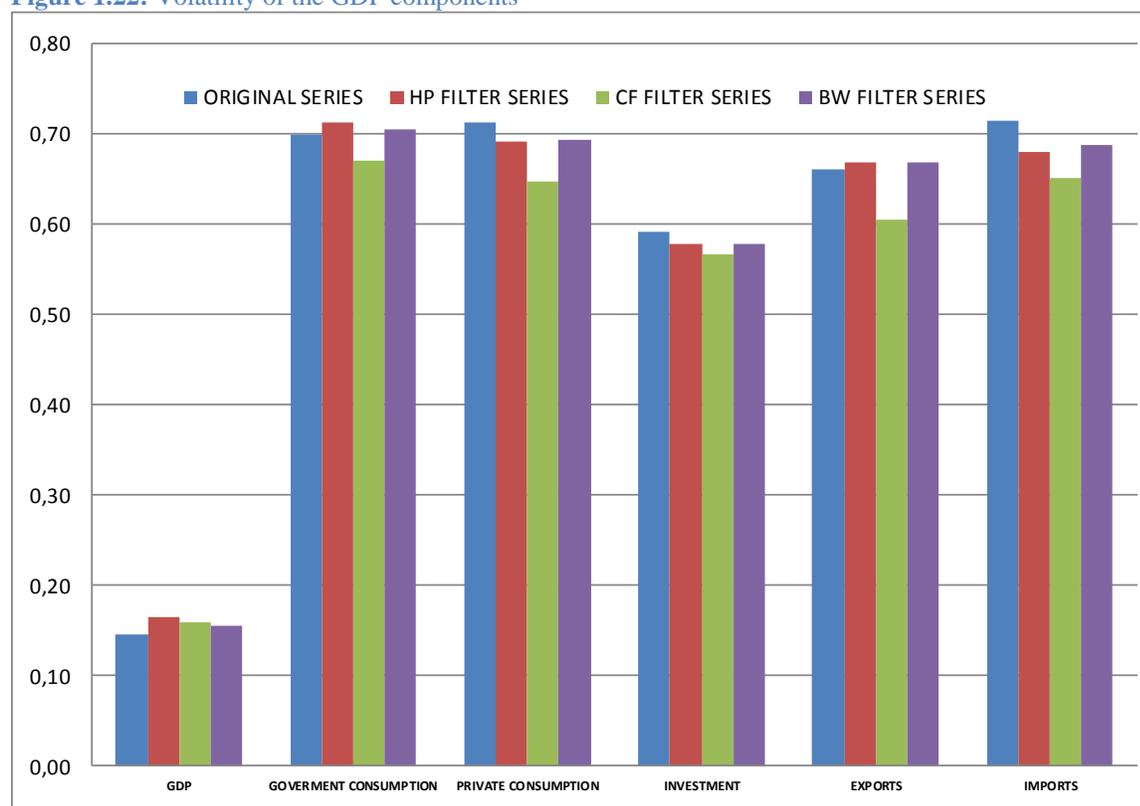


Source: LE&F based on data from ECLAC and the World Bank

### Fiscal spending volatility

**The volatility of the components of domestic demand is greater than the volatility of GDP.** The different components of domestic demand are several times more volatile than total GDP. The volatility of personal and government consumption stands out since both exceed the volatility of capital formation and amount to around six times the GDP volatility (Figure 1.22)

**Figure 1.22: Volatility of the GDP components**



Source: LE&F based on data from ECLAC and the World Bank

## 2. Estimation and Projection of the Structural Fiscal balance

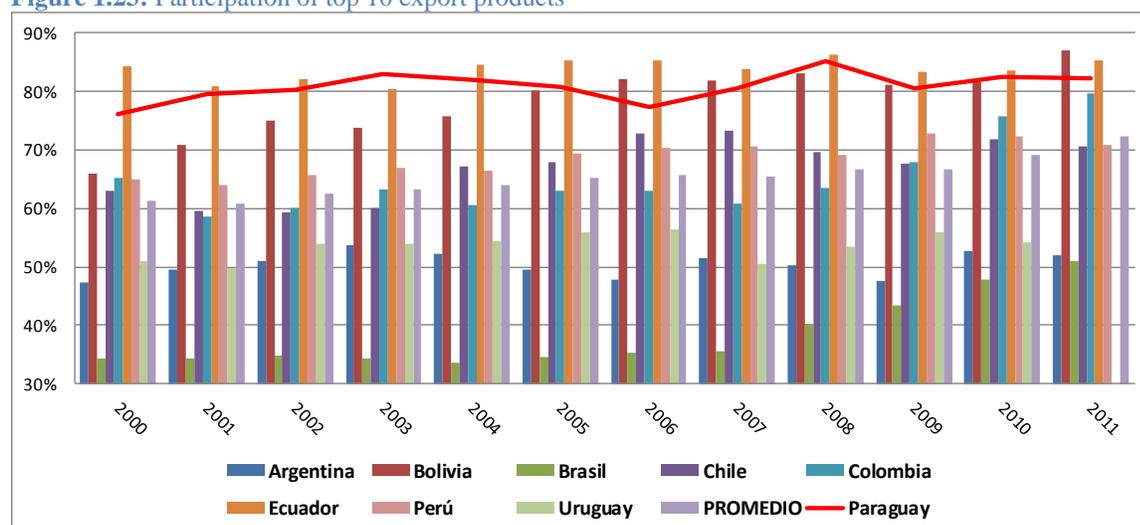
**This chapter covers the estimations and projections that will be used to derive the structural fiscal rule for Paraguay.** The definition of a structural balance requires an estimate of structural or trend fiscal revenue and of the underlying factors to that trend. Possibly among them are the gross domestic products, the price of some export commodities, and weather related variables such as rainfall.

**The relation of fiscal revenue with the price of one or more export commodities was considered since the Paraguayan economy, like other Latin-American countries, shows a high level of specialization in commodity exports.** Actually, Paraguay exports a variety of primary agricultural and livestock commodities, including, among others, soy beans, cereals and meat, and, its degree of specialization is relatively high when the top ten individual export products are considered. Indeed, comparing Paraguay's degree of export specialization with other Latin-American countries, it is only surpassed by Ecuador, Bolivia, and Venezuela (though this country was not included in the chart). In spite of that, Paraguay does not show any specific or individual export product playing a significant role in revenue generation, such as is the case of oil in Venezuela, Ecuador and Trinidad and Tobago, soy beans and other grains in Argentina, or copper in Chile and Peru. (Figure 1.23)<sup>6</sup>. The characteristics of the Paraguayan tax system and its heavy reliance on indirect taxes, rather than export diversification is the underlying cause for

<sup>6</sup> ECLAC, the source of information, does not include data on Venezuela

the non-existence of a direct link between export commodity prices and tax revenue. There could be an indirect link that operates through GDP, but that cannot be peaked up using the single equation cointegration methodology of this work. That is, higher commodity prices increase GDP and domestic private spending and through that, more indirect taxes are collected.

**Figure 1.23: Participation of top 10 export products**



Source: LE&F based on data from ECLAC and the World Bank

**An estimation of a stable and balanced relationship between both, fiscal revenue and its components, with the trend GDP and its gap, is a requisite for the estimation of a structural balance.** Therefore, in order to identify the relevance of each component the elasticities of total and aggregate fiscal revenue and expenditure with respect to the economy's actual and trend GDP were estimated; in particular, the elasticity of fiscal revenue with respect to GDP plays an essential role in the determination of the value of structural income and of the structural balance itself<sup>7</sup>.

**The elasticity of fiscal revenue to GDP was estimated through co-integration and error-correction models.**<sup>8</sup> For the estimation of fiscal revenues a function of GDP, a cointegration relationship was estimated under the hypothesis of the existence of a long-term relationship between revenues and GDP; in addition, some dummy variables were included in order to capture changes in the country's tax regulation as well as other variables that may affect the revenue cycle, including, among them, prices of export products. In addition, estimates were made for the relationship between total and disaggregated fiscal revenue and expenditure with gross domestic product identifying the relevance of each component. These estimates were made on the basis of cointegration models, however, error correction models of the first differences were also estimated so as to illustrate on the short-term relationship of these variables. The

<sup>7</sup> At a disaggregated level the relations between tax revenue and the GDP gap did not show statistical significance

<sup>8</sup> The current estimations do not take into account the potential structural break caused by the 2004 tax reform. While the tax-to-GDP ratio increased moderately after the 2004 tax reform this increase occurred towards the end of the sample and was small in size. As a result, it was not possible to recognize this change in the estimations and it is possible the increase introduces some upward bias in the estimated elasticity. However, the authors believe that the bias would be small and would not significantly change the elasticity estimated for the entire sample period.

results indicate a significant relationship between the aggregate tax revenue with GDP, but not at the disaggregated level of each of the fiscal revenue items with GDP.<sup>9</sup>

**Not only the price of export products but also the hydrography of the basins of the rivers would be relevant in the determination of tax revenue cycles.** According to some point of views, the prices of the main export commodities, like soy beans and beef meat, could be considered to be relevant variables in the determination of cyclical and trend tax revenue and hence for the definition of a structural fiscal policy for Paraguay. In addition, fiscal revenue should also be function of the country's rainfall because of its impact on the volume of electricity generation (in particular in the Parana basin) and on agricultural exports; both have direct effects on the amount of royalties and taxes collected by the State. However, prices of major exports did not show a statistically significant relationship with fiscal revenue, and, a confirmation and quantification of its relationship with rainfall was not possible due to data limitations.

### **Estimation of the trend or structural**

**The trend GDP was estimated on the basis of a Cobb Douglas aggregate production function.** Real GDP ( $y$ ) can be analytically split up in a permanent or trend component ( $Y^p$ ), estimated through the production function under a "normal" productivity and degree of use of resources, and a transitory component ( $Y^{tran}$ ) that represents productivity deviations and above or below normal use of resources. The logarithmic difference of GDP and its trend, also called the GDP gap, represents the economic cycle; it has an average value equal to zero, is positive in periods of expansion or high activity and negative during downturns and recessions.

$$\log y_t = \log y_t^p + \log y_t^{tran}; \log y_t - \log y_t^p = \log y_t^{tran} = gap_t^y$$

**A Cobb-Douglas aggregate production function, with constant returns to scale and under the assumption of a 0.35 value for  $\alpha$ , was used for the estimation of trend GDP.** In the aggregate production function  $A$  is the total factor productivity,  $K$  is the capital and  $N$  the actual workforce, while  $\alpha$  is a parameter that represents the share of capital within total income. The value of  $\alpha$  was obtained from a figure estimated by de IMF (0.35)<sup>10</sup> since its value could not be derived from the national accounts. The superscript  $P$  is used to represent the permanent trend or permanent component of the variables: total factor productivity, the stock of capital and employment. (Figure 1.24)

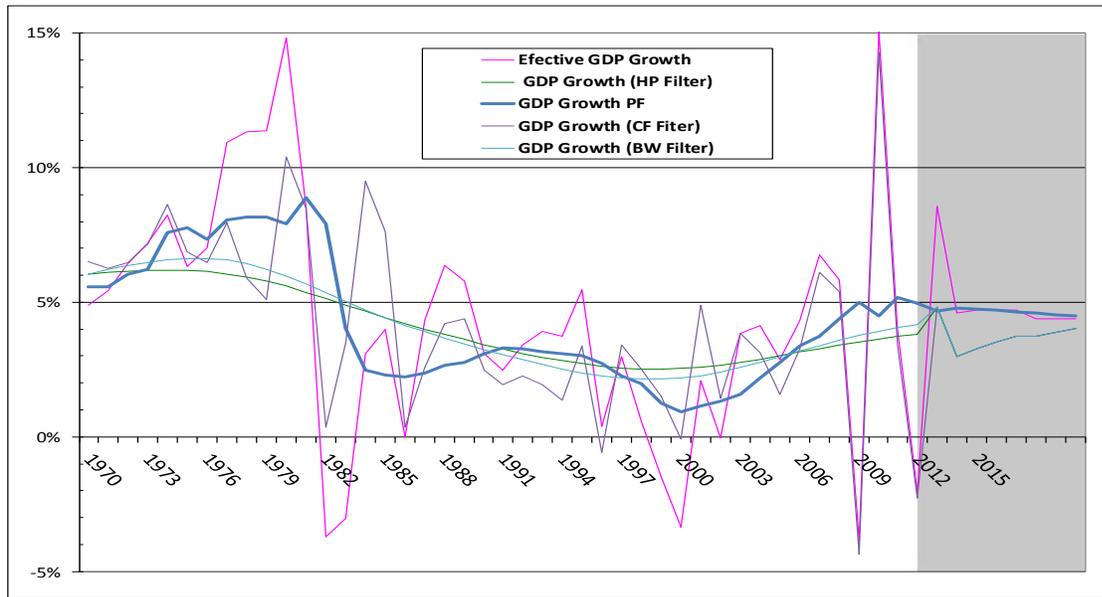
$$y_t^p = A^p (K_t^p)^\alpha (N_t^p)^{(1-\alpha)}$$

$$\log y_t^p = \log A_t^p + \alpha \log K_t^p + (1 - \alpha) \log N_t^p$$

<sup>9</sup> Only tax originated revenues were included; tax revenues represent 71 percent of the central administration income

<sup>10</sup> International Monetary Fund (2011); Paraguay consultation - Article IV corresponding to 2011. IMF Country Report No. 11/239.

Figure 1.24: GDP Growth



Source: LE&F based on data from ECLAC and the World Bank

**Actual employment, defined as a quality adjusted labor index, is calculated as the product of the number of workers ( $N \#$ ), the number of hours worked on average by each worker ( $h$ ), and an index of labor qualification represented by the average years of schooling.** The series on the number of workers  $N \#$  was obtained from ECLAC for the period 1970-2011. Unfortunately, the series for the average number of hours worked and the average years of schooling of the labor force are not available for Paraguay; therefore, we have assumed a value of 1 for all observations of both variables waiting to eventually obtain information in this regard. (Figure 1.25)

$$N_t = N_t \# h_t \times s$$

Figure 1.25: Labor force Growth



Source: LE&F based on data from ECLAC and the World Bank

**The unemployment rate, effective and natural, is used to represent the degree of utilization of resources. The natural unemployment rate is represented as the trend of the original unemployment rate series.** The unemployment rate ( $U$ ) is defined as the difference between the labor force ( $L$ ), all those willing and ready to participate in the labor market, and the number of people actually employed  $N \#$ , expressed as a percentage of labor force. On the other hand, the trend or natural rate of unemployment is obtained through the application of an HP filter on the unemployment rate series<sup>11</sup>.

$$U_t = \frac{L_t - N_t\#}{L_t}$$

$$U_t^p = HPfilter(U_t)$$

**The growth rate of employment in Paraguay is high by international standards, with a trend rate of over 3.5 percent per year.** The value of the trend of actual employment is obtained by applying a Hodrick-Prescott filter (HP filter) to the labor force series, and multiplying the result by one minus the natural rate of unemployment. In recent years, with the recovery of the debt crisis, the growth rate of trend employment has increased peaking slightly above 3.5 percent per year. Given demographic projections, the trend growth rate of employment should decrease gradually, falling below 3 percent by the end of the next decade.

$$N_t^p = HPfilter(L_t) \times (1 - U_t^p)$$

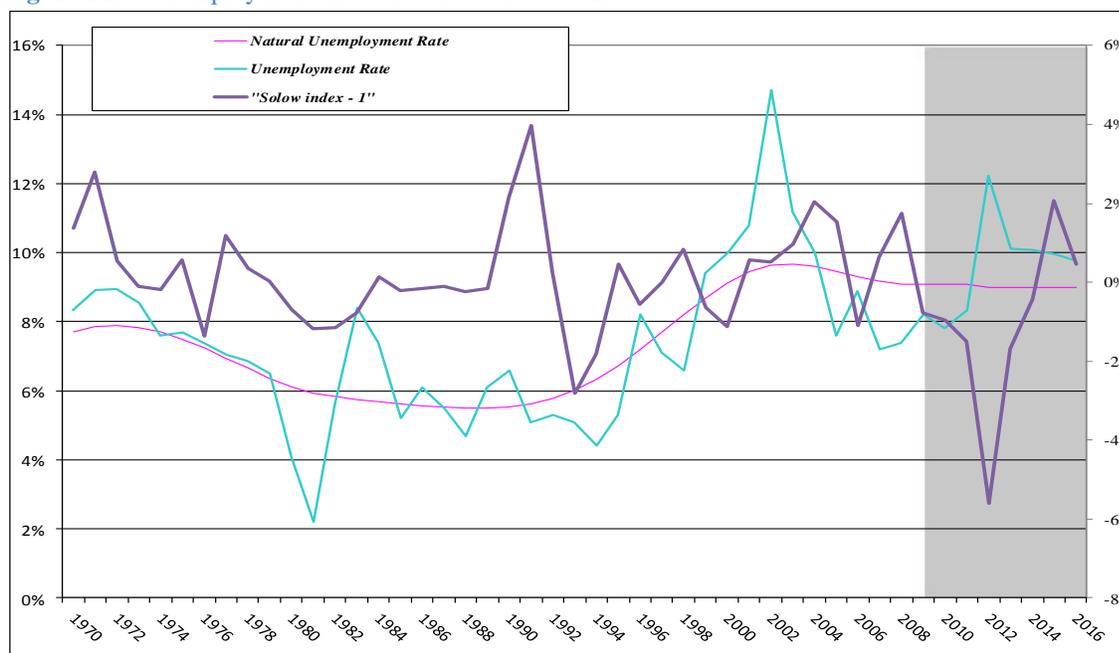
**The Solow labor utilization index is obtained from the relation between the actual rate of unemployment and the natural rate of unemployment.** The Solow index, which measures the intensity of use of the labor factor, is defined on the basis of the relationship between the actual unemployment rate and the natural unemployment rate, so that the value of the index is 1 when actual and natural unemployment rates are equal, greater than one when the actual unemployment rate is below the natural rate and less than one when the actual unemployment rate is above the natural rate. By subtracting 1 to the Solow utilization index an alternative measure of the output gap can be obtained. (Figure 1. 26)

$$S_t = \frac{(1 - U_t)}{(1 - U_t^p)}$$

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<sup>11</sup> In order to obtain the trend of the unemployment rate based on annual data the OECD recommends a value of  $\lambda = 100$ , where  $\lambda$  is the parameter of the HP filter

**Figure 1.26: Unemployment and Solow Resource Use Index**

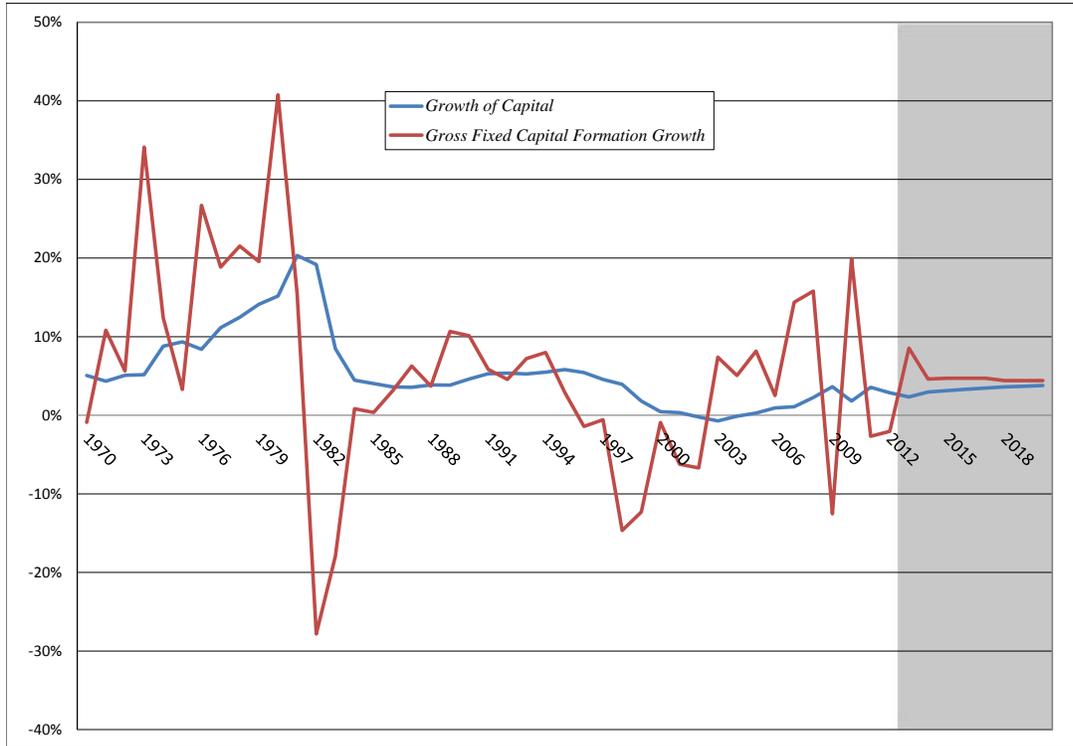


Source: LE&F based on data from ECLAC and the World Bank

**The growth rate of gross fixed capital formation is estimated at 3.2 percent for the coming years on the basis of an average medium-term investment rate and the GDP growth rate projected by the IMF-WEO.** The estimation of the stock of capital was based on the capital accumulation equation, where  $K$  corresponds to the stock of capital,  $I$  is investment defined as gross fixed capital formation, and  $\delta$  is the depreciation rate. The gross capital formation series (investment in the national accounts) was obtained from ECLAC, and the depreciation rate, estimated at 8 percent per year, was obtained from previous studies<sup>12</sup>. According to the initial value of the stock of capital (1970), the capital per worker ratio amounted to 6.3 in 1970. Investment was projected using the last five years average of the investment to GDP ratio and the IMF-WEO projections for Paraguayan GDP through 2020. Furthermore, on that basis the estimated trend growth rate for gross fixed capital formation is of 3.2 percent, that is, below the growth rate of employment, thus, a continuous slight decline for the capital-labor ratio in the coming years can be inferred. (Figure 1.27)

<sup>12</sup> Fernández Valdovinos, C. and A. Monge Naranjo, 2004, "Economic Growth in Paraguay", Economic and Social Study Series, (Washington: Inter-American Development Bank)

Figure 1.27: Growth of investment and of the capital stock



Source: LE&F based on data from ECLAC and the World Bank

The estimated stock of capital actually used ( $K$ ) was obtained by correcting the trend stock of capital  $K^p$  with the Solow's utilization index ( $S$ ), assuming equal degree of utilization of labor and capital.

$$K_t = K_t^p \times S_t$$

The actual capital stock was used to calculate the residual value corresponding to total factor productivity, which has a trend growth rate of **1.7 percent per year**. The total factor productivity ( $PTF = A$ ) is obtained as the residual of the production function, subtracting from actual GDP the contribution of capital and of actual labor, duly adjusted by their respective intensity of use. In order to obtain the total factor productivity trend the Hodrick and Prescott filter is applied to the  $A$  series. Consequently, the resulting trend  $PTF$  shows an annual growth rate around 1.7 percent. In the projection this rate is expected to remain at the historical rate (Figure 1. 28)

$$A_t = \frac{y_t}{K_t^\alpha N_t^{(1-\alpha)}}$$

$$\log A_t = \log y_t - \alpha \log K_t - (1 - \alpha) \log N_t$$

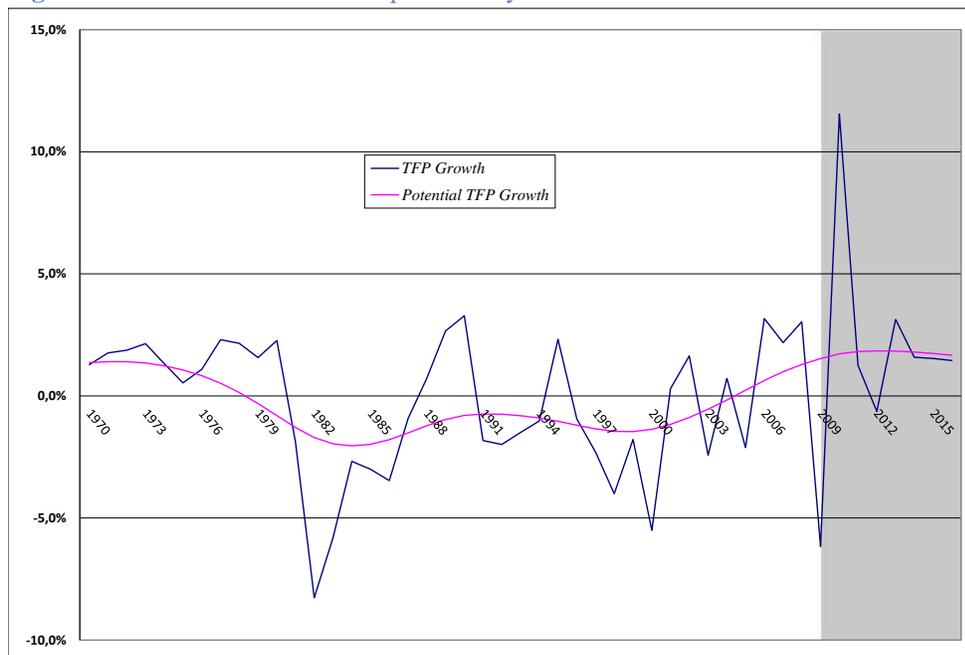
$$A_t^p = HPfilter(A_t)$$

where:

$A$ : total factor productivity

$A^p$ : trend total factor productivity  
 $K$ : stock of capital  
 $N$ : actual workforce  
 $\delta$ : depreciation rate  
 $y$ : real GDP  
 $\alpha$ : share of capital in total income<sup>13</sup>

**Figure 1.28: Growth of total factor productivity**



Source: LE&F based on data from ECLAC and the World Bank

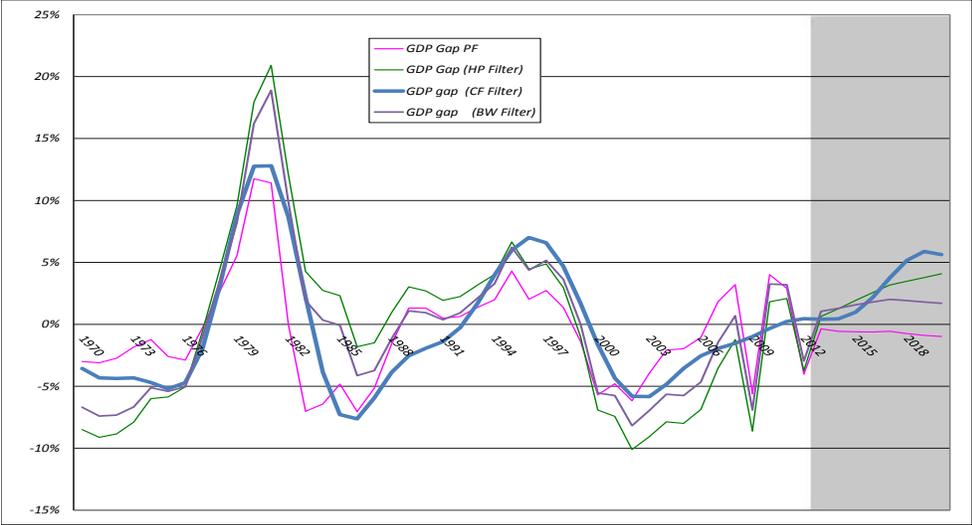
**The trend of GDP growth for the years 2015-2020 is estimated between 4.5 percent and 4.8 percent, slightly above Paraguay's historical average (4.3 percent).** The results indicate that in recent years the Paraguayan trend GDP growth has accelerated, reaching a rate of near 4.8 percent per year in the period 2008-2011. As other experiences indicate, potential growth should decline to more "normal" rates after the post-crisis period as the recovery process is fully completed. However, given the IMF\_WEO forecast and the assumptions used in this article, our forecast indicates a convergence of GDP trend growth to rates of 4.5 percent to 4.8 percent for 2015-2020, well over the average or trend GDP growth of late last century. When Paraguay decides to really implement a structural balance policy the assumptions used for the projections of growth, labor force and gross capital investment should be subject to extensive discussion; the final design of such a policy should be the result of the opinions and agreements between a diversity of experts on the Paraguayan economy and should be re-examined annually or at least every five years.

**Several filters were used to estimate series for trend GDP alternatives to that of the aggregate production function presented above; however, the results were quite similar,**

<sup>13</sup> Value estimated by the IMF, where  $\alpha$  is equal to 0.35. International Monetary Fund (2011). Paraguay -Article IV Consultation - Corresponding to 2011. IMF Country Report No. 11/239

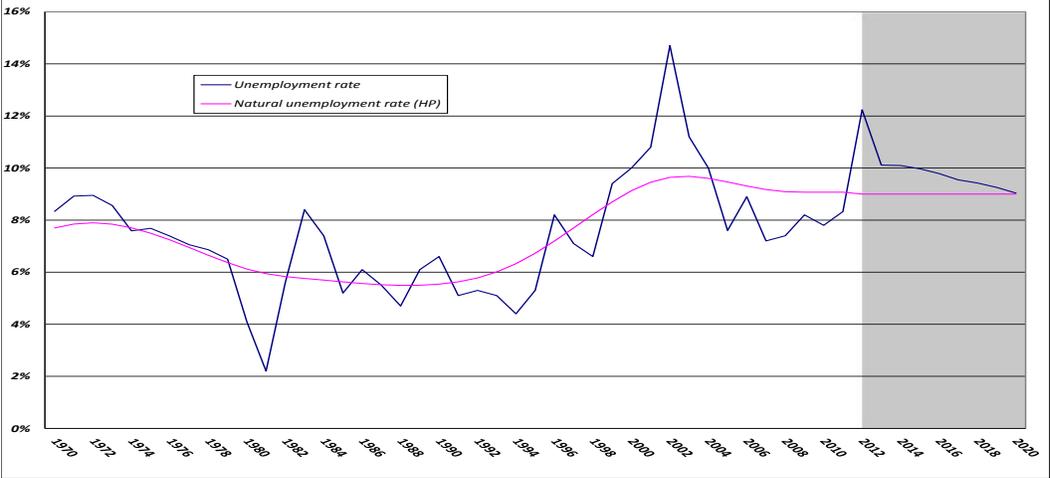
**only much smoother.** For comparison purposes trend GDP was estimated by directly applying the HP filter to the actual GDP series and then comparing it with the one obtained with the production function method explained in previous paragraphs. In addition, the Butterworth Christiano-Fitzgerald filters were used also applying them directly to the GDP series. In terms of levels and trajectories of the trend GDP, the use of different filters shows similar results than those obtained with the production function. In any case, when analyzing the first differences of the calculations of the trend GDP it can be noticed that the HP filter applied directly results in a much smoother series than that obtained from the production function. In fact, far more profound cycles and with much more pronounced annual variations can be distinguished when using the production function model. (Figures 1.29 and 1.30)

Figure 1.29: GDP Gap



Source: LE&F based on data from ECLAC and the World Bank

Figure 1.30: Unemployment rate



Source: LE&F based on data from ECLAC and the World Bank

## Elasticities with respect to GDP

**The relationship between total government revenue and GDP was estimated.** An estimation of a stable relationship between both, fiscal revenue and its components, with the trend GDP and its gap is a requisite for the estimation of a structural fiscal balance. The elasticity of fiscal revenue with respect to GDP will be pivotal in the assessment of the value of structural revenues and of the structural balance. That is, transitory revenue can be estimated as the output gap multiplied by the  $\beta_1$  elasticity. Then, the estimated regression is:

$$\ln IT = \beta_0 + \beta_1(\ln y^P + \ln y^T)$$

**Several models were estimated and were dismissed since they lacked significance, including a breakdown by type of public revenue and the inclusion of other explanatory variables.**

The model in which total revenues are a function of GDP was chosen because the alternative econometric models for the estimation of total revenue did not result in statistically significant elasticities. Among them, a model in which total revenues were a function of GDP along with prices of meat and soy —two major export products in Paraguay— was considered; it was not possible to find a statistically significant response of fiscal revenue to the prices of major exports, perhaps due to the limited available sample, or because the effect of commodity prices on fiscal revenue act indirectly through GDP. No data are available in order to intend a correlation of fiscal revenue with rainfall in the Paraná Basin. In addition, we attempted to estimate revenue through disaggregated taxes (taxes on goods and services, on businesses, foreign trade, etc.), but all these models were dismissed since their parameters were found to have no statistical significance. So, perhaps due to limitations of the available data estimates of the elasticities of fiscal revenue with respect to real GDP, its trend and its gap were the result of the regression of the aggregates and not of the elasticities of individual taxes or individual income sources.

## Cointegration and Error Correction Model

**The order of integration of the relevant variables was verified, finding out that all of them are integrated of order one, while the existence of cointegration between total revenues and GDP could not be rejected by the data.** A statistically significant relationship between total fiscal revenue and the GDP of the Paraguayan economy was established, with both variables expressed in logarithmic terms. In addition, as evidenced by the results, both variables appear to be integrated of order 1<sup>14</sup>. The elasticity of total revenue with respect to GDP is quite high (1.9), reflecting in part the growing trend of government revenue as a percentage of GDP, and the high incidence of indirect taxes, more associated to domestic spending than to income. As it is well known, the cyclical volatility of domestic demand is much higher than that of GDP.

**Following this methodology, the first regression estimated reflects the long term behavior of the variables:**

Where:

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<sup>14</sup> The results of unit root tests can be found in Appendix 6.1.6

$\ln(I\_Tot)_t =$  Natural logarithm of Total Revenue in period  $t$ .

$\ln(PIB)_t =$  Natural logarithm of GDP in period  $t$ .

$$\ln(I\_Tot)_t = \beta_0 + \beta_1 \ln(PIB)_t + \varepsilon_t$$

$$\ln(I\_Tot)_t = -15.6452 + 1.844291 \ln(PIB)_t$$

**Table 1.1:** Ordinary Least Squares Estimation for Total Fiscal Revenues

**In Logs, 1990-2010 (T = 21)**  
*HAC Standard Deviations with bandwidth 3 (Kernel de Bartlett)*

	<i>Coeficiente</i>	<i>Desv. Típica</i>	<i>Estadístico t</i>	<b>Prob</b>
Constante	-15.64522	1.466162	-10.67087	0
Ln(PIB)	1.844291	0.088857	20.75583	0

Media de la vble. dep.	14.78506		D.T. de la vble. dep.	0.274289
Suma de cuad. residuos	0.063559		Suma de cuad. regresión	0.057838
R-cuadrado	0.957759		R-cuadrado corregido	0.955536
Estadístico F	430.8046		Prob (Estadístico F)	0
Log-verosimilitud	31.10554		Criterio de Akaike	-2.771956
Criterio de Schwarz	-2.672478		Crit. de Hannan-Quinn	-2.750367

Source: LE&F based on data from ECLAC and the World Bank

**Then, given the cointegration between total revenue and GDP, an Error Correction Model was estimated in order to capture the short-term relationship between the variables.** For such purpose, the methodology proposed by Engle - Granger (1987)<sup>15</sup> was followed. Cointegration can be verified given the stationary nature of the errors estimated in the regression above. Since the error residuals are found to be stationary, that is, the null hypothesis of unit root for the residuals is rejected at a 95 percent confidence, a cointegration relationship was established. The existence of a long-term relationship between total revenues and trend GDP can be inferred since under the null hypothesis there is cointegration between these two variables. However, in the short term the existence of certain imbalances that are captured by the estimated errors, may divert this relationship.<sup>16</sup>

$$\Delta \ln(I\_Tot)_t = \beta_0 + \beta_1 \Delta \ln(PIB)_t + \gamma \hat{\varepsilon}_{t-1} + \varepsilon_t$$

<sup>15</sup> Engle and Granger, 1987, Cointegration and Error Correction: Representation, Estimation and Testing, *Econometrics*, 55 251-276

<sup>16</sup> Results in Annex 6.1.7

**Table 1.2: Ordinary Least Squares Estimation**

**First Difference Logs of Total Fiscal Revenues 1991-2010 (T = 20)**  
**HAC Standard Deviations with bandwidth 3 (Kernel de Bartlett)**

	<i>Coeficiente</i>	<i>Desv. Típica</i>	<i>Estadístico t</i>	<b>Prob</b>
Constante	-15.64522	1.466162	-10.67087	0
D Ln(PIB)	1.034366	0.298947	3.460031	0.003
U_hat (-1)	-0.604082	0.214789	-2.81245	0.012

Media de la vble. dep.	0.04979		D.T. de la vble. dep.	0.06468
Suma de cuad. residuos	0.040638		Suma de cuad. regresión	0.048893
R-cuadrado	0.488743		R-cuadrado corregido	0.428595
Estadístico F	8.125692		Prob (Estadístico F)	0.003338
Log-verosimilitud	33.60903		Criterio de Akaike	-3.060903
Criterio de Schwarz	-2.911543		Crit. de Hannan-Quinn	-3.031747

Source: LE&F based on data from ECLAC and the World Bank

**According to the error correction model, the short-term elasticity of the public sector revenue with respect to GDP is 1.03, while in the long-term its value is close to 1.8.** The effect of the growth over time of the size of the government relative to GDP is included in the long-term elasticity. This elasticity will be used to estimate the public sector structural revenues as a function of the actual public revenues and the GDP gap. The short-term elasticity captured in the error correction model is much lower.

$$\Delta \ln(I\_Tot)_t = -15.64522 + 1.034366 \Delta \ln(PIB)_t - 0.604082 \hat{\varepsilon}_{t-1}$$

### Analysis of Cycles in Public Revenue and Expenditure

**We sought to establish the behavior of Paraguay's fiscal expenditure and revenue with respect to its GDP cycle.** To determine the behavior of fiscal revenue and expenditure in this regard both variables were correlated with trend GDP and the GDP gap; the results indicate that fiscal revenues generally show a pro-cyclical behavior, while fiscal expenditures do not present a significant relationship with the GDP cycle.

**In order to analyze the behavior of Total Public Expenditure, the model to be estimated corresponds to:**

$$\ln(Gasto)_t = \beta_0 + \beta_1 \ln(BrechaPIB)_t + \beta_2 \ln(PIB\_tend)_t + \varepsilon_t$$

where:

- $\ln(Gasto)_t$  = Natural logarithm of Public Expenditure in period  $t$ .
- $\ln(BrechaPIB)_t$  = Natural logarithm of GDP gap in period  $t$ .
- $\ln(PIB\_tend)_t$  = Natural logarithm of Trend GDP in period  $t$ .

From the results obtained the model was established as:

$$\ln(Gasto)_t = -14.2791 - 0.86946 \ln(BrechaPIB)_t + 1.761336 \ln(PIB\_tend)_t$$

**Table 1.3:** Ordinary Least Squares Estimation Log of Total Fiscal Expenditure  
1990-2010 (T = 21)

*HAC Standard Deviations, with bandwidth 3 (Kernel de Bartlett)*

	<i>Coefficiente</i>	<i>Desv. Típica</i>	<i>Estadístico t</i>	<i>Prob</i>
Constante	-14.2791	2.914757	-4.898898	0.0001
BrechaPIB	-0.86946	0.787665	-1.103845	0.2842
Ln(PIB_tend)	1.761336	0.176639	9.971361	0

Media de la vble. dep.	14.79179		D.T. de la vble. dep.	0.287709
Suma de cuad. Residuos	0.237275		Suma de cuad. regresión	0.114813
R-cuadrado	0.856677		R-cuadrado corregido	0.840753
Estadístico F	53.79539		Prob (Estadístico F)	0
Log-verosimilitud	17.27439		Criterio de Akaike	-1.359465
Criterio de Schwarz	-1.210248		Crit. de Hannan-Quinn	-1.327081

Source: LE&F based on data from ECLAC

**The results indicate that government spending has a cyclically-neutral behavior.** It can be concluded that the constant coefficient and that of the trend GDP are significant at a 99 percent confidence. The GDP gap coefficient appears to be not significantly different from zero; thus, it can be inferred a non-statistically significant reaction of public spending to the GDP cycle.

**Fiscal current expenditure does not seem to present a statistically significant relationship with the GDP cycle, while the constant and trend GDP are significant at a 99 percent confidence.** That is, current expenditure shows a cyclically-neutral behavior. In the case of Total Current Expenditure, the following model was estimated and its results are listed in Table 1.4.

$$\ln(Gasto\_Corriente)_t = \beta_0 + \beta_1 \ln(BrechaPIB)_t + \beta_2 \ln(PIB\_tend)_t + \varepsilon_t$$

where:

$\ln(Gasto\_Corriente)_t$  = Natural logarithm of current fiscal expenditure in period t.

$\ln(Brecha\_PIB)_t$  = Natural logarithm of GDP gap in period t.

$\ln(PIB\_tend)_t$  = Natural logarithm of Trend GDP in period t.

**Table 1.4:** Ordinary Least Squares Estimation Log of Current Fiscal Expenditure**1990-2010 (T = 21)***HAC Standard Deviations, with bandwidth 3 (Kernel de Bartlett)*

	<i>Coficiente</i>	<i>Desv. Típica</i>	<i>Estadístico t</i>	<b>Prob</b>
Constante	-17.50443	2.238915	-7.818262	0
BrechaPIB	-0.784506	0.60503	-1.29664	0.2111
Ln(PIB_tend)	1.663352	0.135682	12.25917	0

Media de la vble. dep.	9.949093		D.T. de la vble. dep.	0.264719
Suma de cuad. residuos	0.139998		Suma de cuad. regresión	0.088191
R-cuadrado	0.90011		R-cuadrado corregido	0.889011
Estadístico F	81.09893		Prob (Estadístico F)	0
Log-verosimilitud	22.81408		Criterio de Akaike	-1.887055
Criterio de Schwarz	-1.737838		Crit. de Hannan-Quinn	-1.854671

Source: LE&F based on data from ECLAC and the World Bank

**Similar results are observed in the case of the central government capital expenditure which also presents a cyclically-neutral behavior.** As in the previous case, the model that estimates capital expenditure indicates that the constant and the trend GDP coefficients are significant at a 99 percent confidence level, while the output gap appears to be non-significant. The model estimated for capital expenditure is presented below, and the detailed results can be found in Table 1.5.

$$\ln(\text{Gasto\_Capital})_t = \beta_0 + \beta_1 \ln(\text{BrechaPIB})_t + \beta_2 \ln(\text{PIB\_tend})_t + \varepsilon_t$$

where:

$\ln(\text{Gasto\_Capital})_t$  = Natural logarithm of Capital expenditure in period  $t$ .

$\ln(\text{Brecha\_PIB})_t$  = Natural logarithm of GDP Gap in period  $t$ .

$\ln(\text{PIB\_tend})_t$  = Natural logarithm of Trend GDP in period  $t$ .

**By contrast, in the case of the public sector revenue clear traces of significant pro-cyclical behavior were found.** Total revenues have a pro-cyclical behavior with a positive and significant effect of the GDP gap on them. The results indicate that the constant and the trend GDP coefficients are significantly different from zero at a 99 percent confidence. The GDP gap coefficient is also significantly different from zero at 95 percent confidence and the value of the parameter is positive. Then, the output gap has a positive effect on total government revenue, which shows a pro-cyclical behavior. In the case of Total Revenue, the following relationship was estimated and its results are listed in Table 1.6.

$$\ln(\text{ITOT})_t = \beta_0 + \beta_1 \ln(\text{Brecha\_PIB})_t + \beta_2 \ln(\text{PIB\_tend})_t + \varepsilon_t$$

where:

$\ln(\text{ITOT})_t$  = Natural logarithm of total revenues in period  $t$ .

$\ln(\text{Brecha\_PIB})_t$  = Natural logarithm of GDP gap in period t.

$\ln(\text{PIB\_tend})_t$  = Natural logarithm of Trend GDP in period t.

**Table 1.5:** OLS Estimation Logarithm Capital Expenditure, 1990-2010 (T = 21)  
*HAC Standard Deviations, with bandwidth 3 (Kernel de Bartlett)*

	<i>Coeficiente</i>	<i>Desv. Típica</i>	<i>Estadístico t</i>	<b>Prob</b>
Constante	-28.87245	6.922551	-4.170782	0.0006
BrechaPIB	-1.174331	1.870705	-0.627748	0.5381
Ln(PIB_tend)	2.271418	0.419519	5.414339	0

Media de la vble. dep.	8.617532		D.T. de la vble. dep.	0.430334
Suma de cuad. residuos	1.338382		Suma de cuad. regresión	0.27268
R-cuadrado	0.638641		R-cuadrado corregido	0.59849
Estadístico F	15.90596		Prob (Estadístico F)	0.000105
Log-verosimilitud	-0.890565		Criterio de Akaike	0.37053
Criterio de Schwarz	0.519748		Crit. de Hannan-Quinn	0.402914

Source: LE&F based on data from ECLAC

**Table 1.6:** OLS Estimation Total Revenues Logarithm  
**1990-2010 (T = 21)**  
*HAC Standard Deviations, with bandwidth 3 (Kernel de Bartlett)*

	<i>Coeficiente</i>	<i>Desv. Típica</i>	<i>Estadístico t</i>	<b>Prob</b>
Constante	-15.85658	1.198032	-13.23553	0
BrechaPIB	0.819889	0.323748	2.532487	0.0208
Ln(PIB_tend)	1.856878	0.072603	25.57583	0

Media de la vble. dep.	14.78506		D.T. de la vble. dep.	0.274289
Suma de cuad. residuos	0.040085		Suma de cuad. Regresión	0.047191
R-cuadrado	0.97336		R-cuadrado corregido	0.9704
Estadístico F	328.8356		Prob (Estadístico F)	0
Log-verosimilitud	35.94563		Criterio de Akaike	-3.137679
Criterio de Schwarz	-2.988461		Crit. de Hannan-Quinn	-3.105295

Source: LE&F based on data from ECLAC

Another of the variables analyzed corresponds to Total Tax Revenue which also shows a pro-cyclical behavior; that is, all estimated coefficients were significantly different from zero at a 99 percent confidence. Then, the output gap has a positive effect on total tax revenues that, therefore, exhibit a pro-cyclical behavior. The model used is presented below, and its results are depicted in Table 1.7.

$$\ln(IT)_t = \beta_0 + \beta_1 \ln(BrechaPIB)_t + \beta_2 \ln(PIB\_tend)_t + \varepsilon_t$$

where:

$\ln(IT)_t$  = Natural logarithm of Tax Revenue in period t.

$\ln(Brecha\_PIB)_t$  = Natural logarithm of GDP gap in period t.

$\ln(PIB\_tend)_t$  = Natural logarithm of Trend GDP in period t.

The model provides the following results:

**Table 1.7:** OLS Estimation Tax Revenues Logarithm

**1990-2010 (T = 21)**

*HAC Standard Deviations, with bandwidth 3 (Kernel de Bartlett)*

	<i>Coficiente</i>	<i>Desv. Típica</i>	<i>Estadístico t</i>	<i>Prob</i>
Constante	-17.32299	1.527129	-11.3435	0
BrechaPIB	2.093586	0.412681	5.073128	0.0001
Ln(PIB_tend)	1.92555	0.092547	20.80624	0

Media de la vble. dep.	14.44743		D.T. de la vble. dep.	0.286356
Suma de cuad. residuos	0.065133		Suma de cuad. Regresión	0.060154
R-cuadrado	0.960285		R-cuadrado corregido	0.955872
Estadístico F	217.614		Prob (Estadístico F)	0
Log-verosimilitud	30.84872		Criterio de Akaike	-2.652259
Criterio de Schwarz	-2.503042		Crit. de Hannan-Quinn	-2.619875

Source: LE&F based on data from ECLAC

## Estimation of a Structural Fiscal Balance

The structural fiscal balance is estimated as the difference between total structural fiscal revenues—the ones that would have existed if GDP had remained at its trend level—with actual expenditures. Consequently, the structural fiscal revenue is the fiscal revenue that would be obtained under a zero GDP gap. Then, the structural fiscal balance will result from the difference between total structural fiscal revenues and total fiscal expenditures. The estimated total structural revenues can be obtained using the estimated regression for total revenue and assuming an output gap equal to zero. Thus, the structural fiscal balance is:

$$SFB_t = T_t^p - G_t$$

Fiscal revenues ( $T$ ) have a permanent component ( $T^p$ ) and a transitory one ( $T^{tran}$ ); both can be expressed as a percentage of GDP and in that case they are denoted in lowercase letters. On the other hand, the structural fiscal balance as a percentage of GDP ( $sfb$ ) can be obtained by subtracting total expenditures (both primary ( $gprim$ ) and interest spending ( $gint$ )) from structural or permanent revenue. Finally, the primary structural fiscal balance ( $psfb$ ) can be obtained by subtracting interest expenses from the structural fiscal balance:

$$T_t = T_t^p + T_t^{tran} \quad t_t = t_t^p + t_t^{tran}$$

$$sfb = t^p - gprim - gint; psfb = t^p - gprim = sfb + gint$$

**The actual fiscal balance, expressed as a percentage of GDP (fb), is the structural balance plus the public transitory income which can be positive or negative.** In order to achieve a stable structural fiscal balance potential positive transitory revenue should be saved while possible negative transitory income is “un-saved” through a lower temporary fiscal balance or higher temporary deficit.

$$fb_t = t_t^p + t_t^{tran} - pg_t - ig_t = sfb_t + t_t^{tran}$$

**The structural fiscal revenue and the transitory fiscal revenue are derived from the relationship obtained between total fiscal revenue and GDP.** In the case of Paraguay, permanent and transitory fiscal revenue derive from the economic cycle which leads to fluctuations in the total income of the public sector (IT).

$$\log IT_t = \beta_0 + \beta_1 \log y_t + \varepsilon_t$$

**In the total revenue equation  $\beta_0$  corresponds to the position constant, while  $\beta_1$  is the elasticity with respect to GDP and  $\varepsilon_t$  represents disturbances or factors not included in the equation that also affect total government revenues.** Using this relationship, it is possible to correct fiscal revenue by eliminating the effect of the output gap on them. That is, the cyclical effect of GDP was eliminated and the trend GDP was multiplied by the previously estimated elasticity to determine the total effect.

$$\begin{aligned} \log IT_t^p &= \beta_0 + \beta_1 \log y_t^p \\ \log IT_t^{tran} &= \beta_1 [\log y_t - \log y_t^p] + \varepsilon_t = \log IT_t - \log IT_t^p \end{aligned}$$

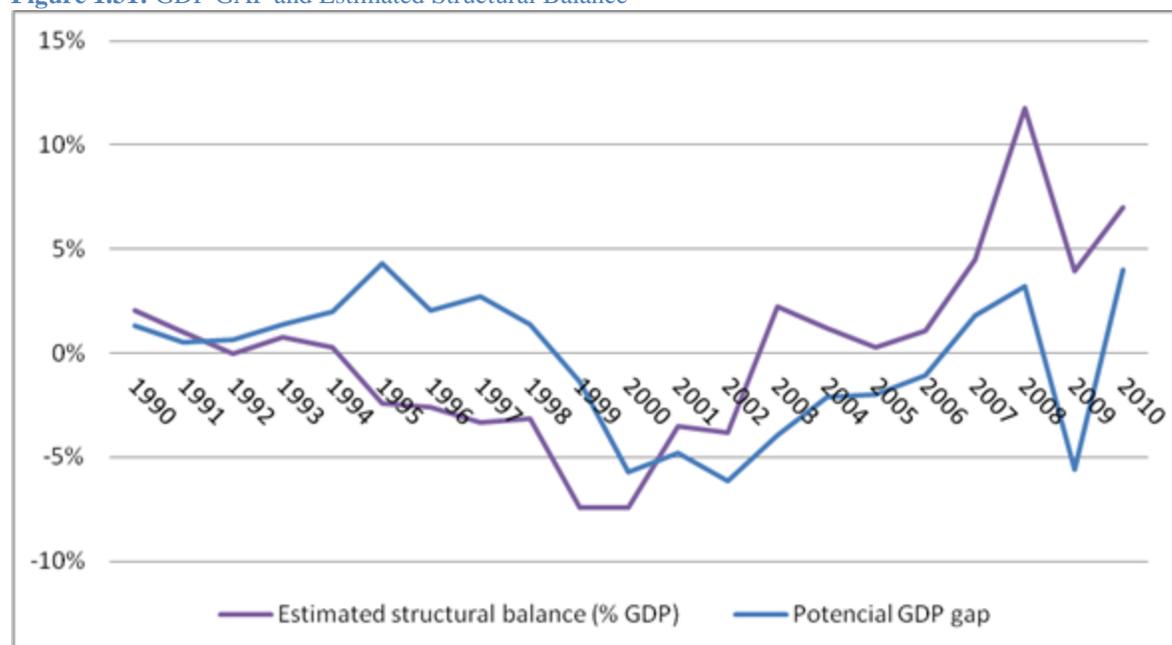
**The representation of revenues as a percentage of GDP is given by:**

$$\begin{aligned} \log it_t^p &= \beta_0 + \beta_1 \log y_t^p - \log y_t \\ \log it_t^{tran} &= \beta_1 [\log y_t - \log y_t^p] - \log y_t + \varepsilon_t \\ IT_t^{tran} &= IT_t - IT_t^p \\ it_t^{tran} &= \frac{IT_t - IT_t^p}{y_t} \end{aligned}$$

**The worst fiscal result since 1990 corresponds to a structural fiscal deficit of 4.6 percent in 2000.** Our estimates indicate that Paraguay’s total structural fiscal balance showed, between 1990 and 1998, a continuous surplus that reached a maximum of 4.5 percent of GDP in 1995. Afterwards the situation was reversed moving to a sustained structural deficit between 1999 and 2002, possibly due to the effects of the Asian crisis. The maximum structural fiscal deficit, around 4.6 percent of GDP, is reached in 2000. Thereafter the structural balance started to

improve and in 2003 turned into a surplus, condition that has continued since then despite the effects of the debt crisis in Argentina, one of Paraguay's major trading partners. (Figure 1.31)

**Figure 1.31: GDP GAP and Estimated Structural Balance**



Source: LE&F based on data from ECLAC and the World Bank

**Since 1992 and given its fiscal results, Paraguay has not required new credit facilities or financing from multilateral agencies.** Since 2002, public finances show progress mainly because debt repayments have exceeded the debt disbursements received during the period. This is coupled with higher economic and revenue growth which have eliminated the need for new fiscal financing. In addition, Paraguay has showed expenditure containment, which has allowed to improve the fiscal balance so as to reach structural fiscal surplus from the year 2007 to date; this, despite the drought that hit the country during the years 2008 and 2009.

### 3. A Structural Fiscal Rule for Paraguay

**This chapter presents a proposal for a structural fiscal rule that was developed on the basis of the estimates for structural fiscal balance presented in previous chapters.** Several alternatives for a long-term fiscal objective and for the horizon to reach them are presented; these alternatives long term goals are the basis for the calculation of the annual fiscal target on the structural primary balance.

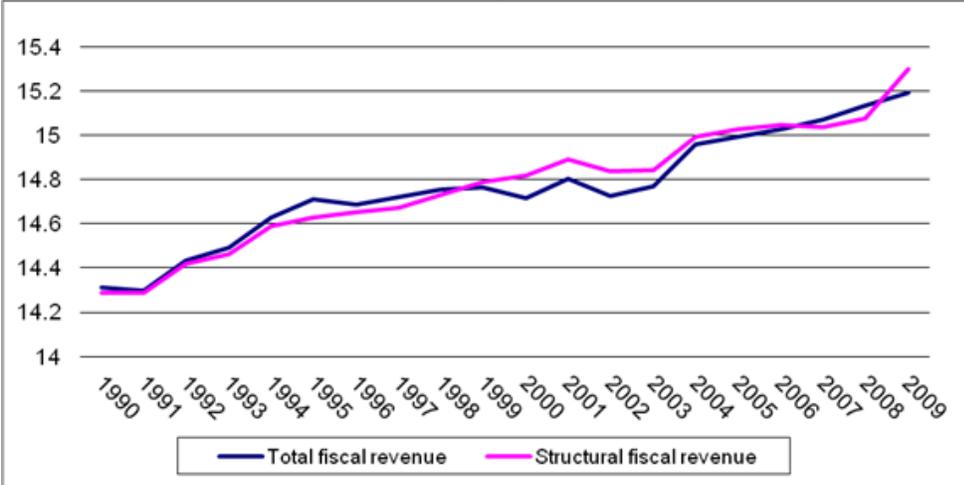
#### Fiscal Projections

**Future fiscal revenues were projected on the basis of the GDP projections and of the error correction model that associates both variables; then, structural revenues were obtained using the estimated GDP gap and the long term elasticity of fiscal revenue to GDP.** The error correction model, developed in the previous section, was used for the projection of fiscal revenue; this model reflects the short-term relationship between fiscal revenue and GDP; these

revenues are denominated Actual Total Revenues. Then, total projected structural revenue was obtained by correcting these results with the output gap weighted by the long term elasticity. So, when GDP is below its trend level Actual Revenues reflect this gap by standing below Structural Revenues which are not affected by the gap. Historical and projected total public revenues, both structural and actual, are shown in Charts 32 and 33. In the projected values the differences between structural and actual revenue are minimal since the projected GDP gap is very close to zero, and, the shocks affecting total revenues are projected at their expected total value, that is, zero.

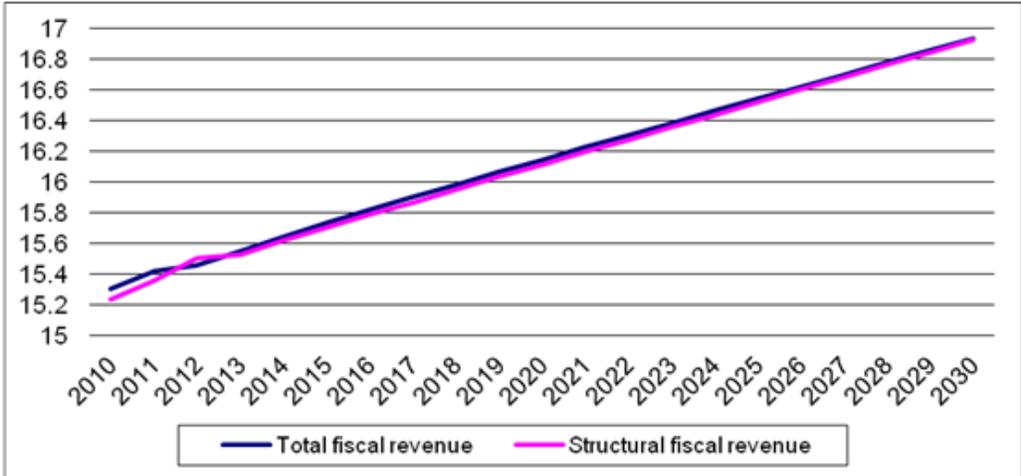
$$\log IT_t^P = \beta_0 + \beta_1 \log Y_t^P$$

Figure 1.32: Historical Fiscal Revenues-(in logarithms)



Source: LE&F based on data from ECLAC and the World Bank

Figure 1.33: Projected Fiscal Revenues (in logarithms)



Source: LE&F based on data from ECLAC and the World Bank

**A production function allows for the projection of the trend GDP between 2012 and 2020.** Future values of trend GDP have been projected on the basis of a production function, the projected trend productivity ( $A^p$ ), the trend of the stock of capital ( $K^p$ ) and of employment ( $N^p$ ).

Projections for GDP were obtained from the World Economic Outlook of the International Monetary Fund (IMF-WEO). The projections for investment ( $I$ ) were obtained by assuming that the rate of investment to GDP remains constant at the average of the last five years; this is the input for the projection of the stock of capital. Employment was projected assuming that the elasticity of employment to GDP remains constant at 0.55, while the labor force was projected using demographics, assuming a constant participation rate equal to the last five years average and using the official population projections. Both sources provide the projected unemployment rate.

**The capital accumulation equation allows for the projection of the stock of capital on the basis of the projections of gross fixed capital formation (I).** The projected trend capital equals the previous period capital, minus depreciation, plus the investment of the period.

$$K_{t+1}^P = K_t^P(1 - \delta) + I_{t+1}$$

**The projection of trend employment requires the projection of the trend labor force and of the natural unemployment rate.** The trend labor force is obtained by applying an HP filter to the historical and projected (up to 2020) labor force figures. Similarly, the trend unemployment rate is obtained with historical and projected figures. by applying an HP filter to the historical and projected unemployment rate series.

$$N_{t+1}^P = HPfilter(L_{t+1})x(1 - U_t^P)$$

**Projected total factor productivity is originated on the projections of actual K, of trend capital adjusted by level of use, of actual employment and of actual GDP.** Trend total factor productivity was estimated throughout 2020 on the basis of the projected total productivity series. Trend productivity can be obtained by applying an HP filter to the actual and projected productivity series.

$$\log A_{t+i} = \log y_{t+i} - \alpha \log K_{t+i} - (1 - \alpha) \log N_{t+i}$$

$$A_{t+1}^P = HPfilter(A_{t+1})$$

**Trend GDP projections are obtained by applying to the production function the trend projections of capital, of employment and of total factor productivity.** The GDP gap is projected as the logarithmic difference between effective and trend GDP.

$$\log y_{t+1}^P = \log A_{t+1}^P + \alpha \log K_{t+1}^P + (1 - \alpha) \log N_{t+1}^P$$

**Having the elasticity with respect to trend GDP and to the gap, total projected fiscal revenue may be corrected in order to obtain structural fiscal revenues which would represent fiscal revenue under a zero gap.** A scenario with an active fiscal policy, where the structural balance target is achieved, is assumed when projecting each fiscal year spending. In the following equations government primary spending (as a percentage of GDP,  $pg$ ) is determined by a budget based on permanent or structural income ( $t^P$ ) and by a target for the structural primary balance ( $ps^*$ ). Interest expense ( $ig$ ) is determined by the debt itself and the

assumed real interest rate<sup>17</sup>; total government spending ( $g$ ) is obtained by adding interest expense to primary spending.

$$pg_t = t_t^p - ps^*$$

$$g_t = pg_t + ig_t = t_t^p - ps^* + ig_t$$

### Structural Fiscal Target and Long Term Fiscal Goal

**The structural fiscal target aims to ensure the sustainability of public debt and, consequently, of plans for fiscal spending over the medium and long run.** The primary structural balance target aims to provide fiscal sustainability by meeting certain goals for the public sector net debt or its negative the net financial wealth or net worth ( $B$ ). The target for the structural fiscal balance is directed at generating debt sustainability over the long-term, which can be any level of debt. In our approach we define a goal for net fiscal worth in order to go beyond debt sustainability and reduce the vulnerability to shocks by targeting a reduced level of net debt. Under this view, the target for the primary structural balance must be derived from the long-term goal regarding the public sector net debt or its negative the net worth.

**The actual final balance represents the change in net financial wealth (B) or minus the change in net debt (-B), we will use the former.**

$$FB_t = T_t - PG_t - IG_t = PFB_t - IG_t$$

$$B_t - B_{t-1} = T_t - PG_t + iB_{t-1} = PS_t + iB_{t-1}$$

where:

$i$  is the nominal interest rate,  $B$  is net worth,  $T$  is fiscal revenue,  $PG$  primary spending and  $PS$  the primary fiscal surplus.

**Thus, an equation of wealth or public net worth (B) consistent with a structural primary balance can be obtained through:**  $\pi$  inflation,  $\lambda$  real GDP growth rate and  $r$  the real interest rate; where public net worth depends on its value in the previous period, the discount rate and the primary structural fiscal balance ( $psb$ ).

$$B_t = PS_t + (1 + i)B_{t-1}$$

$$b_t = psb_t + (1 + i_t)b_{t-1} \times \left(\frac{Y_{t-1}}{Y_t}\right) = psb_t + \left[\frac{1 + i_t}{(1 + \lambda_t r)(1 + \pi_t)}\right] b_{t-1}$$

$$b_t = psb_t + \left[\frac{(1 + r_t)}{(1 + \lambda_t)}\right] b_{t-1} = psb_t + (1 + \psi_t)b_{t-1}$$

<sup>17</sup> It should be noted that only those interest corresponding to the actual paid rate are included in the interest expenses item. Nominal interest in excess of real interest is a form of prepayment of the real value of the debt and is not considered as an expense in this exercise.

Where  $b$  represents the public net worth as a percentage of GDP;  $psb$  the primary fiscal surplus, also in percent of GDP;  $r$  the real interest rate for public sector assets and liabilities; and  $\lambda$ , the long term real growth rate of GDP.

**The structural surplus must be permanent.** In order to define a target for the structural primary balance, it is necessary to consider a stable or permanent value for it ( $psb$  or  $psb^*$ ). The real interest rate and growth rate are assumed to remain unchanged so that the discount factor ( $\Psi$ ) is also constant and the wealth equation becomes<sup>18</sup>:

$$b_t = psb + (1 + \psi)b_{t-1}$$

Where one plus the discount factor represents the ratio between one plus the real interest

rate and one plus the GDP growth rate:  $(1 + \psi) = \frac{(1+r)}{(1+\lambda)}$ :

For the discount factor to be positive, the real interest rate must be higher than the GDP growth rate.

**The base equation for fiscal net worth in the long run can be derived by developing the equation for public net worth for subsequent periods:** the long-term fiscal net worth ( $b(t+N)$ ) is a function of the initial fiscal net worth ( $b(t-1)$ ), the permanent primary surplus ( $psb^*$ ) and the discount factor ( $\Psi$ ). This relationship defines the fiscal target for the primary surplus based on the long-term goal for the public sector net worth and other conditions.

$$b_{t+1} = psb + (1 + \psi)b_t = psb[1 + (1 + \psi)] + (1 + \psi)^2 b_{t-1}$$

$$b_{t+2} = psb[1 + (1 + \psi) + (1 + \psi)^2] + (1 + \psi)^3 b_{t-1}$$

$$b_{t+N} = psb \sum_{j=0}^N (1 + \psi)^j + b_{t-1} [1 + \psi]^{N+1}$$

**The target for the primary structural fiscal surplus ( $psb^*$ ) depends on the initial fiscal net worth ( $b_t$ ), the long-term goal ( $b_{t+N}$ ), the time to reach this goal ( $N$ ) and on the discount factor ( $\Psi$ ).** The specific value of the fiscal target  $psb^*$  will be greater the lower the initial value of the fiscal net worth ( $b_{t-1}$ ), the higher the fiscal net worth long-term goal ( $b_{t+N}$ ), and the lower the number of periods to reach the objective ( $N$ ). A particular goal for wealth as a ratio of GDP within a specified period of  $N$  years in the future  $b_{t+N}$  results in the structural fiscal target in its most complete expression:

$$\frac{b_{t+N}^* - b_{t-1}[1 + \psi]^{N+1}}{\sum_{j=0}^N [1 + \psi]^j} = psb^*$$

**A simple case could be to consider by setting as the long-term goal to maintain the public net worth as a percentage of GDP unchanged at its initial level  $b_{t-1}$ .** Then, the structural

<sup>18</sup> See Croce and Juan Ramon (2003)

fiscal target is simpler and only depends on the initial level of public net worth and the discount rate:

$$\frac{b_{t-1}[1 - (1 + \psi)^{N+1}]}{\sum_{j=0}^N [1 + \psi]^j} = psb^*$$

### **Simulations for the Fiscal Target and the Public Wealth Goal**

**In order to perform simulations of future fiscal balance and public net worth scenarios, real trend GDP was assumed to grow at a sustained rate of 4.5 percent for the next 25 years.** It needs to be acknowledged that there may be different opinions regarding the future growth of the Paraguayan economy; our estimate of 4.5 percent sustained growth, while it represents an estimate based on a well-defined methodology, may seem high by historical standards of this country. This rate was derived using the estimated production function and projections of key variables obtained from different sources. However, the trend growth rate is endogenous to the policies implemented and to other uncontrollable conditions, which may reduce or increase the rate of sustained GDP growth. GDP growth may be altered by effects on productivity growth—such as incentives or disincentives on innovation—, capital accumulation—such as incentives or disincentives on investment, employment growth—such as incentives or disincentives on participation in the labor force, migration, or labor market functioning. It is clear then that different views regarding the Paraguayan economy and its future trend GDP growth may exist; it is necessary to obtain an agreement for this key parameter, which must be periodically reviewed.

**In order to calculate the fiscal target and as shown in the above equation, there are several other information requirements.** First, on the level of the public sector net debt, which was obtained from ECLAC; second, on the discount factor, for which the real interest rate and the real growth rate are a requisite. A long-term goal for public net worth needs to be added—the negative of the net public debt—and the horizon within which this objective is to be achieved.

**The relevant interest rate for Paraguay’s sovereign debt was estimated based on Uruguay’s interest rate plus a margin in consideration of the higher risk assessment for Paraguay.** Considering that Paraguay is a net debtor economy, its estimated relevant real interest rate amounts to 6.5 percent; this estimation is obtained using as a reference a study for the relevant interest in the Uruguayan economy (5.75 percent)<sup>19</sup> and adding 75 bp, considering that Paraguay’s sovereign debt is rated three grades below Uruguay (S&P); each grade was estimated to correspond to 25 bp. This approach was chosen since there is no data available regarding the financing cost for Paraguay. In case Paraguay adopts a rule such as the one suggested in this report, this interest rate is likely to fall.

**Net public debt—the negative of public net worth—is endogenous and generates a direct impact on the risk that markets allocate to the repayment of sovereign debt.** With the establishment of a structural balance target, the Paraguayan economy may enter into a virtuous circle leading to lower deficits, lower debt and increased economic stability; while, the absence

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<sup>19</sup> See Le Fort (2012)

of a structural target can mean, as it did in the past, a vicious circle where cyclical deficit increases lead to expansions in the level and the cost of the debt and the transmission of financial instability.

**Ranges were used for other parameters, including the goal for public financial wealth between -20 percent of GDP and +10 percent of GDP, and the time horizon to achieve it, between 5 and 25 years.** Since it is not possible to determine a unique fiscal objective and horizon to achieve it, a double-entry table was used so as to present the fiscal targets resulting from different long-term goals and different time horizons. The calculations were performed on the basis of the equation for the primary fiscal balance target and considering various alternatives for the long-term goal ( $b(t + N)$ ) and for the time horizon to reach it ( $N$ ). The discount factor  $\psi$  was considered to be constant and equal to the estimated value of 1.021531<sup>20</sup>. Regarding the goal of future wealth of the public sector, a wide range of options was considered: from -20 percent of GDP, similar to the net public debt in 2009, to 10 percent of GDP (negative net debt), similar to the level achieved by Chile in 2011. Different alternatives for the relevant horizon were included, from 5 to 25 years, considering as a minimum one governmental period and as a maximum five government periods. In order to define a target for long periods of time a strong political consensus is required so as to maintain the structural fiscal policy across the different government periods. The results are presented in Table 1.8.

**Table 1.8:** Targets for the Primary fiscal balance as a function of the Long Term Goal for Fiscal Net Worth and Time Horizon to achieve them.

<b>Variables as a percentage of GDP</b>							
<b>HORIZONTE/ PATRIMONI O</b>	<b>-20 percent</b>	<b>-15 percent</b>	<b>-10 percent</b>	<b>-5 percent</b>	<b>0 percent</b>	<b>5 percent</b>	<b>10 percent</b>
<b>5</b>	0,5 percent	1,4 percent	2,3 percent	3,3 percent	4,2 percent	5,2 percent	6,1 percent
<b>10</b>	0,4 percent	0,9 percent	1,3 percent	1,8 percent	2,2 percent	2,7 percent	3,1 percent
<b>15</b>	0,4 percent	0,7 percent	1,0 percent	1,3 percent	1,6 percent	1,8 percent	2,1 percent
<b>20</b>	0,4 percent	0,6 percent	0,8 percent	1,0 percent	1,2 percent	1,4 percent	1,6 percent
<b>25</b>	0,4 percent	0,6 percent	0,7 percent	0,9 percent	1,0 percent	1,2 percent	1,3 percent

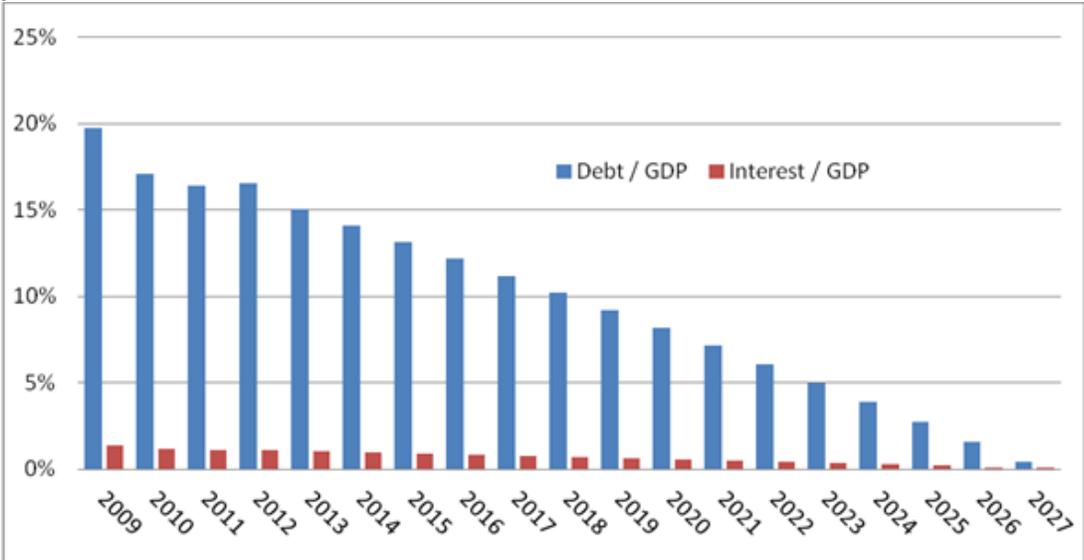
Source: LE&F based on data from ECLAC and the World Bank

**The simulation results show a wide range of targets for the primary fiscal balance: from a small surplus of 0.43 percent of GDP to a huge primary surplus of 6 percent of GDP.** To maintain public debt as a percent of GDP constant at its current level—the equivalent to a net worth of -20 percent of GDP—a primary surplus of 0.43 percent of GDP is required, regardless of the time horizon. If, instead, a zero net debt level or zero net worth is pursued, the fiscal effort needs to be much more substantial; in order to reach this goal within 25 years, the primary fiscal balance must achieve and sustain a surplus of 1 percent of GDP. If, instead, the same zero

<sup>20</sup> The discount factor used in the simulations was:  $(1 + \psi) = \frac{(1+r)}{(1+\lambda)} = \frac{(1+6,75 \text{ percent})}{(1+4,5 \text{ percent})} = 1,02131$

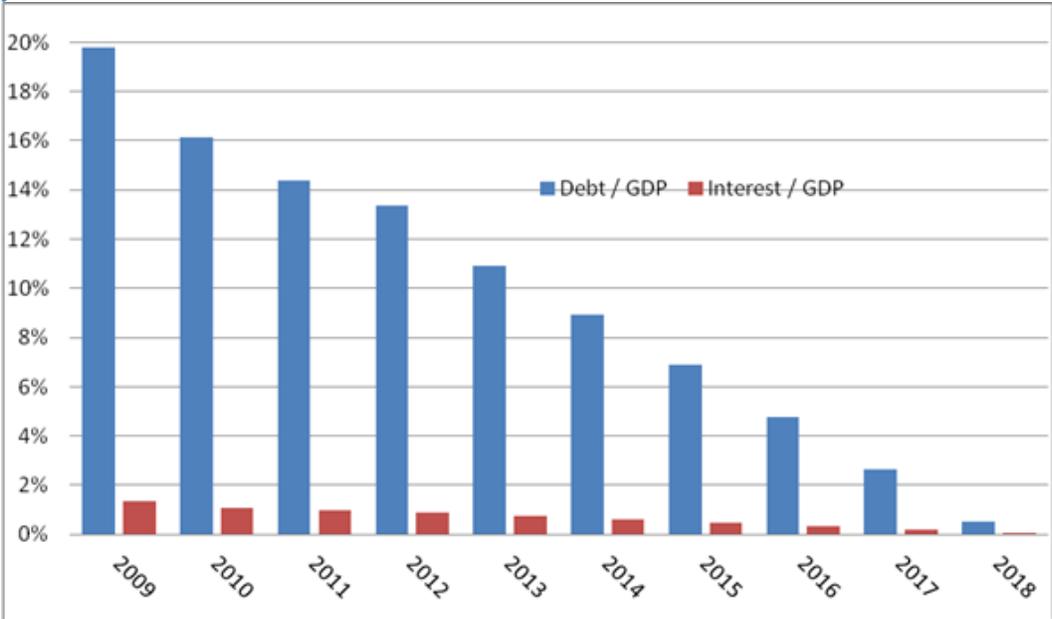
indebtedness goal is intended to be achieved in just 10 years, the required primary surplus would be of 2.2 percent of GDP for the 10 years; and, in order to reach a zero debt in a period of five years, the required structural primary surplus would amount to 4.21 percent GDP. (Figures 1.34 and 1.35)

**Figure 1.34:** Public debt and interest spending as percent of GDP with a fiscal target of 1.23 percent and 20 years' time



Source: LE&F based on data from CEPAL and the World Bank.

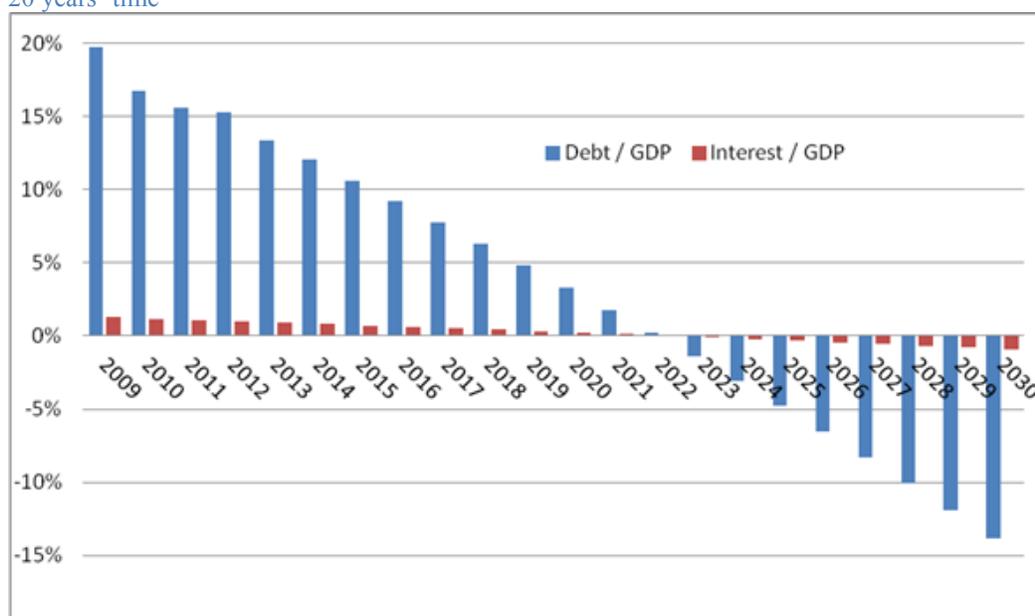
**Figure 1.35:** Public debt and interest spending as percent of GDP with a fiscal target of 2.2 percent and 10 years' time



Source: LE&F based on data from ECLAC and the World Bank

**With a more challenging fiscal policy, Paraguay could reach a positive net worth position, assets greater than liabilities, equivalent to 10 percent of its GDP in 20 years. With a sustained primary surplus of 1.6 percent of GDP, Paraguay could achieve over a period of 20 years a level of positive public net worth of 10 percent of GDP. (Figure 1.36)**

**Figure 1.36:** Public debt and interest spending as percent of GDP with a fiscal target of 1.62 percent and 20 years' time



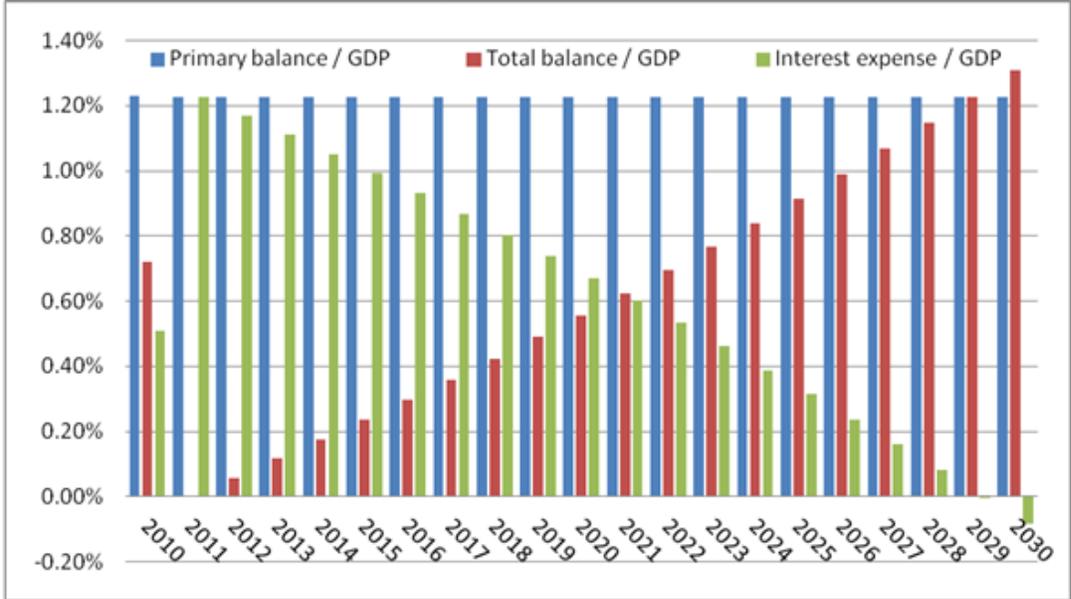
Source: LE&F based on data from ECLAC and the World Bank

**In Paraguay, according to available information, there is no domestic debt market.** It can be concluded that the country is heavily exposed to shocks on the real exchange rate considering the composition of its sovereign debt and since the development of a domestic local currency public debt market has not been possible. The impact of the RER on the level of public debt is high, about one-to-one, and represents a significant risk considering its historical instability. It is on this basis that our main recommendation is that, at least, a long-term goal of zero net debt should be established; this would require a structural primary surplus of 1.23 percent per annum, sustained for the next 20 years. According to our estimates it is feasible for Paraguay to get the fiscal balance to evolve from the 0 percent recorded in 2011 to the balance target of 1.23 percent of GDP until the 2030s.

**It needs to be emphasized that this recommendation is intended only as a reference, since the fiscal target should be adopted under a new fiscal institutional framework, including a review of the structural fiscal target as well as the corresponding adjustments.** In addition, it must be considered that exogenous shocks can generate significant changes in the exchange rate and in the value of the debt, even in the value of GDP, and thus, in the debt as a share of GDP. If that is the case, the structural fiscal target can be adjusted in order to achieve the desired goal in a longer or shorter time horizon.

**Under the target of a structural primary balance of 1.23 percent, interest spending should amount to 0 percent of GDP by 2030.** Under this objective, interest expenses should converge gradually from 1.23 percent of GDP in 2011 to 0 percent in 2029. It should be noted that interest expenses were calculated based on the real interest rate, leaving aside any effect on nominal interest rates. Our proposal uses the Primary Structural Balance that, despite its calculation complexity, has the advantage —over Total Structural Balance— to be achieved through a single target. (Figure 1.37)

Figure 1.37: Fiscal Balance Evolution ( percent of GDP)



Source: LE&F based on data from ECLAC and the World Bank

**The main benefit of a structural fiscal target is to avoid crises and fiscal insolvency.** The rationale for the application of a structural fiscal policy in Paraguay is not only to reduce the cyclical fluctuations of fiscal spending but rather to consider a broader objective such as minimizing the vulnerability of the economy by building a political commitment regarding the fiscal balance. The increased vulnerability of the fiscal position and the risk of an insolvency episode are on its own sufficient justification for the establishment of a structural fiscal policy. No government or political group may by its own assume the cost of initiating a process of long-term fiscal consolidation; this, since all the efforts to reduce debt and deficit can cut down their chances of remaining in power, and open the door for other political groups seeking to increase future levels of spending. Fiscal consolidation must be part of an agreed political effort, a national or State policy built on the basis of permanent institutions that can assure a sustained effort that would result in benefits for all Paraguayans in the coming years.

**The projected scenarios assume that in the future there are no contingencies affecting the evolution of GDP.** It should be made clear that the simulations were performed on the basis of no future contingencies. Negative contingencies, such as banking crises and significant devaluations, clearly result in increases in debt levels which require counter-cyclical policy measures; in turn, this would imply giving up the established objective for a while and resuming it when the crisis eases off. In the event of positive contingencies, such as a positive shock on

prices of major exports or increased hydropower generation due to increased rainfall, the country could raise its saving rate, a condition that should lead to a recalculation of the annual target. Changes in the fiscal net worth base conditions, as well as reviews on the macroeconomic parameters, may result in the need of a revision of the primary surplus target. It seems advisable that such revisions are made at regular intervals, for example every 5 years. It also seems advisable to keep the long-term fiscal net worth objective as given, but, accepting adjustments in the time horizon considered to achieve it. Adverse events which increase the level of public debt and deteriorate the fiscal initial net worth could justify an extension in the deadline for achieving the net worth objective. On the other hand, favorable contingencies that reduce the level of debt or increase public net worth as a share of GDP could justify achieving the final goal in a shorter period.

**It is necessary to review the annual fiscal target once the initial long term goal is achieved planning to maintain indefinitely a level of public assets.** If, for example, after maintaining for 20 years a primary fiscal surplus, the goal of a 0 percent of GDP net worth has been achieved, it would be appropriate to consider reviewing the annual fiscal target. It would be reasonable to consider keeping the same goal indefinitely, for which it would be necessary to establish a new target for the structural primary balance of 0 percent of GDP. Alternatively, an objective of reaching a positive or more ample financial position, similar to Chile, could be contemplated, for which the new target would be a surplus whose value will depend, among other things, on the deadline to do so. But, in 20 or 25 years the discount rate may be very different, either because the GDP growth rate is lower because the economy has matured or since the interest rate is down due to the lower risk corresponding to a zero public debt and a fiscal rule in operation. It would be risky to intend such calculation now.

### **Some Recommendations for Implementation**

**The process of determining the structural fiscal framework requires a periodic update of the estimates for a number of macroeconomic variables.** A periodic estimation and projection of a number of macroeconomic and fiscal variables is required in order to determine the goal for the public financial wealth which in turn is defined on the basis of a structural fiscal target; those estimates and projections will allow to determine, for the long-term objective and within the defined time horizon, the target for the structural primary balance that must be achieved every year. Once the target is defined, the expenditure budget is obtained after projecting the structural revenue; the latter requires projections for the trend GDP and for the gap. Among the main macroeconomic variables to be estimated is the long-term real interest rate relevant to the Paraguayan debt and the trend GDP growth. The estimates of the macroeconomic variables should be performed by a technical agency, a committee of independent experts that offers assurance of independence and technical capacity. One possibility is to organize a specialized public institution in charge of these projections, a kind of technical agency for the fiscal framework. This institution should be headed by a technical committee of several members, all of which should be well-known economists and represent different views on Paraguay's fiscal policy.

**On the basis of the projections of the relevant variables, the committee should monitor the estimates of the primary balance target.** Based on this macroeconomic framework and the

fiscal target, the economic authorities should present their estimates of the structural revenue and the annual expenditure budget, or the annual reviews of the already executed budget. The committee should evaluate and present to the authority a document with the results of its deliberations on these proposals, the value and process by which the fiscal target was determined, and the points of agreement and discrepancies. This should serve as the basis for the authority to calculate the value of the target and thus complete all the procedures for obtaining, from the projected GDP trend and structural fiscal revenue, the space available for primary and total expenditure. Then, the authority should submit to Parliament and the public a technical report explaining the methodology and the results obtained in the estimation of structural revenues, of the expenditure budget and of the structural balance.

**The availability of data and information as well as fiscal transparency are essential requisites for the proper implementation of the fiscal rule.** Greater transparency is a prerequisite for the success of a structural fiscal policy. A fiscal policy of this type should be based on the availability of quality data on the public sector: aggregated fiscal revenue and expenditures, operations, fiscal assets and liabilities in addition to contingencies. Data must be reliable and adequately backed up; in addition, the information should be timely available through public access media (eg, web pages). Deficiencies in Paraguay's data are significant, the series cover relatively short periods, and there appears to be some lack of consistency between national accounts and data on assets and liabilities of the public sector. In addition, a more thorough insight of contingent liabilities of the public sector is necessary. Fiscal transparency requires a major effort for the collection, compilation and coverage of fiscal statistics.

**We recommend the creation of an external and domestic Paraguayan public debt market which could contribute to the dissemination of information on the policies followed, and to obtaining full benefits from the adoption of a structural fiscal policy.** The transaction of Paraguayan debt instruments denominated in foreign currency (dollars or euros) in the international markets could establish a reference for Paraguay's country risk, either a margin as measured by the "Emerging Bond Index" (EMBI) or a premium as in the Credit Default Swaps (CDS); the latter operate as a default insurance, are traded in the international markets, and establish a measure of the risk perception of a particular debt instrument. The sovereign debtor pays for external funding through the international reference rate plus a country risk margin. Establishing a reference country risk would allow for a more refined calculation and projection of the real interest rate relevant to Paraguay. But, more important, this combined with the introduction of a structural fiscal policy would allow measuring the effects of such policy on the risk perception by international markets, and the improvements accomplished in this regard. This would benefit not only the public sector by reducing its funding cost, but also the Paraguayan private sector that could get increased access to external financial markets and a reduction in its cost since risk margins for private debtors are set on the basis of the country risk margin.

**The development of a domestic government bond market could have a very positive effect on the diversification of the fiscal financial risk and facilitate the development of a local capital market.** One of the disadvantages of Paraguay's debt is that it is denominated in dollars, which produces an important exposure of the public sector to the exchange rate. A real devaluation would proportionally increase the value of the public debt since virtually all of it is denominated in dollars. One way to diversify currency risk would be to issue domestic currency

debt indexed by inflation, but this requires the development of a domestic market for local currency public debt. Public debt is the ideal instrument for the founding of the basis of the development of financial markets for private instruments. It would also be beneficial for the private sector since this also provides the basis for the development of local capital markets, including long-term financing in inflation indexed instruments, which can be as important in the stimulus of investment in general and of housing in particular.

#### 4. Concluding Remarks

**The central objective of this paper is to present a proposal for a structural fiscal target for Paraguay starting from estimations of an aggregate production function.** The estimation of variables such as trend GDP and the GDP gap was done through a Cobb-Douglas type of function. Among the estimates, a 4.5 percent to 4.8 percent annual trend GDP growth was concluded. On the other hand, the fiscal revenue estimates were obtained through cointegration econometric models and error correction models.

**The estimated Total Public Revenue elasticity with respect to GDP amounts to 1.8 percent.** With this value it can be concluded that economic growth leads to increases in fiscal revenues. It is also noted that indirect taxes have great significance in total income; the role of direct taxes, such as income tax, should be strengthened, thereby moving closer to the tax systems of other countries in the region<sup>21</sup>.

**Total revenues present pro-cyclical behavior, unlike total fiscal expenditure.** The variables were analyzed in relation to the economic cycle; the results indicate that public expenditure has a cycle-neutral behavior, unlike the behavior of Fiscal Revenue, variable that moves with the cycle.

**Real GDP was assumed to grow 4.5 percent annually over the long-term, while the relevant interest rate was assumed to be 6.5 percent per year.** Estimated values were assumed in the calculation of the structural fiscal target, such as a real GDP growth of 4.5 percent. It must also be considered that since Paraguay does not have a developed domestic debt market, the determination of a benchmark interest rate is quite complicated; that is why Uruguay's rate was assumed as the basis for the determination of the relevant interest rate; to Uruguay's rate, of 5.75 percent, 75p.b. were added in consideration to the difference of three grades between the risk rating of the two economies.

**In order for the current debt level to be maintained constant as a percentage of GDP, it is necessary to establish as a structural fiscal target a primary surplus of 0.43 percent, regardless of the time horizon.** Alternatively, the objective may be to progress from the current situation of a fiscal wealth or net financial position of -20 percent of GDP to a 0 percent of GDP. To achieve this goal within five years a primary structural surplus of 4.21 percent of GDP per year is required, or, if the period is extended to 20 years, a primary structural surplus of 1.23 percent of GDP per year.

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<sup>21</sup> See Annex N°2

**The evolution of the debt could lead to a reduction in the interest rate which would, in turn, require reviewing the fiscal target.** The estimates consider a constant interest rate throughout the entire forecast period, but, the fact remains that as Paraguay improves its borrowing conditions, the relevant interest rate should decrease to the extent its risk rating improves. A reduction in the relevant interest rate would eventually allow recalculating the structural fiscal target; in such case, it would be possible to define a less strict target, but, that equally assures the country's financial sustainability.

**The proposed scenarios do not consider any shocks on GDP throughout the entire forecast period.** It should be noted that the proposed scenarios consider a constant growth rate, so, they do not incorporate the effects on the fiscal target of any shocks on the level of domestic production. In the case of negative shocks, the authority will be compelled to implement counter-cyclical policies that would require a re-assessment of the fiscal target. As well, positive shocks that enable the country to raise temporarily its savings level would lead to a recalculation of the target.

## 5. Technical Appendix

### Regressions

**This section explains the models estimated but finally dismissed justifying the final choice of the one used and presented in the body of this work.** The selection and dismissal was performed on the basis of the statistical significance of the parameters, of the goodness of fit of the models and of information criteria. As explained in previous chapters, the estimations were performed by ordinary least squares with HAC variance-covariance matrix.

### Aggregate Error Correction Models

The development of the Error Correction Model was based on the following cointegration regression:

$$\ln(I\_Tot)_t = \beta_0 + \beta_1 \ln(PIB)_t + \varepsilon_t$$

Where:

$\ln(I\_Tot)_t$  = Natural logarithm of Total Revenue in period t.

$\ln(PIB)_t$  = Natural logarithm of Trend GDP in period t.

Following the results:

**Table 1.9:** OLS estimation Log of Total Fiscal Revenue

**1990-2010 (T = 21)**

*HAC standard errors, with bandwidth 3 (Kernel de Bartlett)*

	Coeficiente	Desv. Típica	Estadístico t	Prob
Constante	-15.64522	1.466162	-10.67087	0***
Ln(PIB)	1.844291	0.088857	20.75583	0***

Media de la vble. dep.	14.78506	D.T. de la vble. dep.	0.274289
Suma de cuad. residuos	0.063559	Suma de cuad. regresión	0.057838
R-cuadrado	0.957759	R-cuadrado corregido	0.955536
Estadístico F	430.8046	Prob (Estadístico F)	0
Log-verosimilitud	31.10554	Criterio de Akaike	-2.771956
Criterio de Schwarz	-2.672478	Crit. de Hannan-Quinn	-2.750367

Thus, the model found is  $\ln(I\_Tot)_t = -15.6452 + 1.844291\ln(PIB)_t$

Considering the above, the models developed are:

### Model first difference of total revenue, explained by its lagged variable and GDP:

$$\Delta \ln(I\_Tot)_t = \beta_0 + \beta_1 \Delta \ln(PIB)_t + \beta_2 \Delta \ln(PIB)_{t-1} + \beta_3 \Delta \ln(I\_Tot)_{t-1} + \beta_4 \hat{u}_{t-1} + \varepsilon_t$$

**Table 1.10:** OLS Estimate First Difference logarithm Total Revenue

**1992-2010 (T = 19)**

*HAC standard errors, with bandwidth 3 (Kernel de Bartlett)*

	Coefficiente	Desv. Típica	Estadístico t	Prob
Constante	0,027565	0,017572	1,57E+00	0,139
D Ln(PIB)	1,038253	0,298204	3,481683	0,0037**
D Ln(PIB) (-1)	-0,083164	0,530721	-1,57E-01	0,8777
D Ln(I_Tot) (-1)	0,057589	0,235089	2,45E-01	0,81
U_hat (-1)	-0,713623	0,257128	-2,78E+00	0,0149*

Media de la vble. dep.	0,053155	D.T. de la vble. dep.	0,064629
Suma de cuad. residuos	0,032337	Suma de cuad. regresión	0,04806
R-cuadrado	0,569888	R-cuadrado corregido	0,446999
Estadístico F	0,569888	Prob (Estadístico F)	0,013586
Log-verosimilitud	33,61193	Criterio de Akaike	-3,011782
Criterio de Schwarz	-2,763245	Crit. de Hannan-Quinn	-2,969719

### First difference model with error correction

$$\Delta \ln(I\_Tot)_t = \beta_0 + \beta_1 \Delta \ln(PIB)_t + \beta_2 \Delta \ln(PIB)_{t-1} + \beta_3 \hat{u}_{t-1} + \varepsilon_t$$

**Table 1.11:** OLS Estimation First Difference Total Revenue logarithm

**1991-2010 (T = 20)**

*HAC standard errors, with bandwidth 3 (Kernel de Bartlett)*

	Coefficiente	Desv. Típica	Estadístico t	Prob
Constante	0,023377	0,018166	1,286841	0,2165
D Ln(PIB)	1,033637	0,31092	3,324448	0,0043**

D Ln(PIB) (-1)	-0,007607	0,432653	-0,017583	0,9862
U_hat (-1)	-0,60516	0,22972	-2,634335	0,018*

Media de la vble. dep.	0,04979	D.T. de la vble. dep.	0,06468
Suma de cuad. residuos	0,040637	Suma de cuad. regresión	0,050397
R-cuadrado	0,488753	R-cuadrado corregido	0,392894
Estadístico F	5,098675	Prob (Estadístico F)	0,011497
Log-verosimilitud	33,60922	Criterio de Akaike	-2,960922
Criterio de Schwarz	-2,761776	Crit. de Hannan-Quinn	-2,922047

$$\Delta \ln(I\_Tot)_t = \beta_0 + \beta_1 \Delta \ln(PIB)_t + \beta_2 \Delta \ln(I\_Tot)_{t-1} + \beta_3 \hat{u}_{t-1} + \varepsilon_t$$

**Table 12: OLS Estimate First Difference Total Revenue logarithm**

**1992-2010 (T = 19)**

*HAC standard errors with bandwidth 3 (Kernel de Bartlett)*

	Coefficiente	Desv. Típica	Estadístico t	Prob
Constante	0,026407	0,015415	1,713009	0,1073
D Ln(PIB)	1,046141	0,284208	3,680902	0,0022***
D Ln(I_Tot) (-1)	0,034419	0,176727	0,19476	0,8482
U_hat (-1)	-0,693906	0,216826	-3,200291	0,006**

Media de la vble. dep.	0,053155	D.T. de la vble. dep.	0,064629
Suma de cuad. residuos	0,032394	Suma de cuad. regresión	0,046471
R-cuadrado	0,569133	R-cuadrado corregido	0,48296
Estadístico F	6,604519	Prob (Estadístico F)	0,004615
Log-verosimilitud	33,59528	Criterio de Akaike	-3,115293
Criterio de Schwarz	-2,916463	Crit. de Hannan-Quinn	-3,081643

### Error Correction Models with prices of export products

The Error Correction Model was based on the following cointegration regression:

$$\ln(I\_Tot)_t = \beta_0 + \beta_1 \ln(PIB)_t + \beta_2 \ln(P\_carne)_t + \beta_3 \ln(P\_soja)_t + \varepsilon_t$$

Where:

$\ln(I\_Tot)_t$  = Natural logarithm of Total Revenue in period t.

$\ln(PIB)_t$  = Natural logarithm of Trend GDP in period t.

$\ln(P\_carne)_t$  = Natural logarithm of international meat price in period t<sup>22</sup>.

$\ln(P\_soja)_t$  = Natural logarithm of the international price of soybean in period t<sup>23</sup>.

<sup>22</sup> Price in Guaraníes/kg (Base=1994)

<sup>23</sup> Price in Guaraníes/Metric Ton (Base=1994)

The results obtained are:

**Table 1.13:** OLS Estimate Total Revenue logarithm

**1990-2010 (T = 21)**

*HAC standard errors with bandwidth 3 (Kernel de Bartlett)*

	Coeficiente	Desv. Típica	Estadístico t	Prob
Constante	-16,62072	1,896502	-8,76388	0***
Ln (PIB)	1,916494	0,121473	15,77717	0***
Ln (P_carne)	0,068889	0,078697	0,875371	0,3936
Ln (P_soja)	-0,092502	0,112917	-0,819197	0,424

Media de la vble. dep.	14,78506	D.T. de la vble. dep.	0,274289
Suma de cuad. residuos	0,060553	Suma de cuad. regresión	0,059682
R-cuadrado	0,959757	R-cuadrado corregido	0,952655
Estadístico F	1351445	Prob (Estadístico F)	0
Log-verosimilitud	3161421	Criterio de Akaike	-2629925
Criterio de Schwarz	-2,430968	Crit. de Hannan-Quinn	-2586746

Then, the model found is:

$$\ln(I\_Tot)_t = -16,62072 + 1,916494 \ln(PIB)_t + 0,068889 \ln(P\_carne)_t - 0,092502 \ln(P\_soja)_t$$

As can be seen, the parameters associated with the two prices, meat and soybeans, are not significant, so, no further progress was made in estimating the error correction model

### **Total Revenue model, considering the price of soybeans with the GAP**

The Error Correction Model was based on the following cointegration regression:

$$\ln(I\_Tot)_t = \beta_0 + \beta_1 \ln(PIB)_t + \beta_2 \ln(P\_soja)_t + \varepsilon_t$$

Where:

$\ln(I\_Tot)_t$  = Natural logarithm of Total Revenue in period t.

$\ln(PIB)_t$  = Natural logarithm of Trend GDP in period t.

$\ln(P\_soja)_t$  = Natural logarithm of the international price of soybean in period t<sup>24</sup>

The results obtained were:

**Table 1.14:** OLS Estimation Total Revenue logarithm

**1990-2010 (T = 21)**

*HAC standard errors with bandwidth 3 (Kernel de Bartlett)*

<sup>24</sup> Price in (\$/mt) Guaraníes (Base=1994)

	Coefficiente	Desv. Típica	Estadístico t	Prob
Constante	-15,62225	1,505291	-10,37823	0***
Ln (PIB)	1,854394	0,097962	18,92964	0***
Ln (P_soja)	-0,022061	0,078699	-0,280321	0,7824

Media de la vble. dep.	14,78506		D.T. de la vble. dep.	0,274289
Suma de cuad. residuos	0,063283		Suma de cuad. regresión	0,059293
R-cuadrado	0,957943		R-cuadrado corregido	0,95327
Estadístico F	204,9955		Prob (Estadístico F)	0
Log-verosimilitud	31,15128		Criterio de Akaike	-2,681074
Criterio de Schwarz	-2,531857		Crit. de Hannan-Quinn	-2,64869

Then the model found is:

$$\ln(I\_Tot)_t = -15,62225 + 1,854394 \ln(PIB)_t - 0,022061 \ln(P\_soja)_t$$

As can be seen, the parameter associated with the price of soybeans is not significant, so, no further progress was made in estimating the error correction model.

### Total Revenue model explained by the price of meat with the gap

The Error Correction Model was based on the following cointegration regression:

$$\ln(I\_Tot)_t = \beta_0 + \beta_1 \ln(PIB)_t + \beta_2 \ln(P\_carne)_t + \varepsilon_t$$

Where:

$\ln(I\_Tot)_t$  = Natural logarithm of Total Revenue in period t.

$\ln(PIB)_t$  = Natural logarithm of Trend GDP in period t.

$\ln(P\_carne)_t$  = Natural logarithm of the international price of meat in period t<sup>25</sup>

The results obtained were:

$$\ln(P\_soja)_t = t^{26}$$

**Table 1.15:** OLS Estimation Total Revenue logarithm, 1990-2010 (T = 21)

#### *HAC standard errors with bandwidth 3 (Kernel de Bartlett)*

	Coefficiente	Desv. Típica	Estadístico t	Prob
Constante	-16,00222	1,723768	-9,283276	0***
Ln (PIB)	1,854232	0,093888	19,74934	0***
Ln (P_carne)	0,022946	0,054701	0,419483	0,6798

<sup>25</sup> Precio en (cents/kg) Guaraníes (Base=1994)

<sup>26</sup> Price in (\$/mt) Guaraníes (Base=1994)

Media de la vble. dep.	14,78506	D.T. de la vble. dep.	0,274289
Suma de cuad. residuos	0,062944	Suma de cuad. regresión	0,059134
R-cuadrado	0,958168	R-cuadrado corregido	0,95352
Estadístico F	206,1482	Prob (Estadístico F)	0
Log-verosimilitud	31,20769	Criterio de Akaike	-2,686447
Criterio de Schwarz	-2,537229	Crit. de Hannan-Quinn	-2,654063

Thus, the model found is:

$$\ln(I\_Tot)_t = -16,00222 + 1,854232 \ln(PIB)_t + 0,022946 \ln(P\_carne)_t$$

As can be appreciated, the parameter associated with the price of meat is not significant, so, no further progress was made in estimating the error correction model.

### Error Correction Models with Income from Taxes on Goods and Services

The development of these Error Correction Models was based on the following cointegration regression:

$$\ln(\text{Impto\_Bsy}\$)_t = \beta_0 + \beta_1 \ln(PIB)_t + \varepsilon_t$$

Where:

$\ln(\text{Impto\_Bsy}\$)$  = Natural logarithm of Taxes on goods and services in period t

$\ln(PIB)_t$  = Natural logarithm of trend GDP in period t

The results are:

**Table 1.16:** OLS Estimation logarithm of Taxes on Goods and Services

**1992-2010 (T = 19)**

*HAC standard errors with bandwidth 3 (Kernel de Bartlett)*

	Coeficiente	Desv. Típica	Estadístico t	Prob
Constante	-42,93481	6,158638	-6,971477	0***
Ln(PIB)	3,137738	0,372715	8,418593	0***

Media de la vble. dep.	8,9107	D.T. de la vble. dep.	0,460886
Suma de cuad. residuos	0,739699	Suma de cuad. regresión	0,208595
R-cuadrado	0,806538	R-cuadrado corregido	0,795158
Estadístico F	70,87271	Prob (Estadístico F)	0
Log-verosimilitud	3,876706	Criterio de Akaike	-0,197548
Criterio de Schwarz	-0,098133	Crit. de Hannan-Quinn	-0,180723

Thus, the model found is:

$$\ln(\text{Impto\_Bsy}\$)_t = -42,93481 + 3,137738 \ln(PIB)_t$$

## Models of first differences and error correction

Considering the above, the models developed are:

$$\Delta \ln(\text{Impto\_Bsy}\$)_t = \beta_0 + \beta_1 \Delta \ln(\text{PIB})_t + \beta_2 \hat{u}_{t-1} + \varepsilon_t$$

**Table 1.17:** Estimation logarithm of First Difference of Taxes on Goods and Services  
1993-2010 (T = 18)

*HAC standard errors with bandwidth 3 (Kernel de Bartlett)*

	Coeficiente	Desv. Típica	Estadístico t	Prob
Constante	-0,025609	0,08271	-0,30962	0,7611
D Ln(PIB)	3,562126	1,549227	2,299292	0,0363*
U_hat (-1)	1,073254	0,704221	1,52403	0,1483

Media de la vble. dep.	0,120426	D.T. de la vble. dep.	0,23618
Suma de cuad. residuos	0,698305	Suma de cuad. regresión	0,215763
R-cuadrado	0,263607	R-cuadrado corregido	0,165422
Estadístico F	2,684785	Prob (Estadístico F)	0,100767
Log-verosimilitud	3,704343	Criterio de Akaike	-0,07826
Criterio de Schwarz	0,070135	Crit. de Hannan-Quinn	-0,057799

## Model of first differences and error correction

$$\Delta \ln(\text{Impto\_Bsy}\$)_t = \beta_0 + \beta_1 \Delta \ln(\text{PIB})_t + \beta_2 \Delta \ln(\text{PIB})_{t-1} + \beta_3 \Delta \ln(\text{Impto\_Bsy}\$)_{t-1} + \beta_4 \hat{u}_{t-1} + \varepsilon_t$$

**Table 1.18:** OLS Estimation logarithm of First Differences of Taxes on Goods and Services  
1994-2010 (T = 17)

*HAC standard errors with bandwidth 3 (Kernel de Bartlett)*

	Coeficiente	Desv. Típica	Estadístico t	Prob
Constante	-0,023359	2,62E-02	-8,92E-01	0,3897
D Ln(PIB)	2,373409	4,87E-01	4,88E+00	0,0004***
D Ln(PIB) (-1)	0,541651	5,47E-01	9,91E-01	0,3412
D Ln(Impto_BsySs) (-1)	0,034857	8,18E-02	4,26E-01	0,6776
U_hat (-1)	0,301141	2,41E-01	1,25E+00	0,2346

Media de la vble. dep.	0,069785	D.T. de la vble. dep.	0,101098
Suma de cuad. residuos	3,98E-02	Suma de cuad. regresión	5,76E-02
R-cuadrado	0,75661	R-cuadrado corregido	0,67548
Estadístico F	9,325895	Prob (Estadístico F)	0,001152
Log-verosimilitud	27,36297	Criterio de Akaike	-2,630938
Criterio de Schwarz	-2,385875	Crit. de Hannan-Quinn	-2,385875

## Model of taxes on goods and services with error correction

$$\Delta \ln(\text{Impto\_Bsy}\$)_t = \beta_0 + \beta_1 \Delta \ln(\text{PIB})_t + \beta_2 \Delta \ln(\text{PIB})_{t-1} + \beta_3 \hat{u}_{t-1} + \varepsilon_t$$

**Table 1.19:** OLS Estimation logarithm of First Differences of Taxes on Goods and Services

**1993-2010 (T = 18)**

*HAC standard errors with bandwidth 3 (Kernel de Bartlett)*

	Coeficiente	Desv. Típica	Estadístico t	Prob
Constante	-0,05386	0,094447	-0,570263	0,5775
D Ln(PIB)	3,671356	1,587546	2,312598	0,0365*
D Ln(PIB) (-1)	1,216057	1,833288	0,66332	0,5179
U_hat (-1)	1,022836	0,72176	1,417142	0,1783

Media de la vble. dep.	0,120426	D.T. de la vble. dep.	0,23618
Suma de cuad. residuos	0,677028	Suma de cuad. regresión	0,219907
R-cuadrado	0,286046	R-cuadrado corregido	0,133055
Estadístico F	1,869699	Prob (Estadístico F)	0,181103
Log-verosimilitud	3,982842	Criterio de Akaike	0,001906
Criterio de Schwarz	0,199767	Crit. de Hannan-Quinn	0,029189

### Model of first differences and error correction for taxes on goods and services

$$\Delta \ln(\text{Impto\_Bsy}\$)_t = \beta_0 + \beta_1 \Delta \ln(\text{PIB})_t + \beta_2 \Delta \ln(\text{Impto\_Bsy}\$)_{t-1} + \beta_4 \hat{u}_{t-1} + \varepsilon_t$$

**Table 1.20:** OLS Estimation logarithm of First Differences of Taxes on Goods and Services

**1994-2010 (T = 17)**

*HAC standard errors with bandwidth 3 (Kernel de Bartlett)*

	Coeficiente	Desv. Típica	Estadístico t	Prob
Constante	-0,009602	0,022178	-0,432975	0,6721
D Ln(PIB)	2,218141	0,460608	4,815676	0,0003***
D Ln(Impto_BsySs) (-1)	0,073114	0,072071	1,014472	0,3289
U_hat (-1)	0,248989	0,234636	1,061171	0,3079

Media de la vble. dep.	0,069785	D.T. de la vble. dep.	0,101098
Suma de cuad. residuos	0,04306	Suma de cuad. regresión	0,057553
R-cuadrado	0,736688	R-cuadrado corregido	0,675924
Estadístico F	12,12369	Prob (Estadístico F)	0,000457
Log-verosimilitud	26,69424	Criterio de Akaike	-2,66991
Criterio de Schwarz	-2,47386	Crit. de Hannan-Quinn	-2,650423

### Error Correction Model Revenue from International Trade taxes

The estimation of the Error Correction Model was based on the following cointegration regression:

$$\ln(\text{Impto\_Comex})_t = \beta_0 + \beta_1 \ln(\text{PIB})_t + \varepsilon_t$$

Where:

$\ln(\text{Impto\_Comex})_t$  = Natural logarithm of International Trade Taxes in period t.  
 $\ln(\text{PIB})_t$  = Natural logarithm of trend GDP in period t

The results are:

**Table 1.21:** OLS Estimation logarithm International Trade Taxes

**1990-2010 (T = 21)**

*HAC standard errors with bandwidth 3 (Kernel de Bartlett)*

	Coeficiente	Desv. Típica	Estadístico t	Prob
Constante	-0,143033	4,204272	-0,034021	0,9732
Ln(PIB)	0,494627	0,254799	1,941241	0,0672

Media de la vble. dep.	8,018168		D.T. de la vble. dep.	0,176959
Suma de cuad. residuos	0,522631		Suma de cuad. regresión	0,165852
R-cuadrado	0,165511		R-cuadrado corregido	0,165852
Estadístico F	3,768415		Prob (Estadístico F)	0,06721
Log-verosimilitud	8,983022		Criterio de Akaike	-0,66505
Criterio de Schwarz	-0,565571		Crit. de Hannan-Quinn	-0,64346

Thus, the model estimated is:

$$\ln(\text{Impto\_Comex})_t = -0,143033 + 0,494627 \ln(\text{PIB})_t + \varepsilon_t$$

### **Error Correction Model Revenue from taxes on Corporations and Companies**

The development of the Error Correction Model was based on the following cointegration regression:

$$\ln(\text{Impto\_Corp})_t = \beta_0 + \beta_1 \ln(\text{PIB})_t + \varepsilon_t$$

Where:

$\ln(\text{Impto\_Corp})_t$  = Natural logarithm of Taxes on Corporations and Companies in period t.

$\ln(\text{PIB})_t$  = Natural logarithm of trend GDP in period t

The results are:

**Table 1.22:** OLS Estimation logarithm Taxes on Corporations and Companies

**1990-2010 (T = 21)**

*HAC standard errors with bandwidth 3 (Kernel de Bartlett)*

	Coeficiente	Desv. Típica	Estadístico t	Prob
Constante	-29,58101	4,069103	-7,269664	0***
Ln(PIB)	2,279713	0,246607	9,2443	0***

Media de la vble. dep.	8,033602	D.T. de la vble. dep.	0,366845
Suma de cuad. residuos	0,489565	Suma de cuad. regresión	0,16052
R-cuadrado	0,818107	R-cuadrado corregido	0,808534
Estadístico F	85,45708	Prob (Estadístico F)	0
Log-verosimilitud	9,669272	Criterio de Akaike	-0,730407
Criterio de Schwarz	-0,630929	Crit. de Hannan-Quinn	-0,708818

Thus, the model found is:

$$\ln(\text{Impto\_Corp})_t = -29,58101 + 2,279713 \ln(\text{PIB})_t + \varepsilon_t$$

Considering the above, the models developed are

$$\Delta \ln(\text{Impto\_Corp})_t = \beta_0 + \beta_1 \Delta \ln(\text{PIB})_t + \beta_2 \hat{u}_{t-1} + \varepsilon_t$$

**Table 1.23:** OLS Estimation logarithm First Differences Taxes on Corporations and Companies  
**1991-2010 (T = 20)**

*HAC standard errors with bandwidth 3 (Kernel de Bartlett)*

	Coeficiente	Desv. Típica	Estadístico t	Prob
Constante	0,066394	0,036173	1,835428	0,084
D Ln(PIB)	0,17045	0,771988	0,220794	0,8279
U_hat (-1)	-0,623833	0,189387	-3,293957	0,0043*

Media de la vble. dep.	0,066927	D.T. de la vble. dep.	0,15623
Suma de cuad. residuos	0,282878	Suma de cuad. regresión	0,128996
R-cuadrado	0,390019	R-cuadrado corregido	0,318256
Estadístico F	5,434857	Prob (Estadístico F)	0,014969
Log-verosimilitud	14,20594	Criterio de Akaike	-1,120594
Criterio de Schwarz	-0,971234	Crit. de Hannan-Quinn	-1,091438

$$\Delta \ln(\text{Impto\_Corp})_t = \beta_0 + \beta_1 \Delta \ln(\text{PIB})_t + \beta_2 \Delta \ln(\text{PIB})_{t-1} + \beta_3 \Delta \ln(\text{Impto\_Corp})_{t-1} + \beta_4 \hat{u}_{t-1} + \varepsilon_t$$

**Table 1.24:** OLS Estimation logarithm First Differences Taxes on Corporations and Companies  
**1992-2010 (T = 19)**

*HAC standard errors with bandwidth 3 (Kernel de Bartlett)*

	Coeficiente	Desv. Típica	Estadístico t	Prob
Constante	0,00854	0,042649	0,200229	0,8442
D Ln(PIB)	0,27523	0,738711	0,372582	0,715
D Ln(PIB) (-1)	2,31948	1,192711	1,944712	0,0722
D Ln(Impto_Corp) (-1)	0,125101	0,21856	0,572387	0,5761
U_hat (-1)	-0,541532	0,225377	-2,402785	0,0307*

Media de la vble. dep.	0,068982	D.T. de la vble. dep.	0,160233
Suma de cuad. residuos	0,168841	Suma de cuad. regresión	0,109819

R-cuadrado	0,634655		R-cuadrado corregido	0,530271
Estadístico F	6,079993		Prob (Estadístico F)	0,004729
Log-verosimilitud	17,91089		Criterio de Akaike	-1,359041
Criterio de Schwarz	-1,110505		Crit. de Hannan-Quinn	-1,110505

$$\Delta \ln(\text{Impto\_Corp})_t = \beta_0 + \beta_1 \Delta \ln(\text{PIB})_t + \beta_2 \Delta \ln(\text{PIB})_{t-1} + \beta_3 \hat{u}_{t-1} + \varepsilon_t$$

**Table 1.25:** OLS Estimation logarithm First Differences Taxes on Corporations and Companies  
1991-2010 (T = 20)

*HAC standard errors with bandwidth 3 (Kernel de Bartlett)*

	Coeficiente	Desv. Típica	Estadístico t	Prob
Constante	-7,15E-03	4,10E-02	-0,17453	0,8636
D Ln(PIB)	0,463743	6,67E-01	6,96E-01	0,4966
D Ln(PIB) (-1)	2,78E+00	1,02E+00	2,723185	0,015*
U_hat (-1)	-4,01E-01	1,81E-01	-2,214397	0,0417*

Media de la vble. dep.	0,066927		D.T. de la vble. dep.	0,15623
Suma de cuad. residuos	1,93E-01		Suma de cuad. regresión	1,10E-01
R-cuadrado	0,583199		R-cuadrado corregido	0,505049
Estadístico F	7,462546		Prob (Estadístico F)	0,002411
Log-verosimilitud	18,01414		Criterio de Akaike	-1,40E+00
Criterio de Schwarz	-1,202267		Crit. de Hannan-Quinn	-1,362538

$$\Delta \ln(\text{Impto\_Corp})_t = \beta_0 + \beta_1 \Delta \ln(\text{PIB})_t + \beta_2 \Delta \ln(\text{Impto\_Corp})_{t-1} + \beta_3 \hat{u}_{t-1} + \varepsilon_t$$

**Table 1.26:** OLS Estimation logarithm First Differences Taxes on Corporations and Companies  
1992-2010 (T = 19)

*HAC standard errors with bandwidth 3 (Kernel de Bartlett)*

	Coeficiente	Desv. Típica	Estadístico t	Prob
Constante	0,063109	0,03497	1,804676	0,0912
D Ln(PIB)	-0,224349	0,7541	-0,297505	0,7702
D Ln(Impto_Corp) (-1)	0,34407	0,203957	1,686975	0,1123
U_hat (-1)	-0,808188	0,194748	-4,149919	0,0009***

Media de la vble. dep.	0,068982		D.T. de la vble. dep.	0,160233
Suma de cuad. residuos	0,214452		Suma de cuad. regresión	0,119569
R-cuadrado	0,443155		R-cuadrado corregido	0,443155
Estadístico F	5,77499		Prob (Estadístico F)	0,007856
Log-verosimilitud	15,63921		Criterio de Akaike	-1,22518
Criterio de Schwarz	-1,026351		Crit. de Hannan-Quinn	-1,19153

### Unit Root Test for Cointegration Model and Error Correction Model

In order to determine the existence of cointegration in the error correction models a unit root test was performed for both variables, Total Revenue and trend GDP, obtaining the following results<sup>27</sup>:

**Table 1.27: Augmented DickeyFuller Test Total Revenue and GDP (1990-2010)**

		Constante	Constante + Tendencia
PIB	Estadístico	0.687778	-2.97611
Test criticalvalues:	1 percent level	<b>-3.808546</b>	<b>-4.667883</b>
	5 percent level	<b>-3.020686</b>	<b>-3.7332</b>
	10 percent level	<b>-2.650413</b>	<b>-3.310349</b>
D PIB	Estadístico	-3.879164	-3.845221
Test criticalvalues:	1 percent level	-3.831511	<b>-4.532598</b>
	5 percent level	-3.02997	-3.673616
	10 percent level	-2.655194	-3.277364
Ingresos Totales	Estadístico	-0.19664	-1.758268
Test criticalvalues:	1 percent level	<b>-3.808546</b>	<b>-4.498307</b>
	5 percent level	<b>-3.020686</b>	<b>-3.658446</b>
	10 percent level	<b>-2.650413</b>	<b>-3.268973</b>
D Ingresos Totales	Estadístico	-4.526943	-4.393646
Test criticalvalues:	1 percent level	-3.831511	<b>-4.532598</b>
	5 percent level	-3.02997	-3.673616
	10 percent level	-2.655194	-3.277364

Source: LE&F based on data from ECLAC

## Dickey Fuller Test

A Dickey Fuller test was conducted to determine the existence of unit root<sup>28</sup>

**Table 1.28: Dickey Fuller Augmented Test Estimated Errors**

Estadístico	-3.039409
-------------	-----------

<sup>27</sup> The Phillip-Perron test (1987) and Kwiatkowski-Phillips-Schmidt-Shin test (1992) for unit root in the errors were performed for purposes of more accuracy and confirmation.

<sup>28</sup> The Phillip-Perron (1987) and Kwiatkowski-Phillips-Schmidt-Shin (1992) test for unit root in the errors were conducted for purposes of more accuracy and confirmation

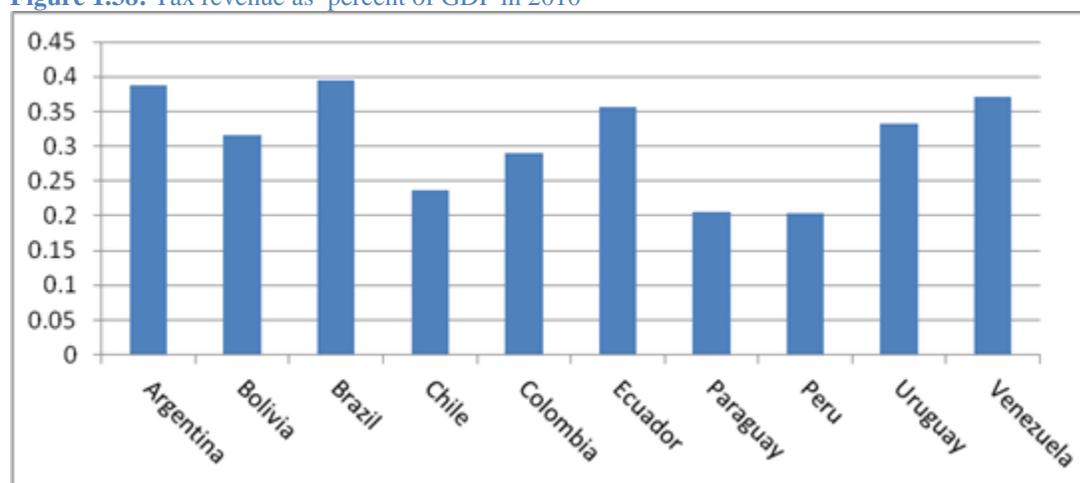
1 percent level	<b>-3.808546</b>
5 percent level	-3.020686
10 percent level	-2.650413

Source: LE&F bases on data from ECLAC

### Tax Revenue Comparison with other countries in the region

Fiscal revenue generated during the 2010 fiscal year represented a 22 percent of GDP with taxes arising from the collection of Value Added Tax (VAT) as one of the main sources of fiscal revenue. One aspect to be considered corresponds to the non-tax revenues which are mostly generated by power generation activities, especially by the Yacyretá and Itaipu plants, which directly depend on the annual precipitation in the Paraná River basin. It is also necessary to mention that in 2010 Congress again delayed the introduction of a Personal Income Tax; thereby, Paraguay remains as the only country in Latin America that does not apply a tax of this kind; this collection is precisely the one that could considerably raise revenue levels, counterbalancing the dependence on indirect tax revenues.

Figure 1.38: Tax revenue as percent of GDP in 2010



Source: LE&F based on information from the IMF and ECLAC.

## 6. Paraguay's Data Base

BASE TRABAJO.xlsx

Copia de Base\_expertos-Paraguay(1)\_update-2.xls

Copia de Copia de Proyecciones MCE Con correcciones.xlsx

Copia de Datos Nuevos2.xlsx

Copia de Proyecciones MCE Correccion.xlsx

Copia de Proyecciones MCE Segundo Método.xls

Copia de Proyecciones MCE Segundo Método-1.xlsx

EXPORTACIONES.XLS

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## Chapter 2. Paraguay: Agriculture Commodity Prices and Tax Revenue Collection<sup>29</sup>, by Edgardo Favaro, Friederike (Fritzi) Koehler-Geib, Nathalie Picarelli, Agustin Inaci

### Executive Summary

This paper aims at improving the understanding of the relationship between soybean and beef commodity prices with tax revenue collection in Paraguay. For this, the authors use monthly observations of beef and soybean exported over fourteen years, and the canonical Nerlove model (1959) of partial adjustment as an underlying framework. The model can be interpreted as an optimal farmer response when there are adjustment costs and farmers build their price expectations rationally. Using Dynamic OLS with distributed lags, the paper finds a statistically significant relationship between tax revenue collection and the value of soy and beef exports. While the characteristics of the data imply serious limitations to the economic interpretation of statistical results, they are not trivial. The absence of direct taxes on agriculture income in Paraguay, seem not to be a limitation for a positive relationship working through the Value Added Tax. Further understanding the channels through which this relationship takes places, calls for a detailed analysis of the value-chain of beef and soybean export-production in Paraguay.

### Introduction

**This paper aims at improving the understanding of the relationship between soybean and beef commodity prices with tax revenue collection in Paraguay.** Agricultural commodities have become one of Paraguay's strong engines of growth in the past decade, with soybean and beef production at the top of the list. Given Paraguay's low tax base and the structure of its tax system, understanding this relationship is central in order to improve tax revenue forecasts as well as for the design of economic policy. Indeed, the existence of a statistically significant soybean (beef) supply response to changes in price of soybeans (beef), would imply that information on future prices of these commodities could be used to improve tax revenue forecasts.

To this aim, two questions arise. First, since Paraguay does not levy direct taxes on agriculture income<sup>30</sup> or exports, the presence of a statistically significant relationship between soybean and beef production with tax revenue collection begs analyzing the channels through which such a link occurs. Secondly, if a relationship between soybean and beef production with tax revenue collection indeed exists, it remains key to distinguish the degree of the relationship for each of the commodities, and the underlying reasons for any possible observed difference.

**The study is based on monthly observations of beef and soybean exported over fourteen years, using the canonical Nerlove model (1959) of partial adjustment as underlying**

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<sup>29</sup> This paper was prepared as a background paper for the World Bank Public Expenditure Review of Paraguay, by a team composed of Edgardo Favaro, Fritzi Koehler-Geib, Nathalie Picarelli and Agustin Indaco.

<sup>30</sup> There is a tax on presumed income (IMAGRO) but revenue from this tax is not very significant as a percentage of total revenue.

**framework.** The model can be interpreted as an optimal farmer response when there are adjustment costs and farmers build their price expectations rationally. One important note: the characteristics of the data imply serious limitations to economic interpretation of statistical results. For instance, monthly production of either beef or soybeans is less elastic than monthly exports; the elasticity of response of beef and soybean production increases over time as producers have time to increase (or decrease) the amount of land and agriculture inputs allocated to crops and livestock production.

**The main results obtained in the study indicate that (1) there is a strong supply response of beef and soybean exports to prices, and (2) that there is a positive and statistically significant relationship between tax revenue collection and the value of beef and soybean exported.** The first results need however to be assessed carefully as the meaning of estimated elasticities are based on exports. These are thus not estimates of the supply of beef and soybeans produced, but rather of the quantity of soybean and beef exported. It is not surprising therefore to find that holders of inventories (soybean seeds and beef herd) respond rapidly to price changes. The second results, which are the main interest of the analysis, seem to indicate that the main underlying reason for the positive relationship is the working of the value added tax (VAT). Beef and soybean production generates income that is spent, for the most part, inside Paraguay. Part of this expenditure generates tax revenue through the VAT system and other part generates revenue through the corporate tax and other tributes. This result supports the view that being exempt from legally paying taxes does not mean that the income generated by agriculture activity is tax exempt. In addition, it suggests that it is worthwhile for the Government to think about whether to insulate fiscal revenues from commodity price fluctuations or factors that impact the volume of production, such as climate shocks.

**The rest of the paper is organized in four sections:** the first section gives a qualitative background of the agricultural sector and its taxation, and then focuses on the soy and beef subsectors in particular. The second section analyzes the methodology of estimation of agriculture supply of soybeans and beef and estimates of price elasticities. Section three then explores the relationship between economic activity and tax revenue collection. It finds, as expected, a significant and positive relationship for the broad economic index. It continues by analyzing the relationship between the level of economic activity and exports of beef and soybeans, as well as the relationship between these and tax revenue collection. Conclusion is carried out in the last section.

## 1. The Agricultural Sector in Paraguay with its Soy and Beef Subsectors

### **The relevance of agriculture**

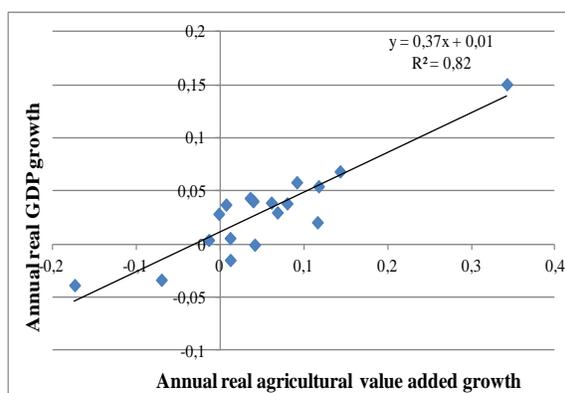
**Paraguay's economy depends strongly on agriculture.** In 2011, the agricultural production covered around 50 percent of the country's total surface and employed around 25 percent of the labor force. At the same time, agriculture represents the largest share of total real value added after the trade and services sector and has continuously increased over the past decade (Table 2.1). The agricultural sector amounted to 32 percent of total value added in 2011 including cattle, forest and fishing, up from 25 percent in 2000. Growth in the sector has explained over 80 percent of the variation of real GDP growth since the early 90s (Figure 2.1).

**Table 2.1: Sectoral shares in total value added**

	Shares in total value added (percent)	
	2000	2011
Agriculture	16	24
Cattle, Forest and Fishing	9	8
Industry and Mining	17	13
Gas, electricity, water	2	2
Construction	4	4
Trade and Services	52	53

Source: Central Bank of Paraguay

**Figure 2.1: Annual real GDP growth versus agricultural value growth**



Source: WB staff, Central Bank of Paraguay

**The sector is concentrated in a few products, soy and beef primarily.** These two products accounted for 56 percent of total exports in 2011 up from an average of 48 percent between 2004 and 2011. Also these products were key in terms of contribution to export growth. In 2011, soy explained 16 percentage points of export growth up from an average of 8 percentage points on average between 2004 and 2011. In contrast to previous years, meat contributed negatively to growth in 2011 due to an outbreak of foot and mouth disease late in the year. The average contribution in prior years had been as high as 5 percentage points. This study focuses on soy and beef for which disaggregate data about production and export volumes, values, and international prices are available.

### **The sector's link to tax revenue collection**

**Despite its importance in the economy, the agricultural sector has historically contributed little to tax revenue collection (Appendix 3).** IMAGRO is the income tax in agriculture (Impuesto sobre la renta del sector agropecuario). Prior to the 2004 tax reform, IMAGRO collection was based on 0.9 percent of the total cadastral value of the land used for agricultural production. With cadastral values inferior to the actual surfaces, the sector's contribution to tax revenue collection was low. Since the 2004 tax reform, IMAGRO has been determined by the net income of agricultural businesses, at a rate of 10 percent. Nonetheless, between 2005 and 2011 tax collection under IMAGRO fell due to exemptions. In particular, since 2005, VAT paid on inputs of goods and services in agricultural and cattle production could be used as a fiscal credit against the payment of IMAGRO. As a consequence, VAT credits mostly paid IMAGRO; until 2012 and despite the credit system having been eliminated by decree in September 2008, the VAT balance to pay IMAGRO has not been totally consumed. For that reason, in 2012 a new decree (8279/12) suspended the accreditation of VAT credit against IMAGRO as of 2014. Without further changes, this means that the agricultural sector would start contributing to direct taxes beginning in 2013.

**Table 2.2: Product Contribution to Total Export Growth**

	Average 2004-2011			2011		
	annual growth rate (percent)	Share in total (percent)	contribution to export growth (percentage points)	annual growth rate (percent)	Share in total (percent)	contribution to export growth (percentage points)
Cotton	-6	2	0	-30	0	0
Soy	31	32	8	44	42	16
Vegetable oils	32	8	2	23	6	1
Flour	22	10	2	19	8	1
Cereals	30	10	2	11	11	1
Beef	54	16	5	-18	14	-4
Wood	7	3	0	-5	2	0
Other	22	18	4	37	18	6

Source: WB staff, Central Bank of Paraguay

### The soy subsector

**Soy has been an important crop in Paraguay historically, and has played an increasing role over the past decade.** The surface used for the production of soy, which represents 7 percent of the country's total surface (2,957,408 hectares), has doubled since 2000, and even increased 5-fold since 1990 (according to data from CAPECO—Camera Paraguaya de Exportadores de Cereales y Oleaginosas and from the Ministry of Agriculture). Most of the soy production is located in the eastern part of Paraguay and is realized by farms that exceed 100 hectares in size (of which 43 percent are farms of 100 to 1000 hectares and 44 percent farms with more than 1000 hectares) according to the 2008 Census. Simultaneously, soy production in tons has increased by a factor 2.4 since 2000 and by a factor 8 since 1990. In 2011, the total volume of production amounted to 8.3 million tons. Based on this extraordinary increase soy has surpassed other historically more important crops, such as wheat and corn.

**At the same time, increases in yields were more modest and volatile relative to the expansion of surface used for soy and the increase in production.** Reaching 2.9 tons per hectare in 2011 yields increased 14 percent relative to 2000 and 60 percent relative to 1990. A maximum yield of 2962 kg per hectare was achieved in 2010 in contrast to a minimum of 1500 kg per hectare in 2009. In the period relevant for the 2010 main harvest, weather conditions in Paraguay were ideal while a severe drought occurred during the growing phase of soy harvested in 2009. Overall, the standard deviation of yields has reached 447 kg per hectare since 1990.

**Soy export occurs quickly after the harvest, due to storage capacity and financial constraints.** In most years, there are two soy harvests. The first one can be as early as February or as late as April and the second one falls into the months of July-August. In some years there is even a third harvest around October-November. This schedule is reflected in the monthly export volumes. Once harvested, soy beans are processed in silos, where they are treated, dried and cleaned for optimal quality. In Paraguay, CAPECO estimates that the static capacity of silos in

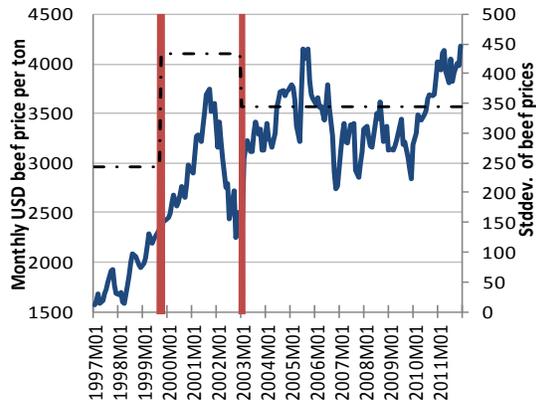
2011 was close 6 million tons while the production was significantly higher at 8 million tons. The constraint of storage capacity is one factor explaining why soy beans are normally exported within a month after harvesting. Another factor is financial constraints. Financial cushions in the sector are relatively small. Producers have therefore little room to schedule soy exports with view to the best price they could get for their beans.

### **The beef subsector**

**The second sector that is highly relevant for agricultural production in Paraguay is beef which has also seen a significant increase in the past decade.** According to the Ministry of Agriculture (MoA), around 40 percent of the country's surface is used as permanent pastures to support cattle breeding. Most of the production occurs in the country's western part. Also in this sector there are imbalances: Farms between 1 and 20 hectares own less than 15 percent of the livestock and represent more than 70 percent of all producers. In contrast, producers with more than 1000 hectares (1 percent of the farms) own 77 percent of the farm land and 60 percent of the livestock population. Overall, the herd size expanded from around 8 million in the beginning of the 1990s, to almost 10 million in the late 1990s and early years of the new millennium, and exceeded 12 million in 2010 (Figure 2.3). Representing around 25 percent increases respectively. Also, in terms of export volumes Paraguay has seen a strong increase. In particular since 2003, export volumes have multiplied 6 fold to reach over 236,000 tons. Due to an outbreak of the foot and mouth disease late in 2011 however, the total export volume was 40 percent lower than in the previous year. It is expected that beef exports will recover when Paraguay regains the status of a country without foot and mouth disease by the World Organization for Animal Health.

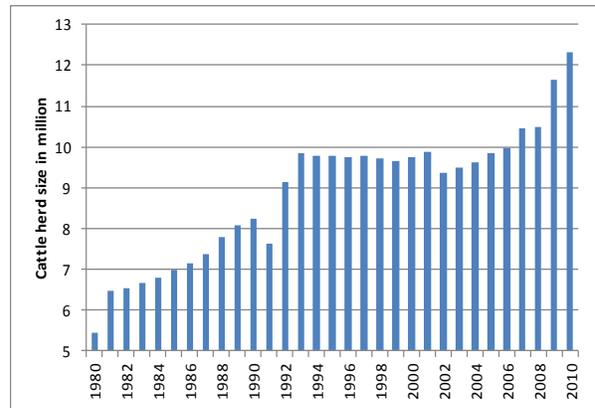
**On the one hand, a surge in the international price of beef, on the other hand, the country's strategy to open up new export markets, may have driven the observed growth of production and export volumes.** Relative to 2000, average annual international beef prices were up 50 percent in 2011, reaching almost USD 4000 (Figure 2.2). Following the Central Bank of Paraguay, we use the price of Australian beef to proxy the price of Paraguayan beef. In addition, volatility has decreased again after a period of heightened volatility between October 1999 and January 2003 where the Inclán Tiao (1994) test for volatility breaks detects two significant shifts (see Figure 2.2). In terms of export destinations, Paraguay has achieved a considerable diversification over time with 90 percent of exports going to Chile, Russia, Venezuela, Brazil, and Israel and among others Angola in 2010 (see Arce 2012 and Table 2.3).

**Figure 2.2: International beef price (USD per ton Australian beef) and Inclin Tiao (1994) volatility break points**



Source: WB staff, Central Bank of Paraguay

**Figure 2.3: Cattle herd size in million**



Source: Ministry of Agriculture of Paraguay

**Significant export growth has by far exceeded the expansion of the cattle herd due to a change in the composition of production for internal versus external use and technological change.** For example in 2000, 49 percent of the cattle slaughtered to be traded as frozen carcasses were produced for domestic use and 51 percent for export. This compares with 1 percent and 99 percent respectively in 2010. According to Arce (2012), Paraguayan beef has been sold to increasingly high value markets based on technological change which has led to improvement of the genetic pool of the cattle and a more efficient processing of the cattle throughout the production chain.

**Table 2.3: Main International Export Markets for Paraguayan Beef (2010)**

Country	Chile	Russia	Venezuela	Brazil	Israel	Other
Share in total beef exports	49.8	25.1	5.6	3.9	3.0	12.5

Source: Central Bank of Paraguay.

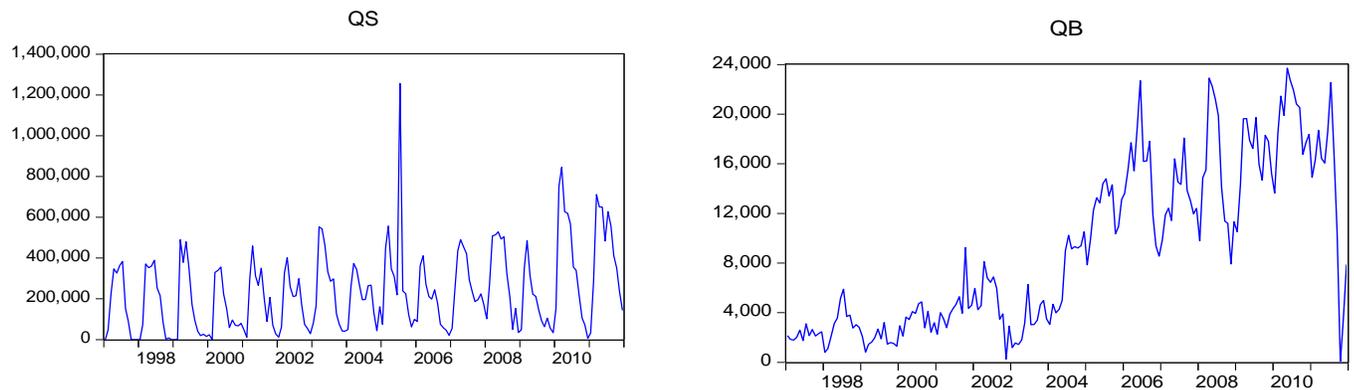
**Beef producers have some room to time the export of beef and sell a relatively diversified product.** Annual beef exports peak occur mostly in the months of May through July, yet a pattern is not strong. The reason is that beef producers can decide to sell their cattle at different maturities, trading off additional weight gain with expected price developments. In addition, beef products are diversified, i.e. frozen versus fresh meat, or different cuts of the cattle. And different export markets which consume different products have different peak demand periods throughout the year.

## 2. Agriculture supply elasticities (soybean and beef)

### Description of the data

As described in more depth in section one, **monthly soybean exports (QS) exhibit a marked seasonal pattern; beef exports (QB) much less so** (Figures 2.4). Seasonality is associated to nature: a crop with specific harvest periods in the case of soybeans and more abundant pastures in the fall and spring (in the case of beef). Both series exhibit an upward trend (soybean, HPSOY and beef HPBEEF) estimated using the Hodrick-Prescott filter (Figure 2.5).<sup>31</sup>

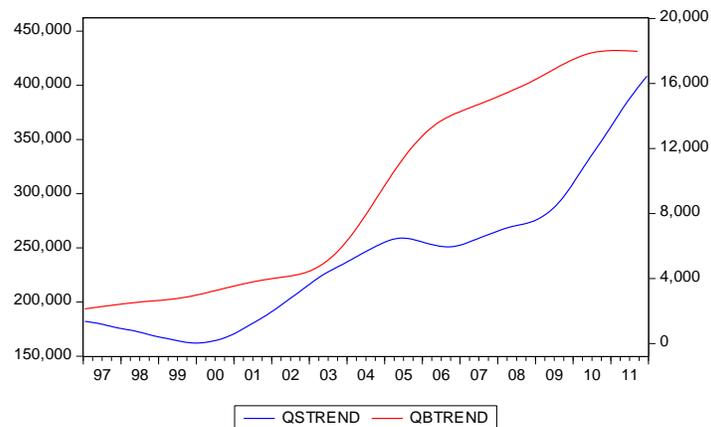
**Figure 2.4:** Soybean and Beef Exports (in tons per month)



Note: Monthly exports of soybeans (QS) and beef (QB)

Source: Authors.

**Figure 2.5:** Soybean and Beef Export Trends

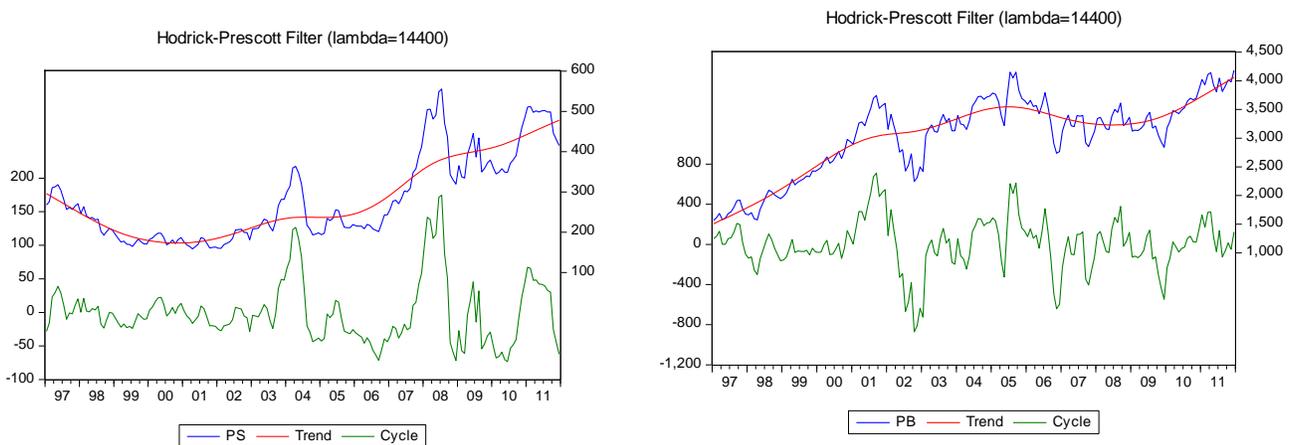


<sup>31</sup> The HP trend for beef exports was estimated using monthly information from January 1997 to September 2011. We truncated the sample in September 2011 (instead of using information until December 2011) to avoid giving undue weight to the impact of the outbreak of hoof and mouth disease on exports of beef during October 2011 (it brought them to zero). The inclusion of such an extreme observation in the sample would seriously bias the estimated HP trend during 2011. We are indebted to Hannah Nielsen for having brought to our attention this issue in a previous draft.

**Prices of soybeans (PSOY) and beef (PB) also exhibit an upward trend** (Figure 6). Paraguay is a price-taker in the international market for soybean and beef exports therefore prices can be assumed to be exogenous for the rest of the analysis. This fact greatly simplifies the interpretation of patterns of export-supply response observed in the past decade (in technical jargon changes in the international price of beef and soybeans can be used to econometrically identify a supply function).

**An increase in international commodity prices is expected to increase supply** for two reasons: in the short run farmers have incentives to use more inputs in production (fertilizers etc.); in the medium term, more land and capital in the form of tractors, more efficient harvesting equipment and pesticides are added to the production process.

**Figure 2.6: Trends in Price of Soybeans and Beef**



Source: Authors.

The short run supply response to an increase in prices is what is described in intermediate microeconomics a ‘move along a supply function; the medium-term supply response is a ‘shift to the right’ of the supply function (Box 1).

**Box 2.1 A Simple Short-run Model of Agriculture Supply**

We observe monthly exports but we know that exports are constrained by total production. To simplify the interpretation of the data we present below a simple model where producers can export  $x_t$  or  $x_{t+1}$  and total exports ( $x_t + x_{t+1}$ ) are constrained by overall production ( $Q_t$ ):  $Q_t \geq x_t + x_{t+1}$ . The problem solved by firms is to maximize profits  $\pi(\cdot)$  given external prices subject to the constraint that exports cannot be higher than production.  $C(\cdot)$  Embodies the cost of exporting at time  $t$  or  $t + 1$ . To further simplify we assume the cost of exporting immediately after production is zero. The cost of exporting at time  $t + 1$  is  $C'(\cdot) > 0, C''(\cdot) > 0$ . The function  $C(\cdot)$  embodies transportation, interest rates, storage costs, among others.

$$Max \pi(x_t, x_{t+1}) = p_t x_t + p_{t+1} x_{t+1} - C(x_{t+1}) + \mu [Q_t - x_t - x_{t+1}]$$

The equilibrium conditions resulting from this simple model are:

$$(1) p_t = \mu$$

$$(2) p_{t+1} = C'(x_{t+1}) + \mu$$

$$(3) Q_t = x_t + x_{t+1}$$

This implies that in equilibrium:

$$(4) p_{t+1} = C'(x_{t+1}) + p_t$$

Equation (1) shows the link between international prices and Paraguay's production possibilities: an increase in international prices implies an increase in the shadow price of capacity ( $\mu$ ), which has the units of a marginal cost. Secondly (4) is an arbitrage condition: under the assumptions of this simplified model it implicitly defines exports at  $t + 1$  as a function of the difference between current and expected prices and production costs:

$$(5) \frac{dX_{t+1}}{dp_{t+1}} = \frac{1}{C''} > 0$$

(5) Defines a move along a supply function. The time between production and exports will be a function of the expected path of prices and cost of storage etc.

A simple extension of the model making  $Q(K_t)$  where  $K_t$  is capital used in production (a vector of inputs) would define and implicit demand for capital as a result of changes in international prices and therefore gives content to a medium- long-term shift of the supply of agricultural goods.

**The series analyzed in what follows are monthly soybean and beef prices called *PS and PB*, and monthly soybean and beef exports called *QS and QB*, respectively. Further, we clean QS for a statistical outlier by estimating the coefficient of the dummy variable (Du=1 for 2005M07 and 0 otherwise). The new series clean from the outlier effects is QS1.**

### A simple econometric model of soybean and beef supply

**The canonical model to estimate agriculture supply elasticity is Nerlove (1959)<sup>32</sup>.** The model consists in two equations: equation (1) posits the desired quantity supplied as a function of the market price; equation (2) posits a partial adjustment model where differences between the actual ( $Q_t$ ) and desired supply ( $Q_t^*$ ) adjust gradually over time (in each period only a fraction  $\gamma$  of the gap adjusts).

$$(6) Q_t^* = \alpha_0 + \alpha_1 P_t^* + \mu_t$$

$$(7) Q_t - Q_{t-1} = \gamma [Q_t^* - Q_{t-1}]$$

If we assume that expectations are formed rationally:

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<sup>32</sup> Nerlove, Marc, 1958, *The Dynamics of Supply: Estimation of Farmers' Response to Price*. Baltimore: The Johns Hopkins Press.

$$P_t^* = E_{t-1}P_t$$

And Plugging (1) into (2):

$$(8) Q_t = \alpha_0\gamma + \alpha_1\gamma E_{t-1}P_t + (1 - \gamma)Q_{t-1} + \gamma\mu_t$$

Equation (3) can be also written as an Error Correction Model (ECM) if  $P_t$  is (1); for instance if  $P$  follows a random walk:

$$(9) P_t = a + P_{t-1} + \epsilon_t$$

$$(10) \Delta Q_t \equiv Q_t - Q_{t-1} = -\gamma[Q_{t-1} - \alpha_0 - \alpha_1(a + P_{t-1})] + \gamma\mu_t$$

**The ECM is consistent with inter-temporal optimization when there are quadratic adjustment costs** (Nickell, 1985)<sup>33</sup>. Moreover, Nerlove's specification is consistent with a form of the Error Correction Model.

**We start by testing the case of soybeans.** To proceed with the estimation of an ECM we start by running an Augmented Dickey-Fuller Test (ADF) on PS, QS1 and on their logarithms, following with the Phillips-Perron test<sup>34</sup> on the same variables. The latter yield mixed results. On the one hand, we cannot reject the hypothesis of a unit root or unit root with a drift for either PS or QS1 but we can reject the hypothesis against the alternative of a time trend. However, on the other hand, we cannot reject the hypothesis of a unit root for PS against either alternative based on a Phillips-Perron test. These results are however intuitively appealing. Changes in world demand for soybeans and beef have resulted in an upward shift of these prices in the latter years of the period under analysis. We can thus interpret these results as a structural change in prices. This idea is also consistent with the volatility breaks and hence the significant changes in volatility of the series that we detected in Section One.

We thus proceed to estimate equation (10) and ECM of (3) using two alternative methods: (Method 1) the Engle-Granger Method and (Method 2) the Dynamic Ordinary Least Squares (DOLS) as advocated by Stock and Watson (1993)<sup>35</sup> (Appendix 1a). *Arguably the DOLS method provides the most reliable estimates of supply elasticities among the methods used in this section. We have used alternative ones given that the stochastic context is one where several variables exhibit unit roots; we will privilege DOLS method in the following sections.*

**In the case of soy beans, we find that all Nerlove-Error Correction models exhibit a high and significant correlation between change in price and quantity response** (Figure 2.7). The response (elasticity) is higher in the long run than in the short run, and ranges between 1.8 to 11.8, and 0.67 to 0.94, respectively. When interpreting these results, it is important to keep in mind that they are not elasticities of supply of production but rather elasticities of supply of exports vis-à-vis price.

<sup>33</sup> Nickell, Stephen (1985), Error Correction, Partial Adjustment and all that: An Expository Note, Oxford Bulletin of Economics and Statistics, 47, 2.

<sup>34</sup> Phillips, P.C.B. and P. Perron (1988), "Testing for a Unit Root in Time Series Regression," *Biometrika*, 75, 335-346.

<sup>35</sup> The cointegrating regression is estimated adding leads and lags of  $P_t$  (see EVIEWS User's Guide II, pp230).

Figure 2.7: Short- and Long-run Soybean Price Elasticities

	Engle-Granger				Dynamic OLS	
	First step: EQ01	Second step: EQ02	First step: EQ03	Second step: EQ04	EQ05	EQ06
Dependent Variable/independent variables	QS1	QS1	LQS1	LQS1	QS1	LQS1
PS	565.8 (124.9)				601.0 (196.3)	
RES01		-0.63 (0.21)				
LPS			0.90 (0.25)			0.94 (0.35)
RES03				-0.57 (0.17)		
Elasticity SR	<b>0.67 (min)</b>		0.90		0.71	<b>0.94 (max)</b>
Elasticity LR	<b>1.8 (min)</b>		2.09		<b>11.8 (max)</b>	2.93

Source: Authors

We proceed on the same manner specified above using the data for beef. As such, we start the estimation of an ECM by running the ADF on PB, QB and on their logarithms. In this case we also find mixed results. On the one hand, we cannot reject the hypothesis of a unit root for PB. On the other hand, results are mixed regarding a unit root in quantities (QB). As a second step, we proceed to estimate equation (10) and ECM on equation (3) using the before-mentioned alternative methods for the case of beef and adding Method 3 – Partial Adjustments Method (Appendix 1b).

In summary, similarly as in the case of soybeans, we find that all Nerlove-Error Correction models exhibit a significant elasticity of response of quantity of beef exported to price (Figure 2.8). Identically, the response (elasticity) is higher in the long run than in the short run; it ranges between 1.98 to 2.82, and 0.28 to 0.31, respectively.

Figure 2.8: Short-and Long-run Beef Price Elasticities

	Engle-Granger				Dynamic OLS		Partial Adjustment	
	First step: EQ13	Second step: EQ12	First step: EQ11	Second step: EQ12	EQ15	EQ16	EQ09	EQ10
Dependent Variable/independent variables	QB	QB	LQB	LQB	QB	LQB	QB	LQB
PB	5.95				6.36		0.84	

	(0.58)				(1.23)		(0.31)	
LPB			2.49 (0.19)			2.58 (0.40)		0.31 (0.12)
Speed of adjustment: RES11(-1)				-0.12 (0.04)				
Speed of adjustment: RES13(-1)		-0.07 (0.04)						
Speed of adjustment: EQ15					-0.11 (0.04)			
Speed of adjustment: EQ16						-0.14 (0.05)		
QB(-1)							0.88 (0.03)	
LQB(-1)								0.89 (0.03)
Elasticity SR	-----		-----	-----	-----	-----	<b>0.28 (min)</b>	<b>0.31 (max)</b>
Elasticity LR	<b>1.98 (min)</b>		2.49	2.12	2.58	2.33		<b>2.82 (max)</b>

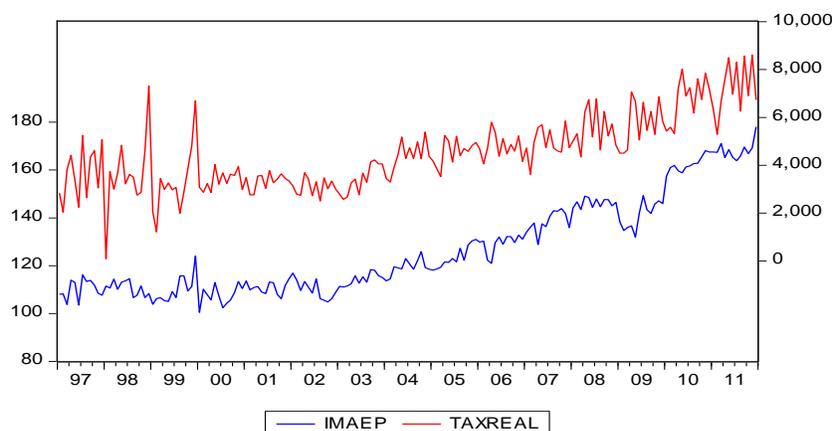
Source: Authors

### 3. Tax Revenue collection, agriculture and economic activity

#### Tax Revenue collection and level of economic activity

This section starts by estimating the relationship between tax revenue collection at constant prices (TAX REAL) and the level of economic activity measured through the IMAE index (IMAEP) (Figure 2.9). Given the importance of the VAT in the Paraguayan tax system, this relationship is central to understand the volatility of tax revenue collection. It is the first step to estimate the cointegration between agriculture commodities of soybeans and beef with tax revenue collection.

Figure 2.9: Tax Revenue Collection and Level of Economic



Source: Authors

We approach the study of this relationship following the same methodology presented in Section Two. As can be anticipated, the Augmented Dickey-Fuller Test (ADF) cannot reject the hypothesis that the IMAEP or TAXREAL have a unit root. Using the DOLS method and a further check of the model using the Johansen (1991, 1995)<sup>36</sup> framework, we find that there is high response of tax revenue collection to the level of economic activity (Figure 2.10) with the elasticity being both at 1.85. However, it is important to pinpoint that there may be other factors than a high response at work, namely the introduction of measures to improve the efficiency of the tax administration during the period under study.

Figure 2.10: Summary Elasticity of response: TAXREAL-IMAEP

	Dynamic OLS EQ11	Johansen
Dependent Variable/independent variables	TAXREAL	
IMAEP	65.8 (3.26)	66.0 (3.16)
Speed of adjustment: RES11(-1)	-0.62 (0.24)	
Elasticity of response	1.85	1.85

Source: Authors

### Agriculture commodities, cointegration with economic activity and tax revenue collection

In order to estimate the correlation between agriculture commodities and tax revenue collection, we start by analyzing the relationship of cointegration between economic activity and exports of soy and beef, following the same two methods described above (DOLS and Johansen). Here we find a one-cointegration equation which shows that exports of beef and soybeans have a significant impact on level of economic activity (Figure 2.11 & 2.12). We then proceed to estimate the relationship between tax revenue collection and agriculture commodities (using exports of soy and beef), with a lags in a DOLS model (Appendix 2).

The results show a significant positive correlation of exports of soy and beef with tax revenue collection, with a higher elasticity for beef exports (1.29) than for soy exports (0.15). While the results are expected to be stronger given that we have worked with exports data, they remain quite significant to understand tax revenue collection given the absence of direct taxes on agriculture commodities.

Figure 2.11: Johansen Method. Agriculture (XSOY, XBEEF) and Level of Economic Activity (IMAEP)

Sample (adjusted): 1997M06 2011M12
Included observations: 175 after adjustments

<sup>36</sup> Johansen, Soren (1991), "Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models," *Econometrica*, 59, 1551-1580

Johansen, Soren (1995), *Likelihood-based Inference in Cointegrated Vector Autoregressive Models*, Oxford: Oxford University Press.

Trend assumption: Linear deterministic trend				
Series: IMAEP XBEEF XSOY				
Lags interval (in first differences): 1 to 4				
Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.313343	75.07475	29.79707	0.0000
At most 1	0.050738	9.288781	15.49471	0.3394
At most 2	0.001008	0.176412	3.841466	0.6745
Trace test indicates 1 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.313343	65.78596	21.13162	0.0000
At most 1	0.050738	9.112369	14.26460	0.2769
At most 2	0.001008	0.176412	3.841466	0.6745
Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				
Unrestricted Cointegrating Coefficients (normalized by $\alpha$ ):				
	IMAEP	XBEEF	XSOY	
	-0.087231	0.001268	0.000852	
	-0.065688	0.002657	-0.000223	
	-0.108963	0.001641	-5.03E-05	
Unrestricted Adjustment Coefficients (alpha):				
	D(IMAEP)	0.427641	0.525674	0.094465
	D(XBEEF)	-45.29141	-33.91471	5.674888
	D(XSOY)	-732.0977	66.30062	1.710752
1 Cointegrating		Log	-3167.238	

Equation(s):	likelihood		
Normalized cointegrating coefficients (standard error in parentheses)			
IMAEP	XBEEF	XSOY	
1.000000	-0.014541 (0.00203)	-0.009766 (0.00108)	
Adjustment coefficients (standard error in parentheses)			
D(IMAEP)	-0.037304 (0.02636)		
D(XBEEF)	3.950833 (1.67168)		
D(XSOY)	63.86190 (7.72935)		
2 Cointegrating Equation(s):	Log likelihood	-3162.682	
Normalized cointegrating coefficients (standard error in parentheses)			
IMAEP	XBEEF	XSOY	
1.000000	0.000000	-0.017153 (0.00246)	
0.000000	1.000000	-0.508002 (0.14205)	
Adjustment coefficients (standard error in parentheses)			
D(IMAEP)	-0.071834 (0.03269)	0.001939 (0.00088)	
D(XBEEF)	6.178610 (2.07219)	-0.147551 (0.05587)	
D(XSOY)	59.50677 (9.65891)	-0.752439 (0.26041)	

Source: Authors

Figure 2.12: Vector Error Correction Estimates

Vector Error Correction Estimates			
Sample (adjusted): 1997M04 2011M12			
Included observations: 177 after adjustments			
Standard errors in ( ) & t-statistics in [ ]			
Cointegrating Eq:	CointEq1		
IMAEP(-1)	1.000000		
XBEEF(-1)	-0.010349 (0.00399) [-2.59429]		
XSOY(-1)	-0.012876 (0.00176) [-7.31506]		
C	-81.49847		
Error Correction:	D(IMAEP)	D(XBEEF)	D(XSOY)
CointEq1	-0.022415 (0.01475) [-1.51942]	0.017794 (0.96130) [ 0.01851]	31.80050 (4.59600) [ 6.91917]
D(IMAEP(-1))	-0.466133 (0.07490) [-6.22357]	-1.317970 (4.88061) [-0.27004]	-17.40743 (23.3344) [-0.74600]
D(IMAEP(-2))	-0.257894 (0.07390) [-3.48961]	-7.664256 (4.81580) [-1.59148]	-13.15721 (23.0245) [-0.57144]
D(XBEEF(-1))	-0.001384 (0.00125) [-1.10740]	-0.077079 (0.08144) [-0.94648]	0.327454 (0.38935) [ 0.84102]
D(XBEEF(-2))	-0.002967 (0.00128) [-2.32640]	-0.151614 (0.08311) [-1.82425]	0.429337 (0.39736) [ 1.08049]
D(XSOY(-1))	3.90E-05 (0.00023) [ 0.16977]	0.036772 (0.01495) [ 2.45919]	0.372552 (0.07149) [ 5.21127]

D(XSOY(-2))	-0.000192 (0.00025) [-0.77939]	0.001906 (0.01608) [ 0.11854]	0.078945 (0.07687) [ 1.02704]	
C	0.669991 (0.30274) [ 2.21309]	7.338784 (19.7275) [ 0.37201]	0.338658 (94.3182) [ 0.00359]	
R-squared	0.239529	0.078157	0.272092	
Adj. R-squared	0.208031	0.039974	0.241942	
Sum sq. resids	2689.628	11420891	2.61E+08	
S.E. equation	3.989356	259.9601	1242.881	
F-statistic	7.604404	2.046907	9.024599	
Log likelihood	-491.9614	-1231.272	-1508.217	
Akaike AIC	5.649281	14.00308	17.13240	
Schwarz SC	5.792836	14.14663	17.27595	
Mean dependent	0.419209	4.932203	-2.020339	
S.D. dependent	4.482792	265.3170	1427.507	
Determinant resid covariance (dof adj.)		1.55E+12		
Determinant resid covariance		1.35E+12		
Log likelihood		-3225.057		
Akaike information criterion		36.74640		
Schwarz criterion		37.23090		
Sample (adjusted): 1997M04 2011M12 Included observations: 177 after adjustments Trend assumption: Linear deterministic trend Series: IMAEP XBEEF XSOY Lags interval (in first differences): 1 to 2				
Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	
			Prob. **	
None *	0.237746	58.14091	29.79707	0.000 0
At most 1	0.055082	10.08981	15.49471	0.273 9
At most 2	0.000347	0.061487	3.841466	0.804 1
Trace test indicates 1 cointegrating eqn(s) at the 0.05 level * denotes rejection of the hypothesis at the 0.05 level				

**MacKinnon-Haug-Michelis (1999) p-values				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	Prob.
No. of CE(s)	Eigenvalue	Statistic	Critical Value	**
None *	0.237746	48.05110	21.13162	0.000
At most 1	0.055082	10.02832	14.26460	0.210
At most 2	0.000347	0.061487	3.841466	0.804
Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				
Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):				
IMAEP	XBEEF	XSOY		
-0.049197	0.000509	0.000633		
-0.074089	0.002605	-0.000133		
-0.086767	0.000997	-2.25E-05		
Unrestricted Adjustment Coefficients (alpha):				
D(IMAEP)	0.455610	0.516167	0.058023	
D(XBEEF)	-0.361688	-43.68580	3.221340	
D(XSOY)	-646.3934	-9.570805	6.813275	
1 Cointegrating Equation(s):    Log likelihood    -3225.057				
Normalized cointegrating coefficients (standard error in parentheses)				
IMAEP	XBEEF	XSOY		
1.000000	-0.010349	-0.012876		
	(0.00399)	(0.00176)		
Adjustment coefficients (standard error in parentheses)				
D(IMAEP)	-0.022415			
	(0.01475)			
D(XBEEF)	0.017794			
	(0.96130)			
D(XSOY)	31.80050			
	(4.59600)			

2 Cointegrating Equation(s):			Log likelihood	-3220.043
Normalized cointegrating coefficients (standard error in parentheses)				
IMAEP	XBEEF	XSOY		
1.000000	0.000000	-0.018997		
		(0.00240)		
0.000000	1.000000	-0.591523		
		(0.11421)		
Adjustment coefficients (standard error in parentheses)				
D(IMAEP)	-0.060657	0.001576		
	(0.02643)	(0.00079)		
D(XBEEF)	3.254437	-0.113969		
	(1.71189)	(0.05108)		
D(XSOY)	32.50959	-0.354022		
	(8.30815)	(0.24792)		
D(TAXREAL)	-1.090047			
	(0.13561)			
D(IMAEP)	0.000528			
	(0.00064)			

Source: Authors

#### 4. Conclusions

The purpose of this study was to measure the relationship of beef and soybean prices (measured with international prices) with tax revenue collection. The basis for the analysis is the canonical Nerlove model of partial adjustment; the model can be interpreted as an optimal farmer response when there are adjustment costs and farmers build their price expectations rationally. The statistical results show a significant elasticity of response of both beef and soybeans to prices.

The meaning of estimated elasticities has to be assessed carefully. First, these are not estimates of the supply of beef and soybeans produced but rather of the quantity of soybean and beef exported. It is not surprising therefore the finding that holders of inventories (soybean seeds and beef herd) respond rapidly to price changes. The case is clearer with soybeans because there is a limit in time that brokers can hold the crop rather than commercialize it in the market. In the case of beef it is possible to withhold supply when facing an increase in prices by way of reducing the supply of cows to the market so as to increase production of calves next year. Second, part of beef and soybeans exports may have been produced in Argentina rather than in Paraguay which

would bias upwards the estimated supply elasticity and downwards the elasticity of tax revenue response to agriculture exports.<sup>37</sup>

In the following sections, we explore the relationship between an index of economic activity and tax revenue collection, as well as between economic activity and exports of beef and soybeans, and find, as expected, a significant and positive relationship. These are the basis for finally analyzing the relationship between tax revenue collection and soybean and beef exports. We find a positive statistically significant response.

The result is not trivial. What are the channels for such a positive correlation given the absence of direct taxes on agricultural production in Paraguay? Evidence points at the working of the VAT. Beef and soybean production generates income that is spent, for the most part, inside Paraguay. Part of this expenditure generates tax revenue through the VAT system and another part generates revenue through the corporate tax and other tributes. This result supports the view that being exempt from legally paying taxes does not mean that the income generated by the activity is tax exempt. It would be interesting to continue this analysis by comparing the correlation and volatility that a direct tax on agriculture income would have compared to the current baseline situation. In addition, a detailed study of the value-chain of soybeans and beef production would further complement such an analysis by identifying the different stages for taxation.

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## 6. Appendix

### Appendix 1a- Methods for estimating Soybean Supply

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<sup>37</sup> We are indebted to John Nash for making this point. The issue can be further explored introducing a measure of changes in constraints and taxation in Argentina in analyzing the Paraguayan data.

Method 1: Engle-Granger Method  
Case 1: Dependent variable is QS1  
Engle-Granger Method: QS1 (EQ01 and EQ02)

Dependent Variable: QS1  
Method: Least Squares  
Sample: 1997M01 2011M12  
Included observations: 180

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	79223.82	37300.57	2.123931	0.0351
PS	565.7505	124.9362	4.528316	0.0000
R-squared	0.103300	Mean dependent var		237174.1
Adjusted R-squared	0.098262	S.D. dependent var		186730.3
S.E. of regression	177318.8	Akaike info criterion		27.02033
Sum squared resid	5.60E+12	Schwarz criterion		27.05581
Log likelihood	-2429.830	Hannan-Quinn criter.		27.03472
F-statistic	20.50565	Durbin-Watson stat		0.689788
Prob(F-statistic)	0.000011			

Dependent Variable: DQS1  
Method: Least Squares  
Sample (adjusted): 1998M02 2011M12  
Included observations: 167 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4375.026	8593.336	0.509119	0.6114
RES01(-1)	-0.630539	0.213663	-2.951082	0.0037
DQS1(-1)	0.252886	0.216010	1.170713	0.2435
DQS1(-2)	0.169613	0.205554	0.825148	0.4106
DQS1(-3)	0.133712	0.188409	0.709688	0.4790
DQS1(-4)	0.071912	0.175445	0.409885	0.6825
DQS1(-5)	0.034883	0.158729	0.219765	0.8263
DQS1(-6)	-0.018444	0.146699	-0.125728	0.9001
DQS1(-7)	-0.019702	0.134485	-0.146500	0.8837
DQS1(-8)	-0.182240	0.122136	-1.492105	0.1377
DQS1(-9)	-0.114766	0.110949	-1.034401	0.3026
DQS1(-10)	-0.233164	0.099563	-2.341865	0.0205
DQS1(-11)	-0.103913	0.089559	-1.160279	0.2477
DQS1(-12)	0.308523	0.081501	3.785517	0.0002
R-squared	0.509831	Mean dependent var		859.9945
Adjusted R-squared	0.468183	S.D. dependent var		149680.7
S.E. of regression	109155.9	Akaike info criterion		26.11905
Sum squared resid	1.82E+12	Schwarz criterion		26.38044
Log likelihood	-2166.941	Hannan-Quinn criter.		26.22514
F-statistic	12.24133	Durbin-Watson stat		2.116973
Prob(F-statistic)	0.000000			

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.343211	Prob. F(12,141)	0.2009
Obs*R-squared	17.13225	Prob. Chi-Square(12)	0.1447

Case 2: Dependent variable is LQS1  
Engle-Granger Method: LQS1 (EQ03 and EQ04)

Dependent Variable: LQS1  
Sample (adjusted): 1997M02 2011M12  
Included observations: 173 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.966472	1.385108	5.029551	0.0000
LPS	0.897993	0.248165	3.618528	0.0004
R-squared	0.071125	Mean dependent var		11.96813
Adjusted R-squared	0.065693	S.D. dependent var		1.213266
S.E. of regression	1.172737	Akaike info criterion		3.168052
Sum squared resid	235.1785	Schwarz criterion		3.204506
Log likelihood	-272.0365	Hannan-Quinn criter.		3.182841
F-statistic	13.09374	Durbin-Watson stat		0.937929
Prob(F-statistic)	0.000390			

Dependent Variable: DLQS1  
Sample (adjusted): 2000M03 2011M12

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.064500	0.049834	1.294291	0.1979
RES03(-1)	-0.568072	0.165633	-3.429706	0.0008
DLQS1(-1)	0.139292	0.168810	0.825141	0.4108
DLQS1(-2)	0.100480	0.158027	0.635841	0.5260
DLQS1(-3)	0.076569	0.147452	0.519281	0.6045
DLQS1(-4)	0.046705	0.135088	0.345739	0.7301
DLQS1(-5)	-0.053341	0.123144	-0.433164	0.6656
DLQS1(-6)	-0.018964	0.116057	-0.163400	0.8705
DLQS1(-7)	-0.000436	0.107052	-0.004069	0.9968
DLQS1(-8)	-0.229763	0.097022	-2.368156	0.0194
DLQS1(-9)	-0.130907	0.093206	-1.404499	0.1626
DLQS1(-10)	-0.194172	0.084852	-2.288356	0.0238
DLQS1(-11)	-0.034244	0.082332	-0.415924	0.6782
DLQS1(-12)	0.350045	0.066969	5.226992	0.0000
R-squared	0.673589	Mean dependent var		0.038404
Adjusted R-squared	0.640438	S.D. dependent var		0.975923
S.E. of regression	0.585197	Akaike info criterion		1.859651
Sum squared resid	43.83436	Schwarz criterion		2.151071
Log likelihood	-118.0352	Hannan-Quinn criter.		1.978072
F-statistic	20.31878	Durbin-Watson stat		1.897714
Prob(F-statistic)	0.000000			

Method 2: DOLS

Case 3: Dependent variable is QS1

2.1 DOLS Method: QS1 (EQ05)

Dependent Variable: QS1  
 Method: Dynamic Least Squares (DOLS)  
 Sample (adjusted): 1997M03 2011M11  
 Included observations: 177 after adjustments  
 Cointegrating equation deterministics: C  
 Fixed leads and lags specification (lead=1, lag=1)  
 Long-run variance estimate (Bartlett kernel, Newey-West fixed bandwidth = 5.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
PS	601.0248	196.2522	3.062512	0.0025
C	73269.59	58100.66	1.261080	0.2090
R-squared	0.113683	Mean dependent var		240117.1
Adjusted R-squared	0.093071	S.D. dependent var		186759.2
S.E. of regression	177856.1	Sum squared resid		5.44E+12
Durbin-Watson stat	0.688885	Long-run variance		7.23E+10

Cointegration Test - Engle-Granger

Date: 07/19/12 Time: 15:50

Equation: EQ05

Specification: QS1 PS C

Cointegrating equation deterministics: C

Null hypothesis: Series are not cointegrated

Automatic lag specification (lag=13 based on Schwarz Info Criterion, maxlag=13)

	Value	Prob.*
Engle-Granger tau-statistic	-4.358547	0.0028
Engle-Granger z-statistic	82.69746	0.9999

\*MacKinnon (1996) p-values.

Case 4: Dependent Variable is LQS1  
 2.2 DOLS Method LQS1 (EQ06)

Dependent Variable: LQS1  
 Method: Dynamic Least Squares (DOLS)  
 Date: 07/19/12 Time: 15:54  
 Sample (adjusted): 1997M03 2011M11  
 Included observations: 171 after adjustments  
 Cointegrating equation deterministics: C  
 Fixed leads and lags specification (lead=1, lag=1)  
 Long-run variance estimate (Bartlett kernel, Newey-West fixed bandwidth = 5.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LPS	0.935536	0.354301	2.640512	0.0091
C	6.772602	1.975278	3.428683	0.0008
R-squared	0.078445	Mean dependent var		11.97575
Adjusted R-squared	0.056239	S.D. dependent var		1.216802
S.E. of regression	1.182091	Sum squared resid		231.9584
Durbin-Watson stat	0.937490	Long-run variance		2.631735

### 2.3. Cointegration test LQS1

Cointegration Test - Engle-Granger

Equation: EQ06

Specification: LQS1 LPS C

Cointegrating equation deterministics: C

Null hypothesis: Series are not cointegrated

Automatic lag specification (lag=12 based on Schwarz Info Criterion, maxlag=13)

	Value	Prob.*
Engle-Granger tau-statistic	-4.276098	0.0038
Engle-Granger z-statistic	-1367.002	0.0000

\*MacKinnon (1996) p-values.

Intermediate Results:

Rho - 1	-0.684719
Rho S.E.	0.160127
Residual variance	0.296738
Long-run residual variance	46.20052
Number of lags	12
Number of observations	160
Number of stochastic trends**	2

\*\*Number of stochastic trends in asymptotic distribution.

Engle-Granger Test Equation:

Dependent Variable: D(RESID)

Method: Least Squares

Sample (adjusted): 2000M03 2011M12

Included observations: 142 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID(-1)	-0.684719	0.170934	-4.005750	0.0001
D(RESID(-1))	0.263797	0.172485	1.529392	0.1286
D(RESID(-2))	0.212623	0.161069	1.320070	0.1891
D(RESID(-3))	0.191917	0.150533	1.274918	0.2046
D(RESID(-4))	0.154585	0.137039	1.128034	0.2614
D(RESID(-5))	0.038234	0.123896	0.308601	0.7581
D(RESID(-6))	0.064176	0.116023	0.553131	0.5811
D(RESID(-7))	0.070997	0.105855	0.670705	0.5036
D(RESID(-8))	-0.178100	0.094982	-1.875103	0.0630
D(RESID(-9))	-0.094296	0.091029	-1.035896	0.3022
D(RESID(-10))	-0.158992	0.083610	-1.901598	0.0595
D(RESID(-11))	-0.011303	0.081343	-0.138952	0.8897
D(RESID(-12))	0.366219	0.066012	5.547747	0.0000
R-squared	0.674141	Mean dependent var		0.033311
Adjusted R-squared	0.643829	S.D. dependent var		0.974363
S.E. of regression	0.581501	Akaike info criterion		1.840675
Sum squared resid	43.62047	Schwarz criterion		2.111279
Log likelihood	-117.6879	Hannan-Quinn criter.		1.950637
Durbin-Watson stat	1.898010			

Appendix 1b-Methods for estimating Beef Supply  
Method 1: Engle-Granger Method

Case 1: Dependent variable is QB

1.1 Engle-Granger Method: QB (EQ13 and EQ14)

Dependent Variable: QB  
Method: Least Squares  
Sample: 1997M01 2011M12  
Included observations: 180

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-9004.368	1803.042	-4.993988	0.0000
PB	5.954493	0.578460	10.29370	0.0000
R-squared	0.373152	Mean dependent var		9107.247
Adjusted R-squared	0.369630	S.D. dependent var		6656.416
S.E. of regression	5284.918	Akaike info criterion		19.99415
Sum squared resid	4.97E+09	Schwarz criterion		20.02963
Log likelihood	-1797.474	Hannan-Quinn criter.		20.00854
F-statistic	105.9602	Durbin-Watson stat		0.233010
Prob(F-statistic)	0.000000			

Dependent Variable: DQB  
Sample (adjusted): 1998M02 2011M12  
Included observations: 167 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	102.6457	184.2170	0.557200	0.5782
RES13(-1)	-0.070441	0.036869	-1.910567	0.0579
DQB(-1)	-0.122357	0.083636	-1.462965	0.1455
DQB(-2)	-0.122140	0.084723	-1.441635	0.1514
DQB(-3)	-0.019303	0.092655	-0.208332	0.8352
DQB(-4)	-0.117742	0.098931	-1.190146	0.2358
DQB(-5)	-0.205947	0.103277	-1.994118	0.0479
DQB(-6)	-0.186670	0.101223	-1.844153	0.0671
DQB(-7)	-0.248941	0.098957	-2.515635	0.0129
DQB(-8)	-0.062551	0.097087	-0.644276	0.5204
DQB(-9)	-0.025516	0.100562	-0.253730	0.8000
DQB(-10)	-0.042449	0.102447	-0.414354	0.6792
DQB(-11)	0.053232	0.101654	0.523657	0.6013
DQB(-12)	0.191070	0.097109	1.967587	0.0509
R-squared	0.199525	Mean dependent var		42.33413
Adjusted R-squared	0.131511	S.D. dependent var		2467.373
S.E. of regression	2299.412	Akaike info criterion		18.39880
Sum squared resid	8.09E+08	Schwarz criterion		18.66019
Log likelihood	-1522.300	Hannan-Quinn criter.		18.50490
F-statistic	2.933583	Durbin-Watson stat		1.982043
Prob(F-statistic)	0.000777			

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.006724	Prob. F(12,141)	0.4460
Obs*R-squared	13.17916	Prob. Chi-Square(12)	0.3562

Case 2: Dependent variable is LQB  
 1.2 Engle-Granger Method: LQB (EQ11 and EQ12)

Dependent Variable: LQB  
 Method: Least Squares  
 Sample: 1997M01 2011M12  
 Included observations: 179

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-11.07806	1.552283	-7.136627	0.0000
LPB	2.485542	0.194206	12.79850	0.0000
R-squared	0.480636	Mean dependent var		8.778851
Adjusted R-squared	0.477702	S.D. dependent var		0.910855
S.E. of regression	0.658276	Akaike info criterion		2.012726
Sum squared resid	76.69901	Schwarz criterion		2.048340
Log likelihood	-178.1390	Hannan-Quinn criter.		2.027167
F-statistic	163.8017	Durbin-Watson stat		0.431961
Prob(F-statistic)	0.000000			

Dependent Variable: DLQB  
 Method: Least Squares  
 Sample (adjusted): 1998M02 2011M09  
 Included observations: 164 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.029170	0.027802	1.049213	0.2958
RES11(-1)	-0.118125	0.044141	-2.676061	0.0083
DLQB(-1)	-0.441526	0.082833	-5.330311	0.0000
DLQB(-2)	-0.018478	0.090475	-0.204234	0.8384
DLQB(-3)	-0.046529	0.089806	-0.518103	0.6052
DLQB(-4)	-0.089609	0.090131	-0.994200	0.3217
DLQB(-5)	-0.053327	0.089808	-0.593793	0.5535
DLQB(-6)	-0.184899	0.085004	-2.175173	0.0312
DLQB(-7)	-0.345395	0.084664	-4.079598	0.0001
DLQB(-8)	-0.103292	0.088619	-1.165580	0.2456
DLQB(-9)	0.059745	0.088572	0.674531	0.5010
DLQB(-10)	-0.036129	0.088531	-0.408090	0.6838
DLQB(-11)	-0.038504	0.088350	-0.435808	0.6636
DLQB(-12)	0.095858	0.077626	1.234872	0.2188
R-squared	0.353719	Mean dependent var		0.015574
Adjusted R-squared	0.297707	S.D. dependent var		0.410146
S.E. of regression	0.343715	Akaike info criterion		0.783491
Sum squared resid	17.72096	Schwarz criterion		1.048113
Log likelihood	-50.24623	Hannan-Quinn criter.		0.890917
F-statistic	6.315154	Durbin-Watson stat		1.979246
Prob(F-statistic)	0.000000			

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.271325	Prob. F(12,138)	0.2422
Obs*R-squared	16.32542	Prob. Chi-Square(12)	0.1768

Method 2: DOLS

Case 3: Dependent variable is QB

2.1 Engel-Granger QB (EQ15) & Cointegration Test: Engle-Granger QB

Method: Dynamic Least Squares (DOLS)

Date: 07/20/12 Time: 10:23

Sample (adjusted): 1997M03 2011M11

Included observations: 177 after adjustments

Cointegrating equation deterministics: C

Fixed leads and lags specification (lead=1, lag=1)

Long-run variance estimate (Bartlett kernel, Newey-West fixed bandwidth = 5.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
PB	6.358035	1.227968	5.177686	0.0000
C	-10116.75	3830.538	-2.641077	0.0090
R-squared	0.394011	Mean dependent var		9194.568
Adjusted R-squared	0.379918	S.D. dependent var		6668.695
S.E. of regression	5251.284	Sum squared resid		4.74E+09
Durbin-Watson stat	0.218802	Long-run variance		1.13E+08

Cointegration Test - Engle-Granger

Date: 07/20/12 Time: 10:22

Equation: UNTITLED

Specification: QB PB C

Cointegrating equation deterministics: C

Null hypothesis: Series are not cointegrated

Automatic lag specification (lag=0 based on Schwarz Info Criterion, maxlag=12)

	Value	Prob.*
Engle-Granger tau-statistic	-3.155096	0.0828
Engle-Granger z-statistic	-20.01492	0.0490

\*MacKinnon (1996) p-values.

Intermediate Results:

Rho - 1	-0.111815
Rho S.E.	0.035440
Residual variance	6163361.
Long-run residual variance	6163361.
Number of lags	0
Number of observations	179
Number of stochastic trends**	2

\*\*Number of stochastic trends in asymptotic distribution.

Engle-Granger Test Equation:

Dependent Variable: D(RESID)

Method: Least Squares

Date: 07/20/12 Time: 10:22

Sample (adjusted): 1997M02 2011M12

Included observations: 179 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID(-1)	-0.111815	0.035440	-3.155096	0.0019

Case 4: Dependent variable LQB  
 2.2 DOLS LQB Engel-Granger QB (EQ16)

Dependent Variable: LQB  
 Method: Dynamic Least Squares (DOLS)  
 Sample (adjusted): 1997M03 2011M11  
 Included observations: 176 after adjustments  
 Cointegrating equation deterministics: C  
 Fixed leads and lags specification (lead=1, lag=1)  
 Long-run variance estimate (Bartlett kernel, Newey-West fixed bandwidth = 5.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LPB	2.583970	0.398142	6.490068	0.0000
C	-11.84672	3.184806	-3.719761	0.0003
R-squared	0.501517	Mean dependent var		8.791210
Adjusted R-squared	0.489857	S.D. dependent var		0.909627
S.E. of regression	0.649695	Sum squared resid		72.17979
Durbin-Watson stat	0.413693	Long-run variance		1.632440

2.3 Cointegration Test Engle-Granger LQB

Cointegration Test - Engle-Granger  
 Date: 07/20/12 Time: 10:33  
 Equation: EQ16  
 Specification: LQB LPB C  
 Cointegrating equation deterministics: C  
 Null hypothesis: Series are not cointegrated  
 Automatic lag specification (lag=1 based on Schwarz Info Criterion, maxlag=12)

	Value	Prob.*
Engle-Granger tau-statistic	-2.977623	0.1210
Engle-Granger z-statistic	-17.79714	0.0786

\*MacKinnon (1996) p-values.

Intermediate Results:

Rho - 1	-0.138596
Rho S.E.	0.046546
Residual variance	0.143211
Long-run residual variance	0.076235
Number of lags	1
Number of observations	176
Number of stochastic trends**	2

\*\*Number of stochastic trends in asymptotic distribution.

Engle-Granger Test Equation:  
 Dependent Variable: D(RESID)  
 Method: Least Squares  
 Date: 07/20/12 Time: 10:33  
 Sample (adjusted): 1997M03 2011M09  
 Included observations: 175 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID(-1)	-0.138596	0.046680	-2.969054	0.0034
D(RESID(-1))	-0.370603	0.070826	-5.232622	0.0000
R-squared	0.231076	Mean dependent var		-0.002680
Adjusted R-squared	0.226632	S.D. dependent var		0.431565
S.E. of regression	0.379524	Akaike info criterion		0.911567
Sum squared resid	24.91871	Schwarz criterion		0.947736
Log likelihood	-77.76213	Hannan-Quinn criter.		0.926238
Durbin-Watson stat	2.031517			

Method 3: Partial Adjustment  
Case 1: Dependent variable is QB  
1.3 Partial Adjustment Model QB (EQ09)

Dependent Variable: QB  
Method: Least Squares  
Sample (adjusted): 1997M02 2011M12  
Included observations: 179 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1393.179	813.6832	-1.712188	0.0886
DUBEEF	-11167.99	2212.484	-5.047718	0.0000
QB(-1)	0.883404	0.030955	28.53843	0.0000
PB	0.836188	0.307485	2.719440	0.0072
R-squared	0.893600	Mean dependent var		9146.169
Adjusted R-squared	0.891776	S.D. dependent var		6654.516
S.E. of regression	2189.160	Akaike info criterion		18.24252
Sum squared resid	8.39E+08	Schwarz criterion		18.31374
Log likelihood	-1628.705	Hannan-Quinn criter.		18.27140
F-statistic	489.9144	Durbin-Watson stat		2.085262
Prob(F-statistic)	0.000000			

And reject the hypothesis of no autocorrelation of residuals:

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.741432	Prob. F(2,173)	0.4779
Obs*R-squared	1.521254	Prob. Chi-Square(2)	0.4674

Case 2: Dependent variable is LQB  
 2.1 Partial Adjustment Model LQB (EQ10)

Dependent Variable: LQB  
 Method: Least Squares  
 Sample (adjusted): 1997M02 2011M12  
 Included observations: 177 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3.007366	1.050019	-2.864106	0.0047
LQB(-1)	0.778105	0.043381	17.93647	0.0000
LPB	0.621724	0.158821	3.914616	0.0001
R-squared	0.820826	Mean dependent var		8.788678
Adjusted R-squared	0.818766	S.D. dependent var		0.910898
S.E. of regression	0.387783	Akaike info criterion		0.960064
Sum squared resid	26.16540	Schwarz criterion		1.013897
Log likelihood	-81.96563	Hannan-Quinn criter.		0.981896
F-statistic	398.5611	Durbin-Watson stat		2.598695
Prob(F-statistic)	0.000000			

Dependent Variable: LQB  
 Method: Least Squares  
 Sample (adjusted): 1997M03 2011M09  
 Included observations: 175 after adjustments  
 Convergence achieved after 10 iterations  
 MA Backcast: 1997M02

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.539374	0.734191	-2.096696	0.0375
LQB(-1)	0.894515	0.033502	26.70027	0.0000
LPB	0.309868	0.115582	2.680934	0.0081
AR(1)	-0.443502	0.164740	-2.692141	0.0078
MA(1)	0.016010	0.193020	0.082945	0.9340
R-squared	0.848294	Mean dependent var		8.794876
Adjusted R-squared	0.844724	S.D. dependent var		0.910933
S.E. of regression	0.358954	Akaike info criterion		0.816908
Sum squared resid	21.90410	Schwarz criterion		0.907330
Log likelihood	-66.47944	Hannan-Quinn criter.		0.853586
F-statistic	237.6465	Durbin-Watson stat		1.984197
Prob(F-statistic)	0.000000			
Inverted AR Roots	-.44			
Inverted MA Roots	-.02			

We cannot reject the hypothesis of no autocorrelation of residuals.

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.112022	Prob. F(2,168)	0.8941
Obs*R-squared	0.233068	Prob. Chi-Square(2)	0.8900

## Appendix 2

An alternative method to explore the effect of exports of beef and soybeans and tax revenue collection uses distributed lags. To test whether XBEEF and XSOY have any impact on tax revenue collection at constant prices (TAXREAL), we run the following regression:

Dependent Variable: TAXREAL				
Method: Least Squares				
Date: 07/06/12 Time: 15:15				
Sample (adjusted): 1997M04 2011M12				
Included observations: 177 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2829.191	132.4115	21.36666	0.0000
XBEEF(-1)	-0.026936	0.286278	-0.094091	0.9251
XBEEF(-2)	0.307507	0.379407	0.810493	0.4188
XBEEF(-3)	1.010793	0.285841	3.536209	0.0005
XSOY(-1)	0.060007	0.057942	1.035636	0.3018
XSOY(-2)	0.183009	0.079876	2.291148	0.0232
XSOY(-3)	-0.090690	0.058992	-1.537319	0.1261
R-squared	0.641217	Mean dependent var	4536.861	
Adjusted R-squared	0.628554	S.D. dependent var	1528.639	
S.E. of regression	931.6498	Akaike info criterion	16.55054	
Sum squared resid	1.48E+08	Schwarz criterion	16.67615	
Log likelihood	-1457.722	Hannan-Quinn criter.	16.60148	
F-statistic	50.63739	Durbin-Watson stat	1.672192	
Prob(F-statistic)	0.000000			

The effect of XBEEF and XSOY on TAXREAL can be approximated as:

$$\frac{\partial TAXREAL}{\partial XBEEF} \sim 1.29$$

$$\frac{\partial TAXREAL}{\partial XSOY} \sim 0.15$$

An alternative approximation is to estimate the same tax revenue collection equation using the Almon lag (polynomial distributed lag) procedure<sup>38</sup>:

Dependent Variable: TAXREAL
Method: Least Squares
Date: 07/06/12 Time: 15:29
Sample (adjusted): 1997M04 2011M12
Included observations: 177 after adjustments

<sup>38</sup> See EViews7: User's Guide (2009), pp24.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2832.901	137.6035	20.58741	0.0000
PDL01	-0.161362	0.192425	-0.838573	0.4029
PDL02	-0.137448	0.209411	-0.656354	0.5125
PDL03	0.373911	0.183415	2.038603	0.0430
PDL04	0.131335	0.035817	3.666862	0.0003
PDL05	0.091364	0.040187	2.273485	0.0242
PDL06	-0.094944	0.037095	-2.559454	0.0114
R-squared	0.644064	Mean dependent var		4536.861
Adjusted R-squared	0.631502	S.D. dependent var		1528.639
S.E. of regression	927.9458	Akaike info criterion		16.54257
Sum squared resid	1.46E+08	Schwarz criterion		16.66818
Log likelihood	-1457.017	Hannan-Quinn criter.		16.59351
F-statistic	51.26909	Durbin-Watson stat		1.716901
Prob(F-statistic)	0.000000			
Lag Distribution of XBEEF				
	i	Coefficient	Std. Error	t-Statistic
. *	0	0.35000	0.24369	1.43624
* .	1	-0.16136	0.19242	-0.83857
. *	2	0.07510	0.18864	0.39811
. *	3	1.05938	0.24911	4.25262
Sum of Lags		1.32312	0.10202	12.9697
Lag Distribution of XSOY				
	i	Coefficient	Std. Error	t-Statistic
* .	0	-0.05497	0.04920	-1.11744
. *	1	0.13133	0.03582	3.66686
. *	2	0.12776	0.03535	3.61394
* .	3	-0.06571	0.04983	-1.31871
Sum of Lags		0.13841	0.04906	2.82142

The SUM of LAGS estimate is very close to the approximation of the effect of XBEEF and XSOY using three lags estimated above.

## Appendix 3

### Table on Taxes on production by sector

% of GDP	2003	2004	2005	2006	2007	2008	2009	2010
Agriculture	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Cattle	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
Forestry	0,0	0,0	0,1	0,1	0,0	0,0	0,0	0,0
Fishing	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Minery	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Meat production	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Production of vegetable oils	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Dairy production	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Milling and baking	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Sugar	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Other foods	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Beverages and Tobacco	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Textile and clothes	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Leather and footwear	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Wood industry	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Paper and paper products	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Petroleum refinery	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Chemical products	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Manufacturing on non-metal products	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Manufacturing of common medal products	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Manufacturing of common medal products	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Manufacturing of other products	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Electricity and Water	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Construction	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Trade	0,1	0,1	0,2	0,2	0,1	0,1	0,1	0,1
Transportation	0,2	0,2	0,4	0,3	0,2	0,2	0,2	0,3
Communication	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Financial intermediation	0,3	0,3	0,7	0,6	0,3	0,4	0,4	0,5
Housing rental	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Services to businesses	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
restaurants and hotels	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Services to households	0,0	0,0	0,1	0,1	0,1	0,1	0,1	0,1
Government services	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
<b>Sectoral total</b>	<b>0,7</b>	<b>0,8</b>	<b>1,8</b>	<b>1,5</b>	<b>0,8</b>	<b>0,9</b>	<b>0,9</b>	<b>1,1</b>
Taxes on products	8,2	9,1	8,8	9,0	9,2	9,4	9,7	10,5
<b>TOTAL</b>	<b>9,0</b>	<b>9,9</b>	<b>10,6</b>	<b>10,5</b>	<b>10,0</b>	<b>10,3</b>	<b>10,7</b>	<b>11,6</b>

Source: Central Bank of Paraguay.

## Chapter 3. Evolution and Composition of Tax Revenue in Paraguay, Effects of the Tax Reform of 2004, by Osvaldo Schenone

### Executive Summary

This study analyzes why tax revenue in Paraguay barely exceeded 13 percent of GDP in 2011—only a modest increase from the 10 percent collected in 1994—despite the tax reforms of 1992 and 2004. Tax revenue today in Paraguay is, along with Ecuador and Guatemala, among the lowest in Latin America as a share of GDP.

The analysis focuses on the design of tax policy. Evasion and deficient administration are other important factors to consider, but are beyond the scope of this study.

#### 1. Situation prior to the tax reform of Law 2421/04.

2012 is the 20th anniversary of the 1992 tax reform (Law 125/91), which defined the tax system until the passage of Law 2421/04. Following Law 125/91, four taxes generated more than 90 percent of total revenue: the value-added tax (VAT), corporate income tax (personal income tax did not exist), selective consumption taxes and customs import duties.

Total revenue never exceeded 11.5 percent of GDP, and stabilized at around 10.5 percent of GDP between 1996 and 2003.

**A) Agricultural income tax (*impuesto sobre la renta del sector agropecuario—IMAGRO*).** The IMAGRO rate was 0.9 percent of the official land valuation. The largest sector of the Paraguayan economy paid almost nothing, since official land values were much lower than the real values. For example, a 100 hectare property in Oveido had a 1997 official value of G. 116,691 per hectare and paid on 80 hectares, meaning that the annual IMAGRO payment was G. 101,517, or less than US\$3 per month.

**B) Commerce, industry and services income tax (*impuesto sobre la renta de las actividades de comercio, industrias y servicios—IRACIS*).** The general tax rate was 30 percent, but re-invested profits were subject to a 10 percent rate. Foreign companies paid 35 percent. In 1994, the recently-created IRACIS generated 2 percent of GDP in revenue. Ten years later, revenue had declined to 1.6-1.7 percent of GDP, from a maximum of 2.22 percent in 1995.

**C) Value-added Tax (VAT).** Almost immediately after its adoption, the VAT of Law 125/91 produced more than 40 percent of total tax revenues from a rate of 10 percent, one of the lowest rates in Latin America, exceeding only Panama's 5 percent rate.

**D) Selective consumption taxes (*impuestos selectivos al consumo—ISC*).** These taxes applied to tobacco, alcohol, alcohol for fuel and fuels derived from petroleum. The immediate effect of the adoption of these taxes was approximately 1 percent of GDP, two-thirds of which was generated by fuel taxes. By the end of the 1990s, these taxes generated revenues equal to about 1.3 percent of GDP, half of which came from fuels.

## **2. The reform of Law 2421/04.**

Law 2421, passed on 5 July 2004, was an ambitious and broad reform, modifying exemptions to the VAT, ISC and customs duties, creating a personal income tax, replacing the Single Tax with an income tax for small payers and modifying both the IRACIS and IMAGRO.

**A) Creation of the personal income tax (PIT).** The creation of a PIT according to Law 2421 was repeatedly postponed and did not enter into effect until 1 January 2013, according to Law 4.064/10, Art. 38. Individuals and small associations will pay the tax, and the taxable base will be on activities generating Paraguayan personal income. The rate is 10 percent on net income above 10 minimum monthly salaries and 8 percent on net income between three and 10 minimum monthly salaries. Income below three minimum monthly salaries is exempt.

**B) Creation of income tax for small payers (*impuesto sobre la renta para pequeños contribuyentes*—IRPC).** The IRPC taxes net income equal to 30 percent of gross income with a rate of 10 percent. This tax substitutes the Single Tax (which itself replaced the VAT and PIT), freeing single-person companies from the PIT and permitting access to a simplified VAT. It establishes an annual maximum income of G. 100 million to remain in this system.

**C) Agricultural income tax (*impuesto sobre la renta del sector agropecuario*—IMAGRO).** The official valuation of a property is no longer used as the basis for determining the tax and a net income criterion is used instead, although a system for properties with a surface area of less than a certain number of hectares is still used in some areas of the country. In 2005-2011 revenue practically disappeared.

**D) Commerce, industry and services income tax (*impuesto sobre la renta de las actividades de comercio, industrias y servicios*—IRACIS).** Law 2421/04 reduced the tax rate on company profits to 20 percent in 2005 and 10 percent as of 2006. A rate of 5 percent is additionally applied to distributed profit, or 15 percent on profits distributed abroad.

IRACIS revenue rose from 2 percent to 2.5 percent of GDP (reaching a maximum of 3 percent in 2009) after enacting Law 2421, despite the rate reduction. Although not as dramatic as the VAT performance, IRACIS also showed a favorable trend, with revenues rising 25 percent as a share of GDP in seven years.

Law 2421/04 also modified Law 60/90, establishing that exonerations of taxes on profits, sending dividends abroad, interests, commissions and capital will only apply to foreign investment of at least US\$5 million, and the taxes on these dividends and profits would not be a fiscal credit by the investor in the country of origin. In the previous tax system, no conditions on minimum investment amount or lack of fiscal credit in country of origin existed.

**E) Value-added Tax (VAT).** The VAT has continued to increase collections (40 percent in seven years) and is, as a result, the tax that caused total collections to rise from 12 percent of GDP before the reform to 13.2 percent of GDP in 2011.

While the 10 percent rate is maintained, a differential rate of 5 percent is now also used for: a) transfer of assets and the sale of property; b) sale of goods making up the family consumption basket (rice, noodles, yerba mate, cooking oils, milk, eggs, uncooked meat, flour, salt and pharmaceutical products); and c) interests, commissions and charges on loans and financing.

The Fuel Regime also incorporates a differential rate and an exemption from VAT. In import and sales transactions of fuel alcohol, pure alcohol, biodiesel, gasoline and gasoil with sulfur content above 2000 ppm, a VAT rate of 20 percent is applied. For petroleum derivatives, import and sale of fuels and crude continue to be exempt from VAT since the VAT that was supposed to be applied since 1 January 2009 is still suspended.

**F) Selective consumption taxes (*impuestos selectivos al consumo*—ISC).** Law 2421/04 modified the tax rates and expanded the list of goods covered by the ISC.

**G) Customs Import Duties.** Customs duties are a part of the country's external trade policy and trade agreements, such as Mercosur, and as such should be considered as separate from tax policy. Consequently, the 2004 reform did not introduce changes and collections remained between 1.5 and 2 percent of GDP before and after the reform.

### 3. Conclusions and Recommendations

While the reform of Law 125/91 increased collection from 8 percent of GDP in 1991 to nearly 12 percent of GDP in 1995 due to the introduction of the VAT—an increase of nearly 50 percent in five years—the reform of Law 2421/04, by contrast, only raised collection from 12 percent to 13.2 percent in seven years.

While the reform of 1991 exploited the opportunity of introducing the VAT, the reform of 2004 did not exploit any new revenue-generating opportunities.

The most important opportunity to improve collection and overall economic efficiency, without which reform efforts will necessary have few significant results, is taxation of the agricultural sector. This sector contributes 5 to 6 percent of tax collections, despite generating more than 25 percent of GDP. Without an IMAGRO that collects a share of tax proportionate to the size of the sector in the economy, and without eliminating the VAT exemption on sector products, tax collections as a share of GDP will continue to evolve slowly, as has occurred in the past 20 years.

The main recommendations and an estimation of the collection impacts that available information permits are presented in the Executive Summary Table. The collection impacts that could not be estimated due to the lack of data are indicated with a positive or negative sign, according to whether they would increase or reduce tax collection.

Executive Summary Table

Recommendations	Estimated Collection Impact (percent of GDP)
<p><b>PIT</b></p> <p>Applying Law 4064/10—two impacts on collection: 1) the direct impact of PIT collection itself; and 2) the indirect impact of greater collection in other taxes due to the higher degree of formalization in the economy.</p>	1.0
<p><b>IMAGRO</b></p> <p>1) Eliminate the categories of large and medium properties. Establish for all contributors (apart from small contributors with less than 20 hectares in the eastern region or 100 hectares in the western region) the obligation of paying the tax through a mechanism of gross income minus expenses.</p> <p>2) Eliminate the deduction for cattle ranching loss of life up to 3 percent of the value of the cattle without requiring proof.</p> <p>3) Eliminate the deduction of personal and family expenses and investments.</p> <p>4) Eliminate the deduction for expenses on neighboring properties.</p>	<p>+</p> <p>+</p> <p>+</p> <p>+</p>
<p><b>IRACIS</b></p> <p>1) Permit the deduction of fiscal losses during the subsequent five years</p> <p>2) Replace the 1 percent regimen for import-assembly businesses (<i>maquila</i>) and tax profits identical to those of other businesses.</p> <p>3) Eliminate the benefits of Law 60/90 for dividends and profits and interest payments abroad.</p>	<p>-</p> <p>0.01</p> <p>+</p>
<p><b>VAT</b></p> <p>1) Terminate the suspension of VAT application to fuel imports.</p> <p>2) Eliminate the 5 percent VAT.</p> <p>3) Eliminate VAT exemptions for the agricultural sector.</p> <p>4) Eliminate VAT exemptions on interest charges.</p>	<p>0.30</p> <p>0.29</p> <p>0.33</p> <p>0.25</p>
<p><b>ISC</b></p> <p>1) Determine the tax base on public sale price and not on the factory price, at least in the case of cigarettes.</p> <p>2) Eliminate the tax on assets now charged at the 1 percent rate.</p> <p>3) Tax auto imports at 10 percent.</p>	<p>+</p> <p>-</p> <p>+</p>
<p><b>Import Duties</b></p> <p>Eliminate the exemptions on capital imports (Law 60/90) and primary materials (primary materials regime).</p>	0.15

## Introduction

This study analyzes why tax revenue in Paraguay barely exceeded 13 percent of GDP in 2011, a modest increase from the 10 percent collected in 1994, despite the tax reforms of 1992 and 2004.

Tax revenue today in Paraguay is, along with Ecuador and Guatemala, among the lowest in Latin America as a share of GDP (Table 3.1).

The analysis focuses on the design of tax policy. Evasion and deficient administration are other important factors to consider, but are beyond the scope of this study.

While Paraguay and Ecuador had similar GDP per capita levels during 2000-2011, only above Bolivia, and face similar tax pressures (less than Bolivia) over the same period, opportunities exist in Paraguay that have not been taken advantage of, as will be discussed in this study.

**Table 3.1: Tax Revenues in Latin America (percent of GDP) and Per Capita GDP (in US\$)**

Country	GDP per capita (2000)	Before Law 2421/04 (2000)	After Law 2421/04		GDP per capita (2011)
			(2008)	(2010)	
Argentina*	7733	18.1	25.5	25.9	10945
Bolivia	998	12.3	19.0	24.5	2315
Brazil**	3762	20.0	26.7	25.5	12789
Chile	5174	16.3	18.6	19.9	14278
Colombia	2480	11.2	13.5	17.7	7132
Ecuador	1275	10.2	12.5	n.d.	4424
<b>Paraguay</b>	<b>1335</b>	<b>10.8</b>	<b>12.4</b>	<b>13.5</b>	<b>3252</b>
Peru	2116	12.3	15.6	15.6	5782
Venezuela	4845	8.6	13.5	n.d.	10610
Uruguay	6914	15.2	17.1	n.d.	13914
Average		13.5	17.4	20.4	

\*Not including social security

\*\*Including sub-national governments

Source: (1) Zarate, W., Efectividad de la Política Tributaria en Paraguay. Antes y después de la reforma (CADEP, January 2010) Annex VII, p. 39. (2) Zarate, W., Análisis del sistema tributario Paraguayo (CADEP, March 2011) Table 1, p. 6. GDP from IMF World Economic Outlook.

## 1. Situation Prior to Tax Reform Law 2421/04

2012 is the 20th anniversary of the tax reform implemented in 1992 (Law 125/91). This law defined the Paraguayan tax system until the passage of Law 2421/04.

Following Law 125/91, four taxes generated more than 90 percent of total revenue: the value-added tax (VAT), corporate income tax (personal income tax did not exist), selective consumption taxes and customs import duties. Total revenue never exceeded 11.5 percent of GDP, and stabilized at around 10.5 percent of GDP between 1996 and 2003.

The value-added tax (VAT) was adopted with Law 125/91, and immediately became the highest collecting tax in Paraguay (about half of revenue), replacing the sales tax that had never achieved even 1 percent of GDP in revenue. The reform of Law 125/91 did not include a personal income tax, the incorporation of the agricultural sector and fuels in the VAT, nor the application of the VAT on all sectors of the economy.

Despite the omissions in Law 125/91, tax collection rose from 8 percent of GDP in 1990 to 11.45 percent in 1995 (Table 3.2). This increase was almost completely due to revenue increases from the VAT. However, by 1995 collections had stagnated and never again in the 1990s reached 11 percent of GDP, and was around 10 percent during 2000-2003.

**Table 3.2: Paraguay: Tax Collection 1990-2003 (percent of GDP)**

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
IRACIS	1.14	1.14	1.37	1.43	1.97	2.22	2.16	1.94	1.93	n.d.	1.80	1.60	1.70	1.60
IMAGRO	-	-	-	-	-	-	0.06	0.09	0.09	n.d.	0.10	0.10	0.10	0.00
IVA	-	-	1.35	3.42	3.98	4.33	4.11	4.54	4.51	n.d.	4.70	4.60	4.40	4.70
ISC (Fuels)	0.88	0.89	0.90	0.84	0.81	0.84	0.98	0.80	0.67	n.d.	1.30	1.60	1.20	1.70
ISC (Other)	0.56	0.56	0.35	0.26	0.34	0.36	0.41	0.50	0.61	n.d.	0.60	0.60	0.60	0.40
Customs	1.70	1.78	1.65	1.63	1.85	2.70	2.16	2.22	2.16	n.d.	1.90	1.80	1.60	1.60
Other taxes	3.76	4.35	2.93	1.08	1.04	1.00	0.87	0.83	0.77	n.d.	0.50	0.40	0.40	0.30
Total	8.04	8.72	8.55	8.66	9.99	11.45	10.75	10.92	10.74	n.d.	10.90	10.70	10.00	10.3

Sources: (1) Secretaría de Estado de Tributación. (2) Shome, P., Haindl, E., Schenone, O. and Spahn, P. "Paraguay: Estrategia de la Reforma del Sistema Tributario" (IMF, Public Finance Department, April 1999), Table 2, p. 19. (3) Varsano, R, Fenochietto, R. and Agostini, C., Paraguay:

### **Agricultural income tax (*impuesto sobre la renta del sector agropecuario*—IMAGRO)**

Prior to the reform of Law 125/91, the agricultural sector had been practically exempt from income tax. While the law established a legal basis for taxing the sector, for several reasons it was not applied until 1996.

The law established tax payments based on official property valuations. For all properties small than 100 hectares, the first 20 hectares were exempt from income tax. The total number of contributors was estimated in 1996 at 5,862, an amount susceptible to manageable oversight.<sup>39</sup>

Gross income was presumed to be equal to 12 percent of official property valuation (not counting forest and lake areas), and expenses were assumed to be 70 percent of gross income (of which 30 percent was to be demonstrated with receipts containing VAT on inputs). In consequence, net income was equivalent to 3.6 percent of official valuation (assuming that the farmer or rancher had sufficient VAT input receipts). Net income was taxed at 25 percent; hence the IMAGRO was equal to 0.9 percent of the property's official valuation.

Estimates made with data from 1997 (when IMAGRO collections were 0.09 percent of GDP) demonstrate the deficient collection performance of this tax. That year the agricultural sector generate value added equivalent to 21.4 percent of GDP. Discounting salaries, workers' own income and profits declared by agricultural firms, agricultural income was almost 15 percent of GDP. With IMAGRO collections at 0.09 percent of GDP, the average taxation in the sector was approximately 0.6 percent of agricultural income (Table 3.3).<sup>40</sup>

**Table 3.3: Paraguay: IMAGRO Collection 1996-2003 ( percent of GDP)**

Year	1996	1997	1998	1999	2000	2001	2002	2003
IMAGRO	0.06	0.09	0.09		0.10	0.10	0.10	0.00

Source: Table 2.

The reason why the largest sector of the Paraguayan economy was not contributing significantly is that official valuations are far from the actual economic value of properties. A property of 100 hectares in Oviedo, one of the best in the country, had a 1997 official valuation of G. 116,691 per hectare and paid tax on 80 hectares, totaling G. 9,335,280, resulting in an annual IMAGRO of G. 101,517, or less than US\$3 per month.

A 2,000 hectare property in Villa Ygatimi, in the Canindeyu department, had a 1997 official valuation of G. 126,777 per hectare, or a total valuation of G. 253,554,000, with an IMAGRO of G. 2,281,986 per year or a bit more than US\$67 a month.

In 1999 the official valuation of all registered rural properties, with a total surface area of 36.37 million hectares, was less than US\$650 million, or about US\$18 per hectare.<sup>41</sup>

<sup>39</sup> Spahn, P. Haindl, E. and Schenone, O. "Paraguay: Perfeccionamiento del Sistema Tributario" (IMF Public Finance Department, March 1996), Table 2, p. 29.

<sup>40</sup> Ibid., p. 30.

<sup>41</sup> Ibid. Table 8, p. 32.

## Commerce, industry and services income tax (impuesto sobre la renta de las actividades de comercio, industrias y servicios—IRACIS)

IRACIS<sup>42</sup> taxes Paraguayan income from commercial, industrial and service business that are not personal in nature. Applying a territorial principal on the source of income reduces the tax base, by not taxing income by businesses or people in Paraguay obtained in another country, and also due to the difficulty of controlling evasion as it incentivizes declaring income actually generated in Paraguay as foreign-earned.

Contributors are single-person companies, associations with or without legal standing, including public companies and people domiciled abroad, and branches, agencies or establishments in the country and cooperatives as defined by law.<sup>43</sup>

The general tax rate is 30 percent, while re-invested income is subject to a 10 percent rate. Foreign companies pay 35 percent.

In 1994, with the IRACIS recently implemented, collection amounted to 2 percent of GDP. Ten years later collection had declined to 1.6-1.7 percent of GDP, with a maximum collection of 2.22 percent in 1995 (Table 3.4).

**Table 3.4: Paraguay: IRACIS Collection 1994-2003 (percent of GDP)**

Year	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
IRACIS	1.97	2.22	2.16	1.94	1.93		1.80	1.60	1.70	1.60

Source: Table 2.

Laws 60/90 (on capital investment) and 1064 of 1997 (on tax regime for assembly plants, or *maquilas*) are the two sources of erosion to IRACIS collections. The first establishes an income tax discount of 95 percent for five years on all investments defined by Law 60/90. During the 1990s, the Investment Council approved more than 3,100 projects to benefit from this regime.<sup>44</sup> The *maquila* regime replaced 30 percent IRACIS payments with a 1 percent rate on the difference in value between exports and imports of *maquila* companies.

### Value-added tax (VAT)

The VAT of Law 125/91 produced more than 40 percent of total tax collections almost immediately after being introduced with a rate of 10 percent, one of the lowest rates in Latin America, above only Panama (5 percent).

However, from the start the VAT has been subject to exemptions that have limited revenue collection as well as economic efficiency. The most significant exemptions are applied to: (1) fuels derived from petroleum and the import of crude oil; (2) unrefined agricultural products; (3) investments protected by Law 60/90 as fiscal incentives; (4) goods imported by investors for the

<sup>42</sup> IRACIS is regulated by Law 195/91, Art. 1 to 25, with modifications introduced by Law 2421/04 and Decree 6359/05.

<sup>43</sup> Law 438/94.

<sup>44</sup> Shome, P., Haindl, E., Schenone, O. and Spahn, P., op. cit., p. 22.

initial installation process; and (5) the import-for-export regime (known as “the tourism regime”), which applies a fraction of the VAT rate (50, 20 or 2 percent) for imported goods supposing that 50, 80 or 98, respectively, of those goods are exported without any VAT credit. The exemptions with the greatest negative impact on collections are the first two, as the other three replace (imperfectly) normal procedures for applying VAT on sales and recognize, simultaneously, a VAT credit to the purchaser (when this is subject to taxation; that is, is not the final consumer or exporter).<sup>45</sup>

The first two exemptions lead to collection losses proportional to the value of exempted goods (agricultural and fuel) that are sold to final consumers. Since crude oil is not a final consumption product, this exemption did not generate any collection loss (VAT that would be paid on crude imports would be immediately credited when paying the VAT on fuels, without any collection impact).

A 1999 estimate indicated that the collection loss attributed to the agricultural sector equaled approximately 0.5 percent of GDP in 1997.<sup>46</sup>

### **Selective consumption taxes (*impuestos selectivos al consumo*—ISC)**

These taxes cover tobacco, alcoholic beverages, fuel alcohol and petroleum-based fuels.

The rates established by Law 125/91 for tobacco products were 8 and 7 percent, according to whether they were cigarettes or other products; 8 percent for beverages with low alcohol content (less than 2 percent) and beer, and 10 percent for other alcoholic beverages. Alcohol for fuel was taxed at 5 percent, and alcohol for unspecified uses at 10 percent. Petroleum-based fuels were taxed at the following rates:

Etanol	0 percent
Unleaded gasoline	45 percent
Regular gasoline	41 percent
Premium gasoline	39.5 percent
Gas oil	10.57 percent
Fuel oil	10 percent
Kerosene	10 percent

The immediate revenue impact of the adoption of these taxes by Law 125/91 was approximately 1 percent of GDP, two-thirds of which was generated by fuel taxes.

At the end of the 1990s these taxes generated approximately 1.3 percent of GDP in revenue, half of which came from fuel taxes.

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<sup>45</sup> The tourism regime is a simplified version of the draw-back or temporary admission systems, although it is an alternative of dubious quality. The tourism regime is, in practice, equivalent to implicitly recognizing a type of geographically unlimited free zone in the entire Paraguayan territory. A true free zone, with strictly limited territory in which goods are admitted from and to other countries without customs duties or VAT, would avoid needing to assume the fraction of which imports are consumed locally. As these values are necessarily inexact, the system allowed in consumption products without VAT to varying degrees according to different products.

<sup>46</sup>Shome, P., Haindl, E., Schenone, O. and Spahn, P., op. cit., Table 22, p. 52.

## 2. Tax reform of law 2421/04

Law 2421, approved 5 July 2004, was an ambitious and far-reaching reform that modified VAT exemptions, consumption taxes and customs duties, created a personal income tax, replaced the Single Tax with a small contributors' income tax and modified IRACIS and IMAGRO.

This reform was presented as a simplification of Paraguay's tax system using a "10-10-10" formula: 10 percent VAT for all products (including soya, which is a commercial product) and services; 10 percent income tax for income above 10 minimum salaries and 10 percent corporate income tax (agriculture, industry and services). The revenue collection increase on implementing these reforms completely was estimated at 1.5 percent of GDP.<sup>47</sup>

Despite the many aims of the law, revenue collection of the main taxes has stayed practically flat (Table 3.5), with the exception of the VAT, which has continued increasing collection (up 40 percent in seven years) and is, as a result, the cause of total collection rising from 12 percent of GDP prior to the reform to 13.2 percent in 2011. Although less notable than the performance of the VAT, IRACIS has also showed a favorable evolution, increasing as a share of GDP by 25 percent in seven years.

**Table 3.5: Paraguay: Tax Revenue 2004-2010 (percent of GDP)**

	2004	2005	2006	2007	2008	2009	2010	2011
IRACIS	2.0	2.0	1.9	2.0	2.1	3.0	2.4	2.5
IMAGRO	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1
IVA	4.9	5.4	5.6	5.7	6.0	6.2	6.9	6.9
ISC (Fuels)	2.0	1.5	1.6	1.6	1.4	1.5	1.3	1.3
ISC (Other)	0.5	0.5	0.6	0.5	0.5	0.6	0.6	0.6
AA Taxes	1.9	1.9	1.8	1.4	1.4	1.5	1.8	1.7
Other Taxes	0.4	0.5	0.6	0.2	0.1	0.1	0.1	0.1
<b>Total</b>	<b>11.8</b>	<b>11.8</b>	<b>12.1</b>	<b>11.4</b>	<b>11.5</b>	<b>12.9</b>	<b>13.1</b>	<b>13.2</b>

Sources: (1) Departamento de Estudios y Estadísticas Tributarias –DPTT--SET. (2) Zarate, W., Análisis del sistema tributario Paraguayo (CADEP, March 2011) Table 3, p. 10 and Annex 3, p. 23.

<sup>47</sup> Borda, D., "Paraguay: Resultado de las reformas (2003-2005) y sus perspectivas". *Informes y estudios especiales (CEPAL, Santiago de Chile, January 2007)*.

One important characteristic of the period after the 2004 reform is the increase in the number of taxpayers. Between 2004 and 2011 the number of small contributors doubled, while the number of large contributors stayed roughly flat (Table 6).

### Creation of the personal income tax (PIT)

The creation of a PIT according to Law 2421 has been repeatedly postponed<sup>48</sup> and, according to Law 4.064/10, Art. 38, will come into effect on January 1, 2013.

**Table 3.6: Small and Large Taxpayers, 2000-2011**

<b>Year</b>	<b>Small Taxpayers</b>	<b>Large Taxpayers</b>	<b>Total</b>
2000	235,234	748	235,982
2001	249,363	794	250,157
2002	267,222	823	268,045
2003	283,236	872	284,108
2004	301,459	903	302,362
2005	328,495	947	329,442
2006	383,509	971	384,480
2007	428,889	992	429,881
2008	470,528	990	471,518
2009	513,011	987	513,998
2010	556,964	980	557,944
2011	603,629	973	604,602

*Source:* Sub-Secretaría de Estado de Tributación (SET).

PIT taxpayers are individuals and simple associations, and income from Paraguayan sources that come from the realization of activities that generate personal income will be subject to taxation. These include:

- a) Remuneration (habitual or accidental, of any type) for the exercise of professions, arts or other occupations and providing personal services of any type, independently or in relation to a company, whatever the denomination of the benefit or remuneration or type of contract. Also taxed is all remuneration received by the owner, shareholders, managers, directors and other higher-level personnel of corporations or entities for services rendered, and remuneration from public service, elective or not, habitual, occasional, permanent or temporary.
- b) Fifty percent of dividends, profits and excesses obtained by shareholders or partners in entities that undertake activities covered by IRACIS or IMAGRO, distributed or accredited.
- c) Capital gains derived from the occasional sale of property, rights, shares, titles or capital quotas.
- d) Interests, commissions or returns on capital.

<sup>48</sup> Law 248 of 1971 is possibly the most remote ancestor of a PIT in Paraguay. It could not be applied because the law was only in force for only a few months before being suspended indefinitely.

The following deductions are permitted:

- a) Legal discounts for contributions to the Institute of Social Security or the Pension and Retirement Funds created by law or decree.
- b) Donations to the state, municipalities and religious entities recognized by competent authorities and entities with legal character for social, educational, cultural, charity or beneficial assistance, recognized by the administration as organizations of public benefit.
- c) All expenses and investments directly related to the taxed activity in the case of physical individuals, when this is a real, documented expenditure at market prices.
- d) All personal and family expenses and investments incurred by individual taxpayers for sustenance, education, health, clothing, housing and holidays, as long as the expense is legally documented according to existing tax regulations.
- e) For individuals not paying into obligatory social security, up to 15 percent of gross income each tax period. This deduction is by legal assumption and requires no justification from the taxpayer.

For the first year the tax is in force, individuals with net income below 10 minimum salaries a month (or 120 minimum monthly salaries a year) are not subject to the tax. This exemption will gradually be reduced by one minimum salary per year until a level of three minimum salaries per month (or 36 per year).

The 10 percent rate is applied on net income above 10 monthly minimum salaries, while an 8 percent rate is applied to net income between 3 and 10 monthly minimum salaries and net income below three monthly salaries is exempt.

The most novel characteristic of the tax, compared to PIT in most countries, is that the deduction indicated in d) means that, automatically, net income taxed by PIT is equivalent only to the part of personal income that has not been consumed (neither by occupational activity or in the family of the taxpayer) and properly documented.

This means that taxable net income will only be positive in the case of families that do not consume (and properly document) all of their income, independent of each family's wealth. Unlike most countries, in which PIT revenue derives from workers employed by companies (who cannot evade taxes as they are withheld from their salaries), in Paraguay the majority of revenue comes from taxpayers who cannot properly document their consumption, independent of their status as a dependent or independent worker.

The explicit purpose of this peculiar PIT design in Paraguay is, above all, to induce formalization in the economy, combat evasion, and generate greater revenue from all taxes, not necessarily the PIT in particular. The evasion that has been quantified in Paraguay corresponds to the VAT. This remains high, as much as 54 percent of potential revenue collection (or 117 percent of actually collected revenue) for 2006.<sup>49</sup> If economic

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<sup>49</sup> Garzón, Hernando; *Paraguay: La brecha de Evasión del IVA*, November 2007, mimeo.

formalization promoted by PIT reduced evasion only by a 20<sup>th</sup>, VAT revenue would increase by almost 6 percent, or 0.4 percent of GDP.

Although solid data is not available to precisely estimate PIT revenue, available information suggests collection of approximately 0.65 percent of GDP (Table 3.7).

**Table 3.7: Estimated PIT Revenue Collection (billions of 2011 G. and percent of GDP)**

Data and Assumptions	Estimated Revenue
<b>I. Source of Taxable Net Income: Distribution of Profits and Dividends</b>	
(a) IRACIS collected: 2540	
(b) Profits subject to IRACIS: $2540/0.145 = 17517$	
(c) Net profits of IRACIS: $(b)-(a) = 14\ 977$	
(d) Taxable gross income: 50 percent of (c)= 7488	
(e) Taxable net income: Assuming deduction of 1/3 value of (d) with documentation= 5000	
Estimated PIT collection (10 percent rate)	500 (0.50 percent of GDP)
<b>II. Source of Taxable Net Income: Personal Work</b>	
(f) Participation of work remuneration in GDP:  percent GDP = 30000	
(g) Taxable net income: Assuming deductions of 95 percent of the value of (f) with documentation=1500	
Estimated PIT collection (10 percent rate)	150 (0.15 percent of GDP)

Sources: (1) Central Bank of Paraguay, Sistema de Cuentas Nacionales (November 2011), Table 3.5.1, p. 84, (2) Secretaría de Estado de Tributación and own calculations.

Estimated revenue collection from the adoption of the PIT, taking into account the direct effects calculated in Table 7 (0.65 percent of GDP) and the indirect effect of reducing VAT evasion (0.4 percent of GDP), is approximately 1 percent of GDP.

**Creation of income tax for small taxpayers (*impuesto sobre la renta para pequeños contribuyentes*—IRPC)**

The IRPC taxes at 10 percent presumed net income equal to 30 percent of gross income. This tax substitutes the Single Tax (which had a rate of 4 percent on gross income and replaced the VAT and income tax). It frees single-person companies from the income tax regime and allows access to the simplified VAT regime. It increases the annual limit of income to stay within this regime from G.52 million to G.100 million.

The IRPC of Law 2421/04 requires that all small taxpayers also pay under the regular VAT regime, thus incorporating a great number of small taxpayers without adding large taxpayers (Table 6), which makes tax administration more difficult. As well, those not using the Single Tax should do so with the aim of being able to print official receipts.

While the number of taxpayers subject to the Single Tax grew at almost 4 percent a year over the final years the system was in force, the number of IRPC contributors grew at about 10 percent per year between 2006 and 2011 (Table 3.8).

**Table 3.8:** Number of Single Tax and IRPC Contributors, 2003-11 (thousands)

	2003	2004	2005	2006	2007	2008	2009	2010	2011
Single Tax	118.0	123.4	127.0	133.1	-	-	-	-	-
IRPC	-	-	-	-	150.6	169.0	184.3	199.6	215.7

Source: Secretaría de Estado de Tributación.

### **Agricultural income tax (*impuesto sobre la renta del sector agropecuario*—IMAGRO)**

After the 2004 reform, several different tax-paying systems exist:

- (1) The so-called “Large Properties”, that individually or jointly have a usable agricultural area (*superficie agropecuaria útil*—SAU)<sup>50</sup> greater than or equal to 300 hectares in the eastern region or 1500 hectares in the western region can choose to pay using either a “simplified” or “accounting” regime. Taxpayers using less than 30 percent of their property can only pay the tax using the “presumed regime”.
- (2) Properties with an SAU less than 300 hectares or 1500 hectares, according to region, can choose pay the tax under any of the three regimes (simplified, accounting or presumed).
- (3) Individuals with property equal or less than 20 or 100 hectares SAU in the eastern or western regions, respectively, are exempt from IMAGRO.

The simplified regime calls for paying the tax on the difference between income and expenses. The IMAGRO rate for this regime is 10 percent.

<sup>50</sup> To determine the SAU, deduct from total property area the following surfaces:

- Spaces occupied by natural forest, permanent or semi-permanent cultivation and wetlands.
- Areas not appropriate for productive use, such as rocky areas, estuaries or salt flats.
- Protected wildlife areas.
- Areas occupied by routes, roads or thoroughfares.
- Areas destined for environmental services declared by authorities.

The accounting regime consists in paying IMAGRO based on accounting results. In this regime, apart from incurred and documented expenses, payers can also deduct:

- Deprecation of female cattle as of the second year of life, equal to 8 percent of the animal's value.
- Die offs in cattle ranching up to 3 percent of the cattle value without the need for proof.
- Depreciation of machinery and installation improvements.
- In the case of individuals, all personal and family expenses.
- The direct costs for assistance to individual property owners on small neighboring farms up to 20 percent of gross income.
- 

The regime's rate is 10 percent.

The presumed regime calls for paying the tax based on multiplying SAU by a "index of soil productivity" (which depends on geographic location of the property and the goods produced) by the market production price (which is determined annually by the Ministry of Agriculture and Ranching). Taxpayers under this regime pay 2.5 percent.

Table 3.9 summarizes the different IMAGRO regimes.

The VAT corresponding to the purchase of goods and services directly related to production constitutes a fiscal credit that is charged directly to the IMAGRO since 2005. The amount of VAT from one fiscal year is carried over to the next until it is completely used up. As of 2012 the accumulated VAT had not been used up, even though the VAT fiscal credit against IMAGRO was eliminated by Decree 238 in September 2008.

**Table 3.9: IMAGRO Payment Regimes**

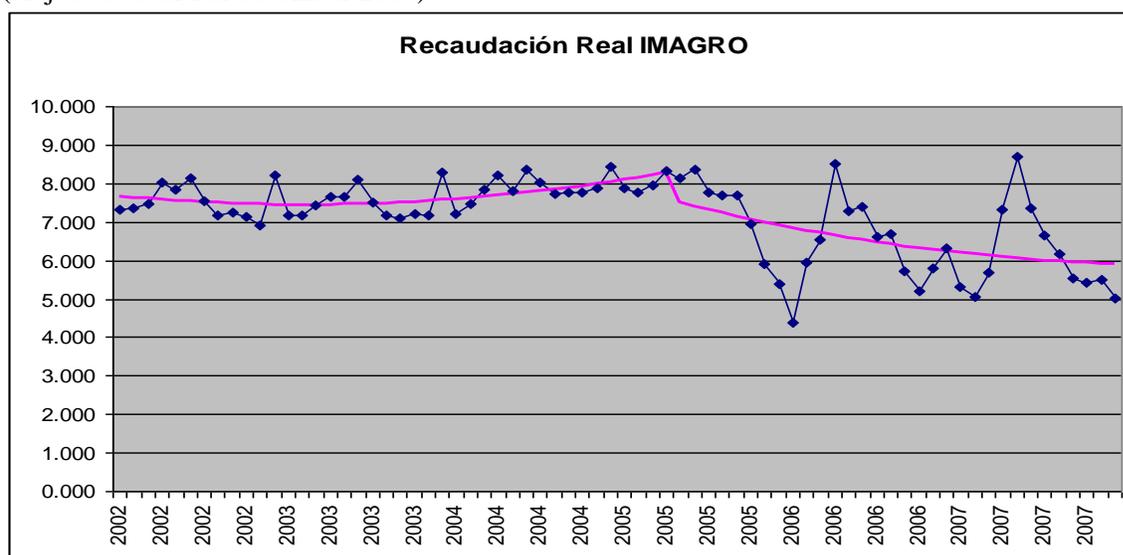
Taxpayer	<b>Simplified Regime (IMAGRO rate=10 percent)</b>	Accounting Regime (IMAGRO rate=10 percent)	Presumed Regime (IMAGRO rate=2.5 percent)
<b>Large Properties</b> SAU>300 hectares in eastern region or SAU>1500 hectares in western region	<b>Accepted *</b>	Accepted	Accepted only if less than 30 percent of the property is used
<b>Medium Properties</b> 20<hectares<300 in the eastern region or 100<hectares<1500 in the western region	<b>Accepted</b>	Accepted	Accepted
Individuals with SAU<20 hectares in the eastern region or SAU<100 hectares in the western region	<b>Exempt from IMAGRO</b>	Exempt from IMAGRO	Exempt from IMAGRO

\* This regime will not be accepted after 2012.

The VAT credit against IMAGRO is one of the factors contributing to the low or almost nil IMAGRO revenue and the fact that official tax declarations result in a positive balance to the taxpayer.

In 2005, the curve representing revenue on this tax in real terms shows an inflection point and, rather than remaining constant (which would anyway represent a very modest revenue level of 0.1 percent of GDP up to 2005), begins to decline to the point of almost disappearing after 2005 (Figure 3.1).

**Figure 3.1: Paraguay: Real IMAGRO Revenue**  
(Adjusted to CPI of december 2007)



Source: Varsano, R, Fenochietto, R. y Agostini, C., Paraguay: Diagnostico del Sistema Impositivo Post Ley 2421/04 (IMF Public Finance Department, September 2008), p. 31.

The number of IMAGRO taxpayers doubled between 2005 (when the VAT credit against IMAGRO began) and 2011, even though the IMAGRO revenue continued at a very low and declining level (Table 3.10).

**Table 3.10: Number of IMAGRO Taxpayers, 2003-2011 (thousands)**

	2003	2004	2005	2006	2007	2008	2009	2010	2011
IMAGRO	27.4	28.3	33.5	37.9	58.4	60.4	64.7	67.0	69.2

Source: Secretaría de Estado de Tributación.

An IMF study indicates that, for 2008, “eliminating the computation of the VAT as a credit against IMAGRO, the revenue of the tax after the second year (when the VAT credit balance in favor of taxpayers is used up) would be equivalent to 0.75 percent of GDP.”<sup>51</sup>

Another way to calculate the effect of the VAT credit against IMAGRO is to use the value of the agriculture sector inputs purchased by VAT taxpayers, which were estimated for 2007-09 in a previous study (Annex Table 1).<sup>52</sup> The value of these purchases was between G.1,120 billion and G. 3,900 billion (on average, G. 2,338 billion) in 2007. As such, the value of VAT credited against IMAGRO was G. 2,338 billion, or 0.36 percent of GDP. Using the same calculations for 2008 and 2009 results in 0.41 percent of GDP and 0.43 percent of GDP, respectively.

Although these estimates are not exact, they indicate that the magnitude of revenue sacrifice imposed by the VAT credit against IMAGRO is between 40 and 75 times the actual revenue collected from IMAGRO.

These estimates suggest that the enactment of Decree 238 in September 2008 would not have had revenue effects in the near future, since for several more years taxpayers would be able to use the credit against IMAGRO generated prior to 2008.

However, in 2012 Decree 8279/12 suspended the crediting of unused VAT balances against IMAGRO. This credit had been granted by Law 2421/04 only to owners of medium properties, but later Decree 5069/05 extended the benefits also to large properties. These latter were the principal beneficiaries of the regime, as they had accumulated practically all of the VAT amounts eligible to be credited against IMAGRO. Decree 8279/12 has the same legal standing as Decree 5069/05 and removes the benefits from owners of large properties.

Despite the historic importance of the agricultural sector in the Paraguayan economy, revenue collection from sector income is very low. The sector represents one-fifth of GDP at constant prices, while IMAGRO only contributes 1/100th of tax revenue generated by companies.<sup>53</sup> Tables 11 and 12 show the disproportionately low share of the agricultural sector in tax revenue. Table 11 refers to all agricultural sector taxes, not just IMAGRO, and Table 12 shows the share of sectors in GDP. Figures 2 and 3 illustrate the data from the tables to show the disproportion of the agricultural sector’s contributions to tax revenue and GDP.

This situation is not substantially different from the tax system prior to Law 195/91. Although taxation based on official land valuations was replaced by the regimes of Law 2421/04, the agricultural sector is still contributing an insignificant rate on its income, well below other economic sectors.

**Table 3.11: Tax Revenue by Economic Activity, 2007-11\* ( percent of total SET revenue)**

Economic Activity	2007	2008	2009	2010	2011

<sup>51</sup> Varsano, R, Fenochietto, R. and Agostini, C., Paraguay: Diagnostico del Sistema Impositivo Post Ley 2421/04 (IMF Public Finance Department, September 2008), p. 31.

<sup>52</sup> Schenone, O., El Gasto Tributario en Paraguay (World Bank, August 2010), Annex 1, p. 25.

<sup>53</sup> IMAGRO, IRACIS, IRPC and Single Tax on the *maquila* sector.

<b>Agriculture, Ranching, Hunting and Fishery</b>	<b>5.0</b>	<b>4.8</b>	<b>6.4</b>	<b>5.4</b>	<b>6.4</b>
Manufacturing Industry	21.8	21.7	21.1	24.5	21.8
Electricity, Gas and Water Supply	6.7	5.5	4.3	2.8	3.1
Wholesale and Retail Trade	25.0	29.7	29.0	28.6	29.5
Transport, Storage and Communications	12.1	11.7	11.4	11.9	10.7
Financial Intermediation	12.0	8.9	12.4	10.1	11.3
Real Estate	8.0	9.2	7.9	7.7	7.8
Public Administration, Defense, Obligatory Social Security	3.5	3.2	2.8	4.0	4.4
Other	5.9	5.3	4.7	5.0	5.0
Total	100	100	100	100	100

Other: Secretaría de Estado de Tributación.

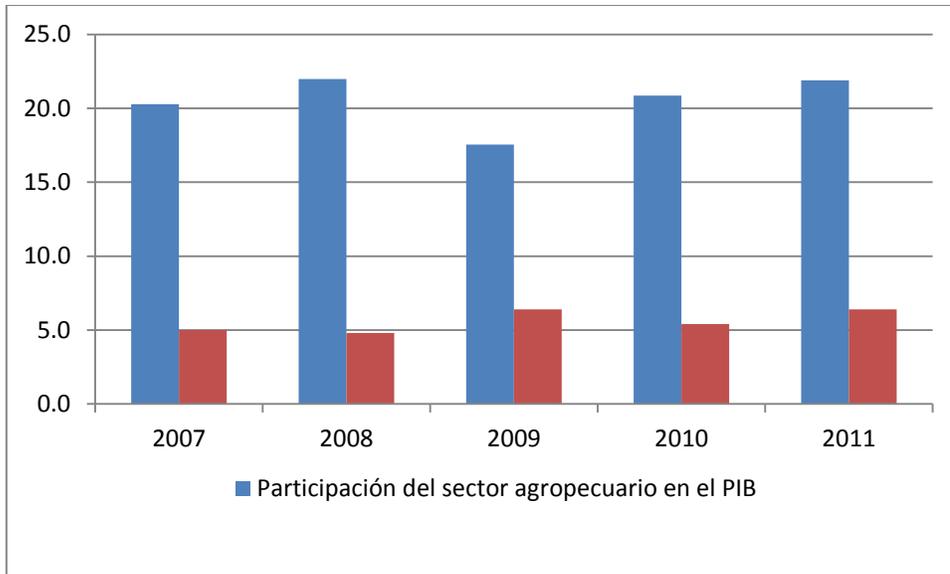
\* This data does not include Customs revenue.

**Table 3.12: Share of Economic Sectors in GDP (2007-11)**

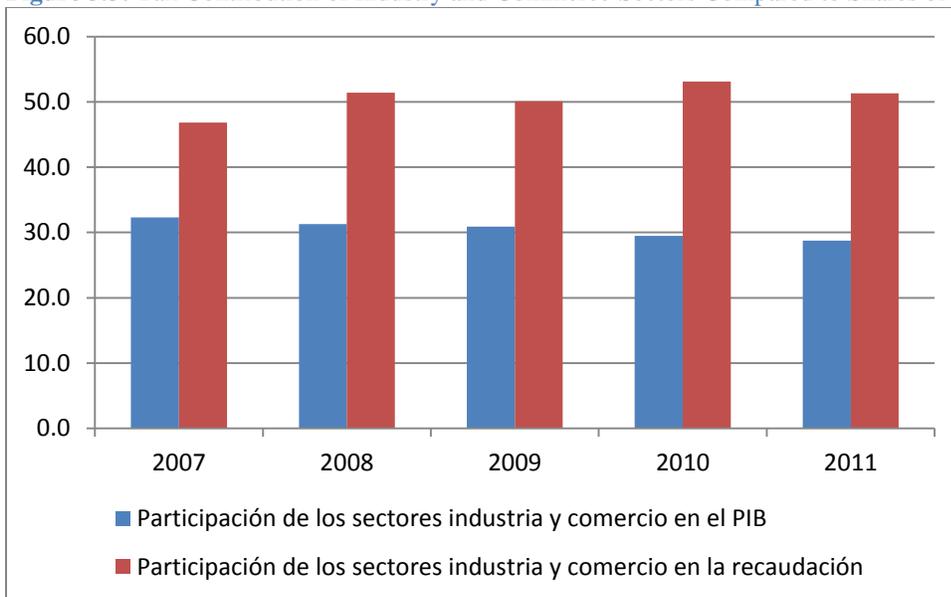
	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>
<b>Agropecuario</b>	20.27	21.97	17.54	20.86	21.89
<b>Explotación forestal</b>	1.67	1.56	1.65	1.37	1.55
<b>Pesca</b>	0.07	0.06	0.06	0.05	0.05
<b>Minería</b>	0.11	0.12	0.15	0.13	0.14
<b>Industria</b>	12.85	12.54	12.94	12.23	11.87
<b>Construcción</b>	5.32	6.10	6.52	6.73	6.39
<b>Electricidad y agua</b>	1.70	1.44	1.53	1.32	1.23
<b>Transportes</b>	4.37	4.09	4.12	3.45	3.27
<b>Comunicaciones</b>	3.54	2.92	3.15	2.85	2.81
<b>Comercio</b>	19.48	18.76	17.94	17.24	16.88
<b>Finanzas</b>	2.50	3.21	3.53	3.91	4.32
<b>Viviendas</b>	1.09	1.00	1.10	0.96	0.90
<b>Servicios a las empresas</b>	2.28	2.19	2.58	2.37	2.35
<b>Hoteles y restaurantes</b>	1.07	1.05	1.11	1.07	1.12
<b>Servicios a los hogares</b>	5.31	5.05	5.80	5.18	5.24
<b>Gobierno general</b>	9.17	8.55	10.54	9.82	9.89
<b>Impuestos a los productos</b>	9.22	9.40	9.75	10.47	10.09
<b>TOTAL</b>	100.00	100.00	100.00	100.00	100.00

Source: Central Bank of Paraguay, Sistema de Cuentas Nacionales

**Figure 3.2: Tax Contribution of Agricultural Sector Compared to Share of GDP**



**Figure 3.3: Tax Contribution of Industry and Commerce Sectors Compared to Shares of GDP**



Commerce, industry and services income tax (*impuesto sobre la renta de las actividades de comercio, industrias y servicios—IRACIS*)

Law 2421/04 reduced the tax rate on company profits to 20 percent in 2005 and to 10 percent since 2006. An additional 5 percent is taxed on distributed profits. The headquarters, partners or shareholders domiciled abroad must pay an additional 15 percent on profits distributed out of the country.

The 5 percent dividend tax did not exist prior to the 2004 reform and the tax on non-domestic domiciled was 5 percent, with which the reduction in the rate for distributed profits was 15.5

points for residents (from 30 percent to 10 percent, plus 5 percent of the 90 percent of profits distributed after paying the 10 percent rate and 5.5 points for non-residents (from 30 percent plus 3.5 percent to 10 percent plus 4.5 percent plus 13.5 percent).

Neutrality between foreign and domestic shareholders required that the rates for foreigners be reduced, if the domestic rate were not to be raised. Nonetheless, reducing the rate could imply a transfer of income to foreign tax authorities without giving any relief to foreign shareholders, who would continue to pay the income tax of their respective countries. This transfer would occur if the shareholder resided in a country like Argentina or the United States, for example, that apply a principal of global income and offer credit for income taxes paid in Paraguay. The only achievement would be to reduce the credit against the income tax for these shareholders in their countries.

Table 3.13 summarizes the decrease in effective IRACIS rates after 2006, due to Law 2421/04.

**Table 3.13: Effective IRACIS Rates After 2006 and Law 2421/04**

Domicile of Taxpayer	Before Law 2421/04	After Law 2421/04	Effective Reduction (percentage points)
<b>In Paraguay</b>			
Before profit distribution	30 percent	10 percent	
<i>Plus:</i> Profit distribution	0 percent	5 percent over 90 percent=4.5 percent	
Total	30 percent	14.5 percent	15.5
<b>Abroad</b>			
Before profit distribution	30 percent	10 percent	
<i>Plus:</i> Profit distribution	5 percent over 70 percent=3.5 percent	5 percent over 90 percent=4.5 percent 15 percent over 90 percent=13.5 percent	
Total	33.5 percent	28 percent	5.5

As Table 3.5 indicates, IRACIS revenue collection rose from 2 to 2.5 percent of GDP since Law 2421 came into effect, reaching a maximum of 3 percent of GDP in 2009, despite the rate reduction. Unlike with IMAGRO, the increase in number of taxpayers for IRACIS went hand in hand with an increase in revenue (Table 3.14).

**Table 3.14: Number of IRACIS Taxpayers 2003-11 (thousands)**

	2003	2004	2005	2006	2007	2008	2009	2010	2011
IRACIS	96.0	101.6	116.9	135.8	149.2	162.1	175.0	187.1	203.8

Source: Secretaría de Estado de Tributación.

The fiscal loss in one tax period cannot be compensated with net income from future tax periods. This is not equitable, as taxpayers with identical income over the long term can pay different taxes according to the varying temporal distribution of their income. As well, in agricultural activity, IMAGRO taxpayers with what the law considers to be large properties can have losses in one period compensated for up to the next five years.

Law 2421/04 did not substantially modify the *maquila* regime. It only modifies Art. 29 of Law 1064/97, establishing that the 1 percent tax, which replaces IRACIS, should be applied on the added value in national territory or the value of receipts issued by the head office, whichever is larger. Before this modification the tax was applied on value added in the national territory, irrespective of the value of receipts. This modification does not resolve the anomaly of conferring to the *maquila* the privilege of not paying profit taxes, as all other business activities must.

The imports and exports of the *maquila* industry between 2001 and 2010 resulted in a value added in national territory equal to US\$148.43 million. This amount would translate into tax revenue of US\$1.48 million over the same period (Table 15). Because *maquila* companies do not have to declare their profits, it is not known exactly how much IRACIS these companies would have paid if they were not able to utilize the *maquila* regime. If profits were only a third of value added (certainly a conservative estimate), profits during 2001-10 would have been US\$49.5 million and IRACIS—with an effective rate of 14.5 percent—would have totaled US\$7.17 million, almost five times more than generated by the *maquila* regime (Table 3.15).

The tax expenditure tax expenditure from the *maquila* regime has been estimated at approximately 0.01 percent of GDP.<sup>54</sup>

<sup>54</sup> Schenone, O., El Gasto Tributario en Paraguay (World Bank, August 2010), Table 7, p. 13.

**Table 3.15: Maquila Regime (US\$ millions)**

Year	Exports	Imports	Value Added	Profit=1/3 of Value Added
2001	1.18	10.34		
2002	2.00	7.85		
2003	7.93	14.63		
2004	8.41	27.08		
2005	27.55	29.16		
2006	54.36	36.53		
2007	74.76	28.71		
2008	79.50	50.24		
2009	62.52	57.29		
2010	109.78	17.74		
Decade Total	427.99	279.57	148.42	49.5
<i>Maquila</i> Tax (1 percent)			1.48	
IRACIS (14.5 percent)				7.17

Law 2421/04 modified Law 60/90, establishing that the tax exemptions on profits and distributing dividends, interest, commissions and capital abroad would apply only to foreign investment of at least US\$5 million, and the tax on these dividends and profits was not fiscal credit for the investor in their country of origin. The previous regime established no minimum limit on the investment amount or the condition on fiscal credit in the country of origin.

### **Value-Added Tax (VAT)**

This tax continues to be the principal revenue source in the Paraguayan tax system, generating more than half of total revenue collection (Table 3.5). This performance is strengthened by the constant increase in the number of inscribed taxpayers (Table 3.16).

**Table 3.16: Number of VAT Taxpayers, 2003-11 (thousands)**

	2003	2004	2005	2006	2007	2008	2009	2010	2011
VAT	134.6	147.3	174.3	225.5	394.9	443.1	489.8	536.9	584.6

The VAT taxes the sale of goods (including property),<sup>55</sup> services (except those of personal character) and imports of goods. Unlike in other countries, which only tax sales charged, the VAT in Paraguay also covers free transfers (except inheritance).

All services undertaken in Paraguayan territory are taxed, independent of where the contract was closed, the residence or nationality of who is involved in the operation or the origin of the payment. Technical assistance is considered to be undertaken in national territory when it is utilized in the country. When services are provided by non-residents, the resident person or association is to retain the tax.

Those subject to the tax are individuals (when the gross income level from the previous year exceeds a certain level),<sup>56</sup> single-person companies and associations that undertake commercial, industrial or service activities.

The general rate is 10 percent. A 5 percent rate is applied to:<sup>57</sup> a) contracts transferring goods and property; b) transfer of the following goods from the basic consumption basket: rice, noodles, yerba mate, cooking oil, milk, eggs, uncooked meats, flour, salt and pharmaceutical products; and c) interests, commissions and charges on loans and financing.

Goods exports and international delivery services for exports are taxed at a zero rate.

The principal exemptions are: a) sale of unprocessed agricultural products; b) inheritance; c) sale and import of capital goods;<sup>58</sup> d) assignment of credit rights; e) sale of educational, cultural or scientific magazines as well as books and newspapers; f) interests on public or private securities, on deposits in banks or financial firms regulated by Law 861/96 and the lease of property and

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<sup>55</sup> In the transfer of property, it is presumed de jure that the minimum value added is 30 percent of the sale price (Art. 82, Law 125/81).

<sup>56</sup> Individuals working in university professions are responsible for VAT independent of their income, and all other individuals for personal services rendered when their gross income in the previous year exceeds one monthly minimum salary on average or when a receipt is issued above that same amount.

<sup>57</sup> Fiscal credit ceiling: Taxpayers applying a rate below 10 percent can use 100 percent of the fiscal credit up to cancelling the corresponding fiscal debt. Amounts exceeding this cannot be used in subsequent years nor can they be refunded, but are a cost for the taxpayer.

<sup>58</sup> Only the imported and produced by national manufacturers undertaken by the investors is exempt according to Law 60/90 of 26 May 1991. This law includes all types of capital goods. To avoid the accumulation effect, manufacturers have the same treatment as exporters for the market sale by unrecovered amounts of fiscal credit for the manufacture of those goods.

financial intermediation including loans from foreign banks (except the issuing of credit cards, administration of real estate security portfolios and debt collections, among others).

Other exemptions include: a) legally recognized political parties; b) social assistance, charity and scientific, literary, artistic, cultural or sporting instruction; c) mutual associations, federations, foundations, corporations and other legal entities; d) non-profit organizations dedicated to teaching recognized by the Ministry of Education and Culture or by national law; e) religious organizations, for acts exclusively related to religious services; and f) for-profit education organizations recognized by the Ministry of Education and Culture or national law for basic, secondary, technical, tertiary and university education.

No economically valid reasons exist to exempt interest charges nor for establishing a different rate for interests, commissions and charges for loans and financing. On the contrary, there are reasons for not creating the exemption when the financing is offered by the seller. The differential rate facilitates evasion by allowing the increase in interests (taxed at 5 percent) and reducing by the same amount the principal product (taxed at 10 percent). As a result, the differential rate for interests, commissions and charges should be eliminated and they should be taxed at 10 percent.

In accordance with Art. 83 of Law 2421/04, interests on financial institution deposits are exempt from VAT. The corresponding fiscal expense is estimated based on the interests paid by the banking sector, according to the Statistical Bulletin of the Bank Superintendency of the Central Bank of Paraguay.

In fact, tax expendituretax expenditure exists only for interests paid to those who are not VAT taxpayers, which includes not only individuals but also companies in exempt sectors. Even if the exemption did not exist, taxpayers would deduct the VAT on deposits in their own VAT declaration and, as such, the exemption does not result in any tax expendituretax expenditure for depositors who pay VAT.

As a result, to estimate the tax expendituretax expenditure it is necessary to distinguish deposits done by those who are and who are not VAT contributors. This data does not exist, but one can assume that 85 percent of deposits are done by VAT contributors. Under this assumption, the average tax expendituretax expenditure for 2008-11 was approximately 0.25 percent of GDP (Table 3.17).

**Table 3.17: Tax expenditure Estimate for Bank Interest Exemption, 2008-11 (billions G and percent of GDP)**

	Interests Paid (1)	Interests paid to VAT non- taxpayers: 15percent of (1)	Tax expenditure: VAT Exemption	Tax expenditure in percent of GDP
2008	13,342.5	2,001.0	200.1	0.27
2009	8,508.2	1,275.9	127.6	0.18
2010	13,173.4	1,976.1	197.6	0.22
2011	22,798.4	3,420.0	342.0	0.34

Source: Statistical Bulletin of the Bank Superintendency, Central Bank of Paraguay.

No economically valid reasons exist for the exemption on unprocessed agricultural products, either. The VAT exemption has three effects on collection. The first is to not tax the total value of domestic sales and, as a result, the taxable base is reduced. But the sales done by other people who do pay VAT do not result in a credit that these people can use as a deduction in determining the amount of VAT they have to pay. This is the second effect, which cancels part of the first. The third effect is that the purchase of inputs with VAT by producers of exempted goods does not result in a VAT deduction incorporated into the price of these inputs. This increases the taxable base.

The agricultural sector exemption is one of the largest tax expenditures and is, in part, responsible for the disproportionately low tax paid by the agricultural sector discussed above (Table 3.18).

**Table 3.18:** Estimate of Tax expenditure of VAT Exemption for the Agricultural Sector, 2004, 2006, 2008 and 2010 (billions G. and percent of GDP)

	2004	2006	2008	2010
(1)Agricultural sector sales	12,147.5	15,392.6	18,774.8	26,307.6
(2)Domestic sales of agricultural sector to VAT non-taxpayers	2,916.0	3,695.1	4,507.1	6,315.4
(3)Purchase of agricultural inputs with VAT	2,732.6	3,462.0	4,222.7	5,916.9
(4) The part of (3) that is not used in exported production	1,938.7	2,138.8	1,788.6	2,655.2
(5) Reduction in taxable base: (2) – (4)	977.3	1,556.3	2,718.4	3,660.2
Tax expenditure: (5) x 0.10	97.73	155.63	271.84	366.02
Tax expenditure as percent of GDP	0.24	0.30	0.37	0.42

Source: Central Bank of Paraguay and own calculations.

The 5 percent rate and VAT exemptions applied to various products are presumably intended to be in favor of the poorest. But these exemptions are a very inefficient way to achieve this, because the exemptions are enjoyed by all, rich and poor, in proportion to their respective consumption of exempted goods. Since the rich consume more than the poor, they capture the largest share of the relief intended for the poorest. For example, a poor family with five children that consumes half a kilo of meat in a meal is benefited 20 times less than a rich family that gives a party for friends where 10 kilos of meat is consumed. Obviously there are other ways to benefit this poor family without automatically benefiting a wealthy family 20 times more.

The 5 percent rate and VAT exemptions reduce the neutrality of the tax, impact economic efficiency, create opportunities for evasion and fraud and unnecessarily complicate tax administration. These negative effects are not worth attempting to impact income distribution

with rate reductions and exemptions that, in any case, do not deliver. A better solution would be to replace the 5 percent rate with a 10 percent rate for all products in the basic consumption basket and pharmaceuticals, and use the increased tax revenue on social programs focused exclusively on the poorest.

The national automobile regime utilized a differential VAT rate, with the import of vehicles and parts taxed at 2 percent. As well, VAT on the sale of nationally-produced vehicles (principally smaller motorcycles) was calculated on 20 percent of the sale price (which was also taxed at 2 percent). Decree 8686/12 cancelled these differential rates, and since the start of 2013 these transactions are taxed at the general 10 percent rate.

A differential VAT rate and exemptions were also applied to fuels. The import and sale of fuel alcohol, pure alcohol, biodiesel, gasoline and gas oil with a sulfur content above 2000 ppm paid VAT on 20 percent of the import or sale value. For petroleum derivatives, the import and sale of fuels and crude are still exempt from VAT since the application of VAT that was supposed to begin on 1 January 2009 remains suspended.

The fuels on which the VAT would be applied to 20 percent of the import value are not imported in Paraguay. The petroleum derivatives that are imported are illustrated in Table 19. The value taxable by VAT is the CIF value, plus customs duties (which is zero for fuels) and by the consumption tax (ISC) corresponding to each fuel.

The tax expenditure due to VAT exemption is the share of imports not utilized by VAT contributors who could have deducted them (for example, transport companies). The calculation assumes that 70 percent of gas oil is used by VAT contributors, who can deduct that in their own VAT declarations, while the rest of fuels are assumed to be used by final consumers. Hence, Table 19 uses the total taxable value of fuels that are not gas oil, plus 30 percent of the gas oil value, to estimate the tax expenditure. The tax expenditure of the fuel tax system averaged 0.3 percent of GDP during 2006-11.

**Table 3.19: Tax expenditure of VAT Exemptions to Petroleum-based Fuels, 2006-11 (billions G. and percent of GDP)**

	CIF Value		ISC		Taxable Value= CIF + ISC			Tax expenditure= Taxable Value x 0.1	
	Gas oil (30 percent)	Other	Gas oil (30 percent)	Other	Gas oil (30 percent)	Other	Total	Billions G.	percent GDP
2006	873.5	495.4	124.9	165.1	998.4	660.5	1658.9	165.9	0.3
2007	790.9	599.4	113.1	200.0	904.0	799.4	1703.4	170.3	0.3
2008	1332.6	868.2	190.6	289.4	1523.2	1157.6	2680.8	268.1	0.4
2009	1069.6	757.5	192.6	250.0	1262.2	1007.5	2268.7	226.9	0.3
2010	1049.4	1080.5	188.9	360.2	1239.3	1440.7	2680.0	268.0	0.3
2011	1296.7	1604.6	233.5	535.0	1530.2	2139.6	3669.8	370.0	0.4

Source: Dirección Nacional de Aduanas.

Estimates of the tax expenditure corresponding to VAT exemptions and reduced rates are summarized in Table 3.20.

**Table 3.20: Tax expenditure of VAT Exemptions and Reduced Rates, 2007-09 Average (percent of GDP)**

Tax expenditure	
Agricultural sector exemptions *	0.33
Interest exemptions **	0.25
Reduced rate (5 percent) ***	0.29
Fuel regime ****	0.30

\*Estimates for 2004, 2006, 2008 and 2010. Source: Table 3.18.

\*\* Estimates for 2008/2011. Source Table 3.17.

\*\*\* Average estimate for 2007/2009. Source: Schenone, O., El Gasto Tributario en Paraguay (World Bank, August 2010).

\*\*\*\* Estimates for 2006/2011. Source Table 3.19.

### Selective consumption taxes (*impuestos selectivos al consumo—ISC*)

This tax is on the import and first transfer of any type of perfume, food, cigarettes, tobacco, alcoholic drinks, jewelry, domestic appliances, musical instruments, toys, weapons and ammunition, cellular telephones and watches, among other products. The export of these goods is exempt from taxation.

The taxable basis is the factory sale price excluding the tax itself and VAT. For imports, the taxable amount is the value determined by customs, to which other taxes on the operation are added, excluding the tax itself and VAT.<sup>59</sup>

ISC revenue has stayed flat at around 2 percent of GDP, and foods represent approximately 70 percent of this tax's collections (Table 3.5). The number of taxpayers has also remained relatively stable between 2003 and 2011 (Table 3.21).

**Table 3.21: Number of ISC Taxpayers, 2003-11 (thousands)**

	2003	2004	2005	2006	2007	2008	2009	2010	2011
ISC	1.1	1.1	1.1	1.1	1.3	1.3	1.3	1.3	1.3

Source: Secretaría de Estado de Tributación.

Taking the factory price as the taxable base is difficult to control, since the producer can undervalue the factory price by creating a distributor to which the product is sold at artificially low prices. Because of this, many countries (including Guatemala, Peru and Argentina, among others) use the public sales price as the taxable base. In this case the difficulty comes in knowing

<sup>59</sup> In the case of taxed imported or nationally produced goods that serve as raw materials for goods made in the country, the credited tax from the previous period is considered as a pre-payment on the tax to be credited for the first transfer of the final good produced in the country. When this good is exported, it results in the right of repayment.

the price. In a free market, the price of any retailer can vary from the prices of others.<sup>60</sup> A common practice is to add an assumed margin to the factory price.

The ISC is commonly applied to few products (alcoholic and non-alcoholic drinks tobacco products, fuels and automobiles) at relatively high rates. In Paraguay, by contrast, it applies to many products at low rates (Table 22). The 1 percent rate generates insignificant revenue in relation to the cost of collection. As well, the highest rates in Paraguay are relatively low, such as for cigarettes and tobacco products, which are taxed at 12 percent compared to between 30 and 67 percent in other countries (for example, Argentina, Chile, Bolivia and Peru). As well, Paraguay's ISC does not cover automobiles, unlike most countries. In 2008 an IMF technical assistance mission recommended applying the ISC to automobiles at a 10 percent rate.<sup>61</sup>

**Table 3.22: ISC Rates**

Goods	Rate ( percent)
I. Fuels	
Gasoline 85	24
Gasoline 91	34
Gasoline 97	38
Other gasolines	50
Gas oil	18
II. Other goods	
Cigarettes, cigars, tobacco	12
Drinks up to 2 percent alcohol content	5
Beer	8
Cognac, gin, rum and other liquors	10
Champagne and equivalents	12
Denatured alcohol, distilled alcohol and others	10
Perfumes, cosmetics, jewelry, pearl, gold, watches, etc.	5
Air conditioners, dishwashers, washing machines and dryers, CD copiers, cellular telephones, etc.	1
Musical instruments, toys and recreational articles	1
Weapons and ammunition	5

<sup>60</sup> One exception is the cigarette market, where it is common for producers to fix or recommend a retail price.

<sup>61</sup> Varsano, R, Fenochietto, R. and Agostini, C., Paraguay: Diagnostico del Sistema Impositivo Post Ley 2421/04 (IMF Public Finance Department, September 2008), p. 51.

Source: Secretaría de Estado de Tributación

## Import customs duties

Customs duties are subject to the country's trade policy and trade agreements such as Mercosur, and hence should be considered exogenous to tax policy. Consequently, the 2004 reform did not introduce any changes and revenue has held steady, before and after the reform, at between 1.5 and 2 percent of GDP.

Because the external trade policy has its own goals (trade opening, international competitiveness, etc.), the tourist regime is not considered a generator of tax expenditures but rather a generator of transactions equivalent to exports. As such, VAT on the import of goods to be sold to individuals not residing in Paraguay is applied only to 15 percent of the value of imported goods.

The trade formalization regime also does not generate tax expenditures. As part of this regime, informational, electronic and telecommunications imports enjoy reduced import duties, agreed with other members of Mercosur. This is not a tax expenditure, but simply an adoption of duties lower than Mercosur's Common External Tariff for certain products.

The tax expenditure from import duties are in the exemptions given to the import of capital goods, according to Law 60/90, and the import of raw materials as per Decree 11.771 of 2000. The raw materials exemptions are concentrated mainly in manufacturing activity, and represented approximately 0.15 percent of GDP annually in 2003-11 (Table 3.23).

**Table 3.23:** Customs Duty Exemptions for the Import of Raw Materials, 2003-11 (millions G. and percent of GDP)

Year	Manufacturing Industry		Other Activities
	Millions G.	percent GDP	Millions G.
2003	52,464	0.15	13,209
2004	81,392	0.20	11,551
2005	53,921	0.12	2,216
2006	54,699	0.10	832
2007	73,875	0.12	1,116
2008	125,127	0.17	2,831
2009	95,432	0.13	5,244
2010	160,946	0.18	9,528
2011	154,838	0.15	6,525

Source: Dirección Nacional de Aduanas.

### 3. Conclusions and Recommendations

While the reforms of Law 125/91, especially the introduction of VAT, increased revenue collection from 8 percent of GDP in 1991 to almost 12 percent of GDP in 1995—an increase of nearly 50 percent in five years—the reforms of Law 2421/04, by contrast, raised collection only from 12 percent to 13.2 percent of GDP in seven years.

Nor did the composition of revenue collection change significantly after the 2004 reform: it is even more concentrated in VAT and IRACIS, and industry, commerce, transport and financial intermediation continue generating almost two-thirds of revenue (Table 3.24).

**Table 3.24: Composition of Tax Revenue**

Before the 2004 Reform	After the 2004 Reform
<b>1) Composition by tax (average 2000-04):</b>	<b>1) Composition by tax (average 2005-11):</b>
VAT 47.75 percent	IVA 53.29 percent
IRACIS 30.39 percent	IRACIS 36.50 percent
Others 21.86 percent	Others 10.21 percent
<b>2) Composition by economic activity (average 2000-04):</b>	<b>2) Composition by economic activity (average 2005-11):</b>
Manufacturing industries 27.43 percent	Manufacturing industries 18.61 percent
Wholesale and retail sales 13.77 percent	Wholesale and retail sales 26.24 percent
Financial intermediation 16.58 percent	Financial intermediation 10.82 percent
Electricity, gas and water 7.67 percent	Electricity, gas and water 3.62 percent
Transport 9.11 percent	Transport 9.94 percent
Pub. adm. and defense 6.69 percent	Pub. adm. and defense 3.55 percent
Agricultural sector 2.17 percent	Agricultural sector 5.29 percent
Other 16.58 percent	Other 21.93 percent

*Source:* Annex 1 (only including SET data and not customs collections).

While the 1991 reform exploited the opportunity of introducing the VAT, the 2004 reform did not exploit any new opportunities.

Modifications could improve the performance of several components of the Paraguay tax systems, as described in this section.

The most important change, without which efforts to reform the tax system will necessarily produce few significant results, is the taxation of the agricultural sector. Without an IMAGRO that collects taxes proportional to the share of the sector in GDP, and without eliminating the VAT exemption on sector products, tax revenue as a share of GDP will continue evolving slowly, as it has in the last 20 years.

Personal income tax (PIT)

Apply Law 4064/10.

### **Agricultural income tax (IMAGRO)**

- Eliminate the categories of large and medium properties. Require the all taxpayers (except for small owners with 20 hectares or less in the eastern region or 100 hectares or less in the western region) pay the tax through a mechanism using gross income minus income-related expenses.
- Eliminate the deduction for cattle deaths in ranching activity of up to 3 percent of the cattle value without requiring proof.
- Eliminate the deductions for personal and family expenses and investments by the taxpayer.
- Eliminate the deduction for expenses on neighboring farms.

### **Commerce, industry and services income tax (IRACIS)**

- Allow the deduction of fiscal losses for the following five years.
- Replace the 1 percent *maquila* regime, and instead treat *maquila* profits identically to the profits of any other company.
- Eliminate the benefits of Law 60/90 for dividends, profits and interest payments abroad.

### **Value-added Tax (VAT)**

- Terminate the suspension of VAT application on fuel imports.
- Remove the 5 percent VAT and apply a single 10 percent rate. This can be done gradually, increasing the rate to 7.5 percent the first year and 10 percent the second year.
- Eliminate the VAT exemption to the agricultural sector, and apply initially a 5 percent rate, then 7.5 percent the following year and finally 10 percent the year after that.
- Eliminate the VAT exemption on charged interest.

### **Selective consumption taxes (ISC)**

- Determine the tax base on the public sale price and not the factory sale price, at least in the case of cigarettes.
- Eliminate the tax for products now taxed at 1 percent
- Tax the sale and import of automobiles at 10 percent.

### **Customs Import duties**

- Eliminate exemptions on the imports of capital goods (Law 60/90) and raw materials (raw materials regime).

### **Annex 1. Revenue Collection by Economic Activity and Tax**

Includes only SET revenue and not revenue from customs authorities.  
In billions G. and percentages.

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Activities:

A: Agriculture

B: Fishing and related services

C: Mining and quarrying

D: Manufacturing industries

E: Electricity, gas and water

F: Construction

G: Wholesale and retail trade  
Hotels and restaurants

I: Transport, storage and communication

\* Includes "Obligatory Social Security Plans"

J: Financial intermediation

K: Real estate and rental

L: Pub. administration and def.\*

M: Education

N: Social services and health

O: Other community services

P: Private homes & domestic service H:

Q: Organizations

No Act.: No declared activity

2000

	IRACI S	IMAGR O	TU or IRP C	MA Q	VAT	ISC (other )	ISC (Comb )	Custom s	Othe r	TOTA L	Comp ( percent )
A	3.89	10.71	0.09	0	5.56	0.04	0	0	0.72	21.03	1.59
B	0	0	0	0	0	0	0	0	0	0	0
C	0.20	0	0	0	0.29	0	0	0	0	0.49	0.04
D	69.37	0.23	0.35	0	111.6 3	62.86	199.62	0	1.17	445.23	33.70
E	9.23	0	0	0	62.08	0	0	0	0	71.42	5.41
F	5.44	0	0.20	0	4.54	0	0	0	0.38	10.59	0.80
G	83.81	1.37	0.74	0	76.52	1.18	0	0	5.00	168.68	12.77
H	1.28	0	0	0	2.05	0	0	0	0.45	3.85	0.29
I	18.67	0	0.13	0	35.78	0	0	0.81	5.60	61.06	4.62
J	53.83	1.34	0.73	0	81.31	0	0	64.43	5.59	207.25	15.69
K	14.95	0.61	0.79	0	24.79	0	0	0.1	2.17	43.39	3.28
L	41.58	0	0	0	79.24	0	0	0	0.70	121.54	9.20

M	1.83	0	0	0	4.29	0	0	0	0.12	6.31	0.48
N	6.81	0.20	0.33	0	30.28	0	0	0	0.60	38.22	2.89
O	15.88	0	0.44	0	22.22	0	0	0	0.68	39.28	2.97
P	0	0	0	0	0.11	0	0	0	0	0.11	0.01
Q	0.33	0.16	0	0	1.00	0	0	0	0.09	1.62	0.12
No Act.	36.19	0.27	0.22	0	34.26	0	0	6.37	3.91	81.24	6.15
Total	363.30	15.04	4.24	0	575.94	64.14	199.62	71.78	27.28	1321.34	
Comp( percent )	27.50	1.14	0.32	0	43.59	4.85	15.11	5.43	2.07		100

Source: Secretaría de Estado de Tributación

2001

	IRACIS	IMAGRO	TU or IRPC	MAQ	VAT	ISC (other)	ISC (Comb)	Customs	Other	TOTAL	Comp ( percent)
A	5.35	10.59	0.09	0	4.86	0	0	0	1.00	21.93	1.63
B	0	0	0	0	0	0	0	0	0	0	0
C	0.17	0	0	0	0.25	0	0	0	0	0.42	0.03
D	76.84	0.27	0.37	0	108.72	73.59	185.81	0	2.83	448.43	33.27
E	9.61	0	0	0	94.42	0	0	0	0	104.15	7.73
F	6.13	0	0.19	0	6.94	0	0	0	0.31	13.61	1.01
G	70.76	1.20	0.88	0	73.20	5.25	0	0.11	4.66	156.05	11.58
H	1.08	0	0	0	2.02	0	0	0	0.52	3.70	0.28
I	15.63	0	0.12	0	30.73	0.45	0	2.67	4.77	54.46	4.04
J	62.79	1.21	0.77	0	90.63	1.45	0	66.56	5.97	229.39	17.02
K	12.62	0.53	0.59	0	24.35	0	0	0.14	2.08	40.32	2.99
L	39.96	0	0	0	78.63	0	0	0	0.79	119.40	8.86
M	1.76	0	0	0	4.26	0	0	0	0.14	6.29	0.47
N	6.55	0.23	0.35	0	30.05	0.12	0	0	0.68	37.96	2.82
O	15.26	0	0.47	0	22.05	0	0	0	0.77	38.64	2.87
P	0	0	0	0	0.11	0	0	0	0	0.11	0.01
Q	0.32	0.18	0	0	1.00	0	0	0	0.10	1.60	0.12
No Act.	28.26	0.19	0.33	0	33.77	0.56	0	5.31	2.86	71.27	5.29
Total	353.12	14.61	4.39	0	605.96	81.57	185.81	74.78	27.57	1347.81	
Comp( percent)	26.20	1.08	0.33	0	44.96	6.05	13.79	5.55	2.05		100

Source: Secretaría de Estado de Tributación

2002

	IRACIS	IMAGRO	TU or IRPC	MAQ	VAT	ISC (other)	ISC (Comb)	Customs	Other	TOTAL	Comp ( percent)
A	5.55	11.44	0.11	0	10.77	1.97	0	0	0.92	30.76	2.36
B	0	0	0	0	0	0	0	0	0	0	0
C	0	0	0	0	0.31	0	0	0	0	0.31	0.02
D	64.70	0.23	0.35	0	133.25	68.08	10.76	0	2.30	279.68	21.44
E	8.78	0	0	0	115.50	0	0	0	1.38	125.71	9.64
F	6.67	0	0.20	0	7.27	0	0	0	1.20	15.38	1.18
G	104.80	1.21	0.86	0	78.90	4.39	0	0	2.99	193.20	14.81
H	1.61	0	0	0	2.34	0	0	0	0.49	4.50	0.35
I	50.91	0	0.15	0	99.83	0	0	4.92	2.65	158.54	12.15
J	68.55	1.25	0.72	0	96.05	0	0	63.92	3.03	233.54	17.90
K	18.69	0.54	0.58	0	28.19	0	0	0	2.13	50.21	3.85
L	34.79	0	0	0	39.39	0	0	0	0.51	74.71	5.73
M	1.53	0	0	0	2.13	0	0	0	0.10	3.82	0.29
N	5.70	0.24	0.33	0	15.05	0	0	0	0.44	21.77	1.67
O	13.29	0	0.45	0	11.04	0	0	0	0.50	25.36	1.94
P	0	0	0	0	0	0	0	0	0	0	0
Q	0.28	0.19	0	0	0.50	0	0	0	0	1.07	0.08
No Act.	37.92	0.12	0.29	0	36.97	0.10	0	5.05	5.53	85.98	6.59
Total	423.81	15.44	4.26	0	677.53	74.60	10.76	74.04	24.23	1304.68	
Comp( percent)	32.48	1.18	0.33	0	51.93	5.72	0.82	5.68	1.86		100

Source: Secretaría de Estado de Tributación

2003

	IRACIS	IMAGRO	TU or IRPC	MAQ	VAT	ISC (other)	ISC (Comb)	Customs	Other	TOTAL	Comp ( percent)
A	5.86	12.18	0.10	0	14.97	8.21	0	0	0.92	42.24	2.59
B	0	0	0	0	0	0	0	0	0	0	0
C	0.12	0	0	0	0.40	0	0	0	0	0.52	0.03
D	64.64	0.25	0.37	0.17	160.22	79.82	70.65	0	3.59	379.54	23.30
E	13.42	0	0	0	121.59	0	0	0	1.92	137.01	8.41
F	9.80	0	0	0	12.94	0	0	0	1.33	24.19	1.49
G	113.18	1.21	0.69	0	103.87	5.79	0	0	5.59	230.42	14.14
H	1.73	0	0	0	3.07	0	0	0	0.61	5.50	0.34
I	78.19	0.30	0.90	0	128.15	0	0	6.32	2.25	216.11	13.26
J	72.38	.48	0.16	0	84.15	0	0	58.58	3.12	218.88	13.43
K	29.53	1.04	0.80	0	72.37	0	0	0.55	2.89	107.18	6.58
L	40.39	0	0	0	44.35	0	0	0	0.47	85.24	5.23
M	1.78	0	0	0	2.40	0	0	0	0	4.33	0.27
N	6.62	0.24	0.37	0	16.95	0	0	0	0.40	24.57	1.51
O	15.43	0	0.49	0	12.44	0	0	0	0.46	28.89	1.77
P	0	0	0	0	0	0	0	0	0	0	0
Q	0.32	0.18	0	0	0.56	0	0	0	0	1.17	0.07
No Act.	34.69	0.61	0.24	0	72.99	0.46	0	4.89	9.48	123.36	7.57
Total	488.09	16.63	4.43	0.17	851.49	94.37	70.65	70.43	33.17	1629.26	
Comp( percent)	29.96	1.02	0.27	0	52.26	5.79	4.34	4.32	2.04		100

Source: Secretaría de Estado de Tributación

2004

	IRACIS	IMAGRO	TU or IRPC	MAQ	VAT	ISC (other)	ISC (Comb)	Customs	Other	TOTAL	Comp ( percent)
A	4.78	18.60	0.11	0	19.32	9.71	0	0	1.15	53.66	2.67
B	0	0	0	0	0	0	0	0	0	0	0
C	0.11	0	0	0	0.72	0	0	0	0	0.83	0.04
D	127.13	0.35	0.44	0	196.08	122.44	58.90	0	5.60	510.95	25.43
E	12.13	0	0	0	132.05	0	0	0	0	144.30	7.18
F	17.13	0	0	0	18.78	0	0	0	0.58	36.65	1.82
G	192.32	1.80	1.38	0	117.51	6.79	0	0	2.76	322.63	16.06
H	2.95	0	0	0	3.48	0	0	0	0.39	6.90	0.34
I	105.87	0.14	0.17	0	112.81	0	0	7.18	4.89	231.06	11.50
J	123.95	1.72	0.81	0	134.54	0	0	115.81	2.16	378.99	18.86
K	34.29	0.80	1.00	0	41.99	0	0	0.1	1.49	79.69	3.97
L	37.04	0	0	0	52.07	0	0	0	0.44	89.59	4.46
M	1.63	0	0	0	2.82	0	0	0	0	4.62	0.23
N	6.07	0.39	0.37	0	19.90	0	0	0	0.38	27.10	1.35
O	14.15	0.12	0.40	0	14.60	0	0	0	0.43	29.70	1.48
P	0	0	0	0	0.1	0	0	0	0	0.1	0
Q	0.29	0.30	0	0	0.66	0	0	0	0	1.25	0.06
No Act.	39.91	0.75	0.14	0	57.23	0.45	0	10.21	- 17.36	91.32	4.54
Total	719.76	25.06	5.21	0	924.63	139.46	58.90	133.38	3.07	2009.48	
Comp( percent)	35.82	1.25	0.26	0	46.01	6.94	2.93	6.64	0.15		100

Source: Secretaría de Estado de Tributación

2005

	IRACIS	IMAGRO	TU or IRPC	MAQ	VAT	ISC (other)	ISC (Comb)	Customs	Other	TOTAL	Comp ( percent)
A	10.78	17.32	0.14	0	27.40	5.95	0	0	1.06	62.65	2.67
B	0	0	0	0	0	0	0	0	0	0	0
C	0.15	0	0	0	0.95	0	0	0	0	1.10	0.05
D	112.42	0.34	0.52	0.16	236.95	144.55	17.40	0	6.86	519.21	22.17
E	10.92	0	0	0	115.13	0	0	0	0	126.10	5.38
F	26.87	0	0.13	0	32.33	5.05	0	0	0.94	65.40	2.79
G	201.31	1.63	1.10	0.12	136.11	2.02	0	0	8.37	350.66	14.97
H	3.08	0	0.10	0	4.03	0	0	0	0.44	7.66	0.32
I	135.45	0.12	0.21	0	144.95	0	0	23.60	6.28	310.61	13.26
J	116.03	1.64	0.95	0	159.59	0	0	145.37	6.66	430.24	18.37
K	35.90	0.72	1.20	0	48.64	0	0	0	3.75	90.21	3.85
L	51.57	0	0	0	78.90	0	0	0	0.49	130.99	5.59
M	2.27	0	0	0	4.27	0	0	0	0	6.73	0.29
N	8.45	0.29	0.52	0	30.15	0	0	0	0.42	39.82	1.70
O	19.70	0	0.70	0	22.13	0	0	0	0.47	43.09	1.84
P	0	0	0	0	0.11	0	0	0	0	0.11	0
Q	0.41	0.22	0	0	1.00	0	0	0	0	1.63	0.07
No Act.	57.40	0	0	0	74.36	0.82	0	23.44	0	156.03	6.66
Total	792.73	22.48	5.80	0.28	1117.01	158.42	17.40	192.39	35.92	2342.44	
Comp( percent)	33.84	0.96	0.25	0.01	47.69	6.76	0.74	8.21	1.53		100

Source: Secretaría de Estado de Tributación

2006

	IRACIS	IMAGRO	TU or IRPC	MAQ	VAT	ISC (other)	ISC (Comb)	Customs	Other	TOTAL	Comp ( percent)
A	9.97	0.35	0	0	30.64	8.84	0	0	0	49.82	2.34
B	0	0	0	0	0	0	0	0	0	0	0
C	0	0	0	0	1.05	0	0	0	0	1.05	0.05
D	168.63	0	0	0	217.87	147.16	0.48	0	5.37	539.63	25.30
E	63.52	0	0	0	132.52	0	0	0	0	196.05	9.19
F	5.67	0	0	0	12.34	0	0	0	0.35	18.43	0.86
G	125.58	0	0	0.46	153.34	4.88	0	0	5.42	289.78	13.59
H	1.92	0	0	0	4.54	0	0	0	0.22	6.68	0.31
I	112.01	0	0	0	144.63	0	0	5.31	6.09	268.12	12.57
J	145.42	0	0	0	156.39	0	0	63.46	2.93	388.27	18.20
K	22.39	0	0	0	54.79	0	0	0	1.85	79.09	3.71
L	39.09	0	0	0	58.65	0	0	0	0	97.80	4.59
M	1.72	0	0	0	3.18	0	0	0	0	4.90	0.23
N	6.41	0	0	0	22.41	0	0	0	0	28.82	1.35
O	14.93	0	0	0	16.45	0	0	0	0	31.43	1.47
P	0	0	0	0	0.01	0	0	0	0	0	0.01
Q	0.31	0	0	0	0.74	0	0	0	0	1.05	0.05
No Act.	73.22	0	0	0	65.15	0	0	11.44	1.86	151.76	7.12
Total	790.91	0.75	0	0.46	1074.80	161.01	0.48	80.22	24.26	2132.97	
Comp( percent)	37.08	0	0	0	50.39	7.55	0	3.76	1.14		100

Source: Secretaría de Estado de Tributación

2007

	IRACIS	IMAGRO	TU or IRPC	MAQ	VAT	ISC (other)	ISC (Comb)	Customs	Other	TOTAL	Comp ( percent)
A	13.10	8.05	0.36	0	31.19	0	0	0	0.86	53.65	7.25
B	0.01	0	0	0	0.01	0	0	0	0	0	0.02
C	0.43	0	0	0	0.92	0	0	0	0	0	1.35
D	17.40	0.11	1.20	0.15	32.92	0	0	0	1.28	53.05	7.17
E	1.06	0	0	0	1.08	0	0	0	0	2.14	0.29
F	4.67	0	0.72	0	7.22	0	0	0	0.33	13.01	1.76
G	120.00	0.77	5.20	0.52	144.75	3.87	0	0	7.42	282.54	38.20
H	1.17	0	0.39	0	4.60	0	0	0	0.28	6.45	0.87
I	12.66	0	0.53	0	19.84	0	0	0	0.89	33.96	4.59
J	6.06	0	0	0	13.11	0	0.25	4.97	0.34	24.77	3.35
K	22.99	0.44	3.25	0	121.95	0	0	0	3.31	151.97	20.55
L	4.50	0	0	0	5.31	0	0	0	0.59	10.41	1.41
M	0.74	0	0	0	1.77	0	0	0	0.29	2.84	0.38
N	2.44	0	0.01	0	15.50	0	0	0	0.61	18.72	2.53
O	4.44	0	0.35	0	6.84	0	0	0	0.40	12.05	1.63
P	0	0	0	0	0.11	0	0	0	0	0.11	0.01
Q	1.24	0	0	0	2.45	0	0	0	0.10	3.80	0.51
No Act.	8.32	0.23	0.60	0	33.66	0.35	0	0	25.04	68.42	9.25
Total	221.26	9.84	14.42	0.67	443.24	4.31	0.25	4.97	39.36	739.59	
Comp( percent)	29.92	1.33	1.95	0.10	59.93	0.58	0.03	0.67	5.32		100

Source: Secretaría de Estado de Tributación

2008

	IRACIS	IMAGRO	TU or IRPC	MAQ	VAT	ISC (other)	ISC (Comb)	Customs	Other	TOTAL	Comp ( percent)
A	23.01	11.42	0.32	0	32.45	0	0		2.48	69.80	6.60
B	0	0	0	0	0	0	0	0	0	0	0
C	0.83	0	0	0	1.30	0	0	0	0	2.13	0.20
D	30.29	0.16	0.96	0.26	51.55	0	0	0	3.40	86.65	8.20
E	1.11	0	0	0	1.48	0	0	0	0.49	3.15	0.30
F	25.72	0	0.39	0	13.89	0	0	0	1.42	41.52	3.93
G	205.99	1.69	4.68	0.15	213.97	5.78	0	0	19.98	452.34	42.79
H	2.81	0	0.25	0	9.61	0	0	0	0.66	13.35	1.26
I	15.31	0	0.47	0	37.10	0	0	0	1.98	54.93	5.20
J	7.02	0	0	0	13.51	0	0	0.56	0.38	21.61	2.04
K	34.07	0.72	2.42	0.20	187.68	0	0	0	7.54	232.72	22.01
L	8.58	0	0	0	13.02	0	0	0	0.49	22.12	2.09
M	1.46	0	0	0	2.53	0	0	0	0.26	4.32	0.41
N	3.83	0	0.13	0	20.44	0	0	0	1.11	25.58	2.42
O	6.31	0	0.24	0	10.50	0	0	0	1.17	18.25	1.73
P	0	0	0	0	0.13	0	0	0	0	0.13	0.01
Q	1.16	0.12	0	0	2.49	0	0	0	0.17	3.97	0.38
No Act.	2.03	0	0	0	2.02	0	0	0	0.31	4.40	0.42
Total	369.58	14.35	10.23	0.62	613.70	5.90	0	0.56	41.91	1057.15	
Comp( percent)	35.00	1.36	0.97	0	58.05	0.56	0	0	3.96		100

Source: Secretaría de Estado de Tributación

2009

	IRACIS	IMAGRO	TU or IRPC	MAQ	VAT	ISC (other)	ISC (Comb)	Customs	Other	TOTAL	Comp ( percent)
A	134.51	18.23	0.35	0	125.16	20.32	0	0	4.66	303.24	6.37
B	0.07	0	0	0	0.04	0	0	0	0	0.11	0
C	2.81	0	0	0	2.25	0	0	0	0.20	5.28	0.11
D	356.20	0.60	0.92	1.21	421.03	215.75	0	0	10.56	1006.31	21.12
E	70.67	0	0	0	128.44	0	0	0	3.68	202.82	4.26
F	31.67	0.01	0.80	0	28.67	0	0	0	2.05	63.29	1.33
G	656.64	2.55	3.30	0.36	674.96	9.63	0	0	33.31	1380.90	28.99
H	8.13	0	0.22	0	19.44	0	0	0	1.16	28.99	0.61
I	261.16	0.01	0.49	0	277.18	0	0	0	4.12	543.02	11.40
J	348.47	0.01	0	0	239.52	0	0	0.20	1.69	590.04	12.39
K	113.61	0.87	2.75	0.25	248.49	0	0	0	11.48	377.77	7.93
L	61.33	0	0	0	69.14	0	0	0	0.91	131.38	2.76
M	3.44	0	0	0	6.08	0	0	0	0.31	9.93	0.21
N	9.87	0.01	0.16	0	39.37	0	0	0	1.60	51.10	1.07
O	27.61	0	0.17	0	27.13	0	0	0	2.67	57.66	1.21
P	0	0	0	0	0.16	0	0	0	0	0.16	0
Q	0.51	0.01	0	0	1.59	0	0	0	0.23	2.44	0.05
No Act.	3.10	0	0	0	5.94	0	0	0	0.17	9.26	0.19
Total	2089.81	22.65	9.49	1.72	2314.58	245.72	0	0.20	78.85	4763.73	
Comp( percent)	43.87	0.48	0.20	0.04	48.59	5.16	0	0	1.66		100

Source: Secretaría de Estado de Tributación

2010

	IRACIS	IMAGRO	TU or IRPC	MAQ	VAT	ISC (other)	ISC (Comb)	Customs	Other	TOTAL	Comp ( percent)
A	48.77	27.05	0.36	0	175.08	29.69	0	0	6.46	287.48	5.41
B	0	0	0	0	0	0	0	0	0	0	0
C	2.55	0	0	0	2.43	0	0	0	0.12	5.11	0.09
D	470.56	0.32	1.09	2.42	550.12	266.31	0	0	12.98	1303.95	24.54
E	32.08	0	0	0	117.09	0	0	0	0.25	149.45	2.81
F	21.48	0	0.49	0	42.78	0	0	0	2.04	66.83	1.26
G	609.35	1.26	3.58	0.48	862.90	6.49	0	0	37.24	1521.62	28.64
H	11.29	0	0.23	0	24.61	0	0	0	1.75	38.03	0.72
I	308.94	0.01	0.57	0	314.75	0	0	0	8.16	632.53	11.89
J	211.49	0.01	0	0	323.68	0	0	0.33	1.33	537.23	10.10
K	118.63	1.10	3.05	0.35	274.93	0	0	0	12.93	411.16	7.73
L	78.31	0	0	0	129.14	0	0	0	5.40	212.86	4.01
M	3.82	0	0	0	7.07	0	0	0	0.39	11.44	2.15
N	12.76	0.01	0.19	0	42.86	0	0	0	1.99	57.92	1.09
O	28.22	0	0.21	0	31.04	0	0	0	3.13	62.76	1.18
P	0	0	0	0	0.16	0	0	0	0	0.21	0
Q	0.30	0	0	0	0.72	0	0	0	0.29	1.39	0
No Act.	2.33	0	0	0	12.11	0	0	0	0.12	14.58	0.27
Total	1960.95	30.11	10.09	3.31	2911.53	302.51	0	0.33	94.61	5314.62	
Comp( percent)	36.90	0.57	0.19	0.06	54.78	5.68	0	0	1.78		100

Source: Secretaría de Estado de Tributación

2011

	IRACIS	IMAGRO	TU or IRPC	MAQ	VAT	ISC (other)	ISC (Comb)	Customs	Other	TOTAL	Comp ( percent)
A	96.32	52.97	0.18	0	219.61	28.70	0	0	5.98	403.80	6.39
B	0.01	0	0	0	0.01	0	0	0	0	0.02	0
C	7.07	0	0	0	4.83	0	0	0	0.42	12.33	0.20
D	480.26	0.34	0.61	2.25	599.80	286.87	0	0	9.27	1378.46	21.83
E	42.95	0	0	0	154.08	0	0	0	1.23	198.27	3.14
F	27.01	0.35	0.31	0	51.14	0	0	0	2.47	81.30	1.29
G	849.37	4.26	2.50	0.73	969.20	3.64	0	0	34.81	1863.55	29.49
H	14.17	0	0.18	0	28.98	0	0	0	1.74	45.08	0.71
I	311.86	0.11	0.27	0	357.46	0	0	0	5.28	675.01	10.68
J	321.52	0.01	0	0.10	390.50	0	0	0.16	1.94	714.36	11.30
K	154.37	1.42	1.23	0	324.21	0	0	0	14.11	495.41	7.83
L	95.91	0	0	0	183.48	0	0	0	0.56	279.95	4.43
M	2.30	0	0	0	5.66	0	0	0	0.40	8.39	0.13
N	16.87	0.15	0.01	0	49.19	0	0	0	1.84	68.12	1.08
O	34.26	0	0.13	0.01	43.14	0	0	0	2.83	80.52	1.27
P	0	0	0	0	0.17	0	0	0	0	0.17	0
Q	0.33	0.01	0	0	0.86	0	0	0	0.3	1.57	0.03
No Act.	3.23	0	0	0	8.61	0	0	0	0.1	11.95	0.19
Total	2457.93	59.79	5.28	3.18	3389.98	318.21	0	0.16	83.33	6318.42	
Comp( percent)	38.90	0.95	0.08	0.05	53.65	5.03	0	0	1.31		100

Source: Secretaría de Estado de Tributación

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## Chapter 4. Assessing the Poverty and Social Impact of Fiscal Policies and External Shocks in Paraguay, by Carolina Diaz-Bonilla and Martín Cicowiez

### Introduction

**As part of the World Bank's Public Expenditure Review (PER), this Poverty and Social Impact analysis (PSIA) explores the distributional and poverty impacts of fiscal policies under consideration by the Government of Paraguay, as well as the impacts of external growth shocks.** The PER as a whole is expected to inform the policy discussion and the budget process helping to address the challenges of public resource management, as well as serve as a source of information for the incoming Government. The PSIA seeks specifically to inform policy decisions regarding a revenues and expenditure structure to support the policy goal of equitable growth and poverty reduction in Paraguay. Thereby, the PSIA seeks to provide the government with the analytical groundwork for future fiscal reforms.

**Fiscal reform in Paraguay is relevant because of a combination of scarce resources in general and weak results in the social dimension.** Paraguay lags behind the Latin America and Caribbean region on indices for human development, opportunities, poverty and inequality. Resources allocated to social development are scarce, public service delivery is poor, and low tax revenues restrict the resources available for the provision of public services. Paraguay's tax-to-GDP ratio of 12.1 percent on average between 2003 and 2011 remains significantly lower than for its MERCOSUR neighbors or for the average lower middle income country. In addition, the economy, and fiscal revenues are strongly dependent on agriculture and commodity price fluctuations, rendering public resource management a challenge when faced with external shocks to growth.

**The PSIA would focus on two distinct policy issues.** The first analysis would complement the analysis of tax exemptions in Paraguay and shed light on the different trade-offs that are involved. In particular, the aim would be to quantify the trade-off between potentially higher consumption (in case of a VAT exemption) and consequently higher economic growth and lower poverty, versus higher levels of human development expenditure (such as in education, health, water and sanitation) from a redirection of the resources from the VAT exemption. The second analysis would illustrate the economy-wide repercussions (that is, both direct and indirect effects), including on public resource management, that a potential new global economic slowdown could cause in Paraguay. A slowdown would be expected to affect commodity prices and agriculture, given the high dependence of the Paraguayan economy on the agricultural sector. This would shed light on possible distributional impacts of these fluctuations and possible mitigation options.

The PSIA is expected to serve as an important input into the Public Expenditure Review that was requested and agreed upon by the Ministry of Finance of Paraguay. In particular, one of the topics requested by the Government was on Fiscal Policy and Equity. Sustainable and equitable growth has been the overall objective of the Government's Economic and Social Strategic Plan since 2008. However, the Government recognizes that despite the country's strong growth in recent years, further improvements in the collection of revenues and the allocation of public resources to reach its public policy goals continue to be a priority. Among the challenges facing

the country, the PSIA will address two actions that the Government of Paraguay has identified as potentially having significant distributional impacts: changes in VAT exemptions and a global economic slowdown that impacts commodity prices and agriculture (Paraguay is a country whose economy and fiscal revenues are strongly dependent on agriculture).

**The PSIA is expected to benefit the Government of Paraguay in its efforts to improve social development and reduce poverty.** It is also expected to improve capacity within the country through a training component on the tools used for the analysis, in particular within the Government, thus also strengthening the design of future policies (and further benefitting the poor, vulnerable, and all segments of society). More specifically, the expected outcomes are: (1) evidence on the potential distributional and poverty implications, and trade-offs, of different fiscal policies and growth scenarios; (2) contribution to the policy discussion on how to improve public resource management, in particular informing policy decisions regarding a revenue and expenditure structure to support the policy goal of equitable growth and poverty reduction; and (3) a more highly trained team in the Ministry of Finance and the Central Bank on the use of these tools and models for the analysis of public policies.

**The analyses will be undertaken using a general equilibrium model that is being created for Paraguay in coordination with a team from the Ministry of Finance, and with important inputs from the Paraguay Central Bank (BCP) and the National Statistical Office (DGEEC).** The model is based on a Social Accounting Matrix for 2009 that includes data from Paraguay's National Accounts, Fiscal Accounts, Balance of Payments, and Permanent Household Survey, and builds on an Input-Output Table created by the Central Bank. The information from Paraguay's Fiscal Accounts is being coordinated with other World Bank teams working on the PER (in particular the BOOST team) as well as with several Ministries and Institutions in Paraguay, including in particular Education and Health.

**The Ministry of Finance and the Central Bank have requested training on the model and the full transfer of knowledge on all steps of the process and analysis.** The general equilibrium model quantifies the possible macro and sectoral effects of the different simulations, and links to an econometric microsimulation model at the household level (using the 2009 household survey) that provides the poverty and distributional impacts of the policies. The macro model is run in a software program called General Algebraic Modeling System (GAMS) and the micro model is run using STATA, a statistical software. To respond to the requested training, a central part of the PSIA project will be capacity building so that the Government of Paraguay can continue to simulate the effects of different policy options and inform their policy making.

**The report is structured as follows: Section 2 presents the country context in terms of recent trends in growth, poverty and inequality; Section 3 presents policy scenarios, Section 4 presents methodology and data; section 5 presents simulations and results, and Section 6 offers concluding remarks.** The analysis is presented with the least possible amount of technical details in order to maximize the appeal to a broader audience. For the interested reader, the methodological details of the empirical approaches employed in this report are contained in Annexes A and B, which develop the CGE and micro-simulation models, respectively.

## 1. Country Context: Growth, Poverty, and Inequality Trends

Between 2003 and 2008, Paraguay experienced six consecutive years of positive output growth with an annual average growth rate of 4.6 percent and an overall decline in poverty and inequality. Poverty fell from 44 percent in 2003 to 37.9 percent in 2008 (Figure 1) and the Gini declined by 0.04 points to reach 0.506 in 2008 (Figure 2). Although by regional standards both remain at comparatively high levels, Paraguay nonetheless experienced real improvements in well-being during this period. Improvements in both mean incomes and its distribution worked towards the reduction of poverty.

Figure 4.1: Poverty and Extreme Poverty Trends, Paraguay

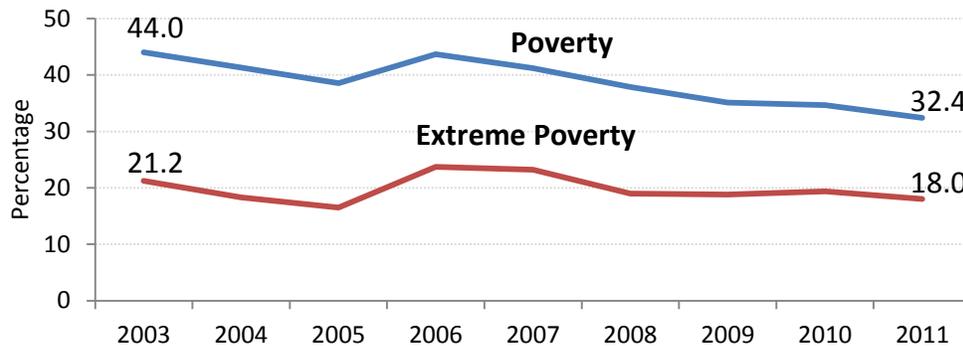
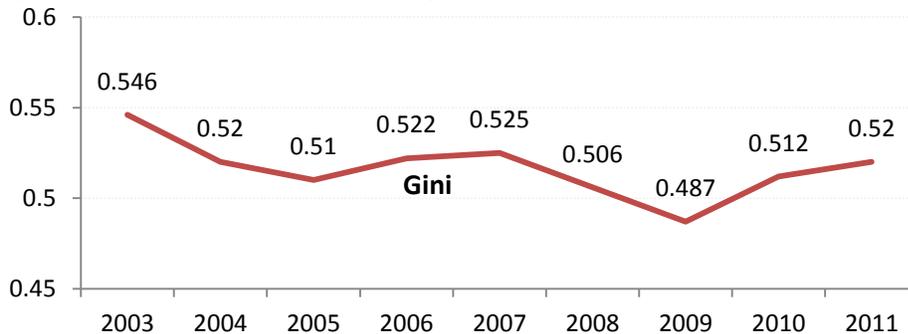


Figure 4.2: Gini Coefficient Trend, Paraguay (2003-2011)



The severe drought and global financial crisis experienced in 2009 had little effect on national poverty levels, but had a differentiated effect on the rural and urban sectors. National poverty and inequality continued to decline in 2009, reaching 35.1 percent and 0.487, respectively, in that year. In urban areas, the negative impact on GDP was not as strong and as a result, urban poverty declined from 30.2 in 2008 to 24.7 percent. This reflected rising wages for urban low skilled workers, in part possibly due to countercyclical government spending on public works that benefitted low-skilled sectors such as Construction. Real wages in construction increased by about 20 percent between 2008 and 2009. Increasing remittances, which represented 10 percent of urban household income of the poorest decile, and increased public transfers (Tekopora) to extreme poor urban households may also have buffered these households. However, contrary to the developments in the urban sector, rural GDP fell strongly as the agriculture sector was hit hard by the drought. Rural poverty went up 1 percentage point to 49.8 percent. The labor force participation of family members increased in search of additional

income but this may have led to a further dampening of wages. Neither extra family labor income nor remittances nor public transfers (Tekopora) were enough to buffer household incomes. Nevertheless, all these sources of income likely kept poverty from increasing even further. In all, the net effect of the changes in rural and urban areas resulted in a relatively stable poverty rate – a small reduction at the national level.

**In 2010, Paraguay faced an unprecedented 15 percent GDP growth, yet poverty decreased by only 0.4 percent (to 34.7 percent) and extreme poverty even increased by 0.6 percent (from 18.8 percent in 2009 to 19.4 percent).** The rebound in the agricultural sector accounted for more than half of the strong rebound in 2010, while the commerce sector accounted for another third. One possible explanation for the difference in these trends as compared to 2003-2008 could be the growing importance of soybeans, as the acreage devoted to this commercial export crop has increased significantly since 2008 responding to higher world market prices. Both the production of soybeans and meat requires large extensions of land and are not labor-intensive, weakening the links to employment creation and poverty reduction, while being characteristic of an economy with high inequality. The extreme poor in rural areas do not work in commercial export agriculture; and soybean/cattle -based economic growth seems to be insufficient to raise the incomes of the extreme poor in rural areas. Growth driven by these sectors has not trickled down by enough to offset the higher food prices faced by both the rural and urban poor.

**By 2011, GDP resumed its pre-crisis growth, reaching 4 percent; nevertheless, high poverty and inequality levels continue to pose development challenges.** Poverty decreased to 32.4 percent in 2011, and extreme poverty to 18.0 percent, yet this still places Paraguay among the poorest countries in Latin America. Inequality is also among the highest in the LAC region at a Gini of 0.52. Over half of the poor and more than two thirds of the extreme poor are located in rural areas of Paraguay.<sup>62</sup> With only 40.9 percent of the population in 2011, rural households have a disproportionate amount of the poor (56.4 percent). Extreme poverty in particular is mainly a rural phenomenon, with 67 percent of the extreme poor living in rural areas of Paraguay (although this is an improvement over the almost 69 percent in 2010). Overall, poor household heads have similar age and gender characteristics as non poor heads, but lower mean years of schooling (5.6 years versus 8.5 years for the non-poor) and of informality (60 percent versus 42 percent), with a third working in agriculture (as compared to 16.5 percent for the non-poor). Poor and extreme poor households have a higher dependency ratio with an average of 4.9 and 5.3 members, respectively (versus 3.7 members for the non-poor) and tend to speak Guarani at home. Poor households also live in low quality dwellings of inferior floors and ceilings.

**Socio-economic conditions have improved in Paraguay over the past decade but, over a longer horizon, poverty and inequality show less improvement and an insufficiency to overcome existing structural issues.** Since 2003, Paraguay improved considerably its socio-economic indicators including poverty, inequality, health, and education. Nonetheless, evaluated in a longer term perspective and with respect to average trends in other LAC countries, poverty

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<sup>62</sup> Paraguay measures poverty in monetary terms using the poverty line method: persons with income below the poverty line (measured by the value of a basic basket of food and non-food goods and services) are considered poor. Those below the extreme poverty line (measured by the value of a basic basket of food) are considered extreme poor, or indigent.

declined more gradually in Paraguay, from 36.1 percent in 1998 to 32.4 percent, while inequality increased from 0.489 in 1998 to 0.52, indicating the structural nature of the problem.

**Growth continues to be necessary for poverty reduction, but is not sufficient.** Poverty decompositions undertaken throughout the period as part of the Poverty Assessment and 2010 Poverty Note highlight that growth continues to be an important component in poverty reduction. However, increases in food prices and, in recent years, high levels of inequality have not helped reduce poverty. A better distribution of income matters and would have helped reduce poverty more strongly along with the economic growth. Poor people living in rural areas do not benefit much from an expansion in agriculture due to land access issues and also mass production by big firms. Social transfer programs exist but are insufficient to introduce a meaningful change in poverty and inequality. The government does not have a strong revenue basis to afford stronger transfer programs: the tax to GDP ratio in Paraguay is still around 12 percent, one of the lowest in LAC.

**Poverty rates have also shown strong differences between rural and urban areas, yet not reflecting the recent high volatility in the Paraguayan economy.** Paraguay's economy is strongly based in the agricultural sector (especially soy and meat) that represented more than 20 percent of total value added in 2010. Paraguay's exports and export partners are also heavily concentrated. About 80 percent of exports in 2010 were agriculture based products, half of which are soy and meat. This makes the economy extremely sensitive to weather and commodity price changes. Paraguay is also very vulnerable to a slowdown in trade activity of the MERCOSUR region, as 50 percent of exports are destined to Argentina, Uruguay and Brazil. However, the poor in rural areas do not participate strongly in soy and meat production. Therefore, although the observed volatility in the economy reflects itself on household incomes, the impacts of changes in the distribution of income and in food prices also matter in terms of changes in poverty rates.

**The weak link between growth and poverty reduction during these years in Paraguay seems to be linked mainly, but not exclusively, to three main phenomena.** First, high levels of initial inequality in income and assets holdings (such as land), which makes growth less effective in reducing poverty. Second, a growth pattern in the rural area based on relatively capital-intensive sectors, which extends to service sectors in urban areas (such as commerce), with the exception of construction that has a clear link to public investment. Third, a non-structural factor but one determined by external conditions: price and weather shocks that affect primary goods and have an impact on real wages. Public transfers and remittances have played a role, but compensating only partially the other components.

## 2. Policy Scenarios

### **Direct and Indirect Effects of Alternative Tax revenue Policies**

Recent estimates of tax expenditures in Paraguay suggest that they fluctuated between 1.1 and 1.9 percent of GDP in the period from 2007 to 2009. In particular in a country, where the tax-to-GDP ratio averaged 12.1 percent over the same period, this appears a relevant amount. While this estimate could be interpreted as a cost to the economy in terms of foregone tax revenue, it

stops short of providing an analysis of the net impacts on the economy and the social sectors, and therefore the trade-offs involved.

In a first step, the proposed study could give an overview of tax reform in Paraguay since 2004 and the development of tax expenditures and composition of tax revenues over time. This case study could also take into account aspects of tax administration such as the audit function and present their impact on the composition of tax revenues. In a second step, a general equilibrium framework could then analyze direct and indirect effects of different tax revenue policies on economic growth, poverty rates, and equity in Paraguay. Concretely, such analysis would allow quantifying the trade-off between higher private investment and consequently higher economic growth and lower poverty, versus higher levels of human development expenditure such as in education, health, water and sanitation. Moreover, the analysis would contribute to the policy discussion on how to generate more tax revenue.

### **Impacts of Commodity Price Shocks and a Growth Slowdown**

Fiscal revenues and expenditures in Paraguay are likely to be directly influenced by the economic cycle and indirectly by weather and commodity price fluctuations. Economic activity in Paraguay is strongly based on agriculture representing over 25 percent of total value added. Within the agricultural sector soy and meat production are particularly important, representing 39 and 18 percent respectively of total exports. This structure explains why variations in rainfall in the year prior to the harvesting period, explain 45 percent of variations in agricultural output and 22 percent of variations in real GDP growth. It also explains the important role of soy and beef prices for the economy. Agricultural exports are not directly taxed, and agriculture as such contributes modestly to overall tax collection, consequently a direct impact on revenues is not expected. However, agricultural output has an indirect impact on revenues through its impact on disposable income and value added tax (VAT) collections. Through this channel also weather and commodity prices are likely to impact fiscal revenues and subsequently expenditures in Paraguay.

The proposed general equilibrium framework could also be used to complement the time series analysis proposed in another part of the PER. In particular, the model could analyze economy-wide repercussions, including on public resource management that a potential new global economic slowdown could cause in Paraguay through effects on commodity prices and agriculture.

## **3. Methodology and Data**

**The quantitative analysis of the distributional impacts of tax reform uses a dynamic-recursive computable general equilibrium (CGE) model and a microsimulation model that translates the CGE results into poverty and inequality outcomes.** More specifically, the analysis uses the MAMS (Maquette for MDG Simulations) model, a single-country CGE model with a focus on policies related to the achievement of time-bound international MDG targets and, more broadly, how government spending and taxation, foreign aid, and exogenous conditions (including world markets) together influence and are influenced by human development. MAMS has a relatively detailed treatment of (a) government activities and private sector activities in health and education; and (b) MDG outcomes as a function of relevant services (provided by the

government and private sectors) and other determinants. We follow a sequential “top-down” approach in order to link MAMS with the microsimulation model. For a more detailed description of MAMS and the microsimulation model, see the Annexes.

**The Paraguay MAMS is based on a 2009 disaggregated Social Accounting Matrix (SAM) and other supplementary data.** The 2009 Paraguay SAM was created for this project in close collaboration with the Ministry of Finance and with inputs from the General Directorate of Statistics, Surveys, and Censuses (DGEEC, in Spanish; the national statistical institute) and the Paraguayan Central Bank. The government is disaggregated into seven activities: three types of education (primary, secondary, and tertiary cycles), health, water-sanitation, (other) infrastructure, and other government services. For these sectors, output is exported and sold domestically, competing with imports.

Among the factors of production, there are three types of labor: those with less than completed secondary education (unskilled), with completed secondary education but incomplete tertiary (semi-skilled), and with complete tertiary (skilled). Each of these labor types is therefore linked directly to the education sectors/cycles, and thus the growth in the labor force will in part depend on the functioning of the education system in the model. The remaining factors include public capital stocks by government activity, a private capital stock, land, and natural resources.

The institutions include the government, a household (the private domestic institution that represents both households and domestic enterprises), and the rest of the world. Each institution has its own savings and capital accounts. Taxes have been disaggregated into direct, import, indirect producer, and indirect consumer taxes. There is one private investment account and seven public investment accounts (for each government sector). Lastly, the model includes accounts for domestic and foreign interest payments.

**The 2009 disaggregated micro SAM for Paraguay was created in several steps.** First, a macro SAM for the country was created using the national accounts, balance of payments accounts, and government fiscal data for 2009.

**Apart from the SAM, the MAMS database includes data related to the different MDGs, the labor market, and various elasticities.** Most importantly, the first two data types include levels of service delivery required to meet the different MDGs, stocks of students at different educational levels, stocks of labor by skill (educational achievement), and student behavioral patterns in terms of graduation rates and other indicators. The elasticities include those in production, trade, consumption, and in the different MDG functions (see Table A.2).

**The CGE model is based on the Maquette for MDG Simulations (MAMS) model.** It is a single-region country model with a focus on policies related to the achievement of time-bound international MDG targets and, more broadly, how government spending and taxation, foreign aid, and exogenous conditions (including world markets) together influence and are influenced by human development.

**The model is solved year-by-year through 2018, as agreed with counterparts.** The CGE analysis is carried out by contrasting a baseline simulation with a set of alternative scenarios for the years 2009-2018. In order to generate a dynamic solution, certain assumptions have been

made regarding the evolution of the model's exogenous variables. BaU (business-as-usual, or "no-reform") growth has been calibrated using the near- and medium-term assumptions of the IMF; the evolution of remittances, FDI, and the overall capital account also are drawn from IMF sources. The maximum labor supply available in each period evolves according to the World Bank population projections for the 15-64 age cohort, but the actual quantity of labor supplied in each period is determined endogenously by the model.

**The CGE simulations are complemented with a microsimulation model.** The microsimulation model was applied to data from the Encuesta Permanente de Hogares, EPH – the main household survey in Paraguay. It is undertaken by the DGEEC and has been nationally representative since 1997. The results of the macro simulations are linked to the 2009 EPH through the microsimulation model to explore the potential impacts of changes in the macroeconomic and sectoral variables on household welfare, poverty, and the distribution of income.

#### 4. Simulations and Results

This section presents the specific simulations and analyzes the results for both MAMS and the microsimulation model. The first simulation (BASE) creates a baseline for Paraguay between 2009 and 2018 on the basis of IMF projections for GDP. All the remaining simulations should be analyzed in comparison to the Base simulation.

##### **Base scenario**

**The Base scenario represents a baseline for Paraguay between 2009-2018.** The behavior of the main macro variables in the Base scenario is summarized in Table 5.1. The second column presents the base year (2009) values, while the third column presents the percent annual growth between 2009 and 2018 for each of the macro indicators. The baseline takes into account actual GDP growth in 2010-2012 and projections for 2013-2018 (IMF World Economic Outlook Database, October 2012) (see Figure 4.1). The baseline results based on IMF numbers imply that, over the full period, GDP at factor cost will grow at an annual 5.5 percent. Although GDP is set exogenously in the Base simulation, the remaining simulations will instead endogenously solve for a new equilibrium GDP growth rate. Growth of government consumption over the full model period is higher, at 6.5 percent, since actual Central Bank figures show that growth in government consumption was higher than GDP growth in 2011 and 2012 (in particular it was strongly positive in 2012, while GDP growth was negative). Table 4.1 also shows that government investment grows at the same level as GDP (5.5 percent) while private consumption and private investment grow by slightly more (5.7 percent). Exports increase by 5 percent and imports grow by 5.8 percent, as the real exchange rate shows a slight appreciation. The Base scenario would lead to a decrease in poverty to 20.5 percent by 2018. All simulation results in the next sections should be analyzed as comparisons to this baseline.

**Table 4.1: Real macro indicators by simulation ( percent annual growth from first to final report year)**

	<b>2009</b>	<b>base</b>
<b>Absorption</b>	7302.4	5.8
<b>Consumption – private</b>	5351.8	5.7
<b>Consumption – government</b>	864.7	6.5
<b>Fixed investment – private</b>	894.9	5.7
<b>Fixed investment - government</b>	165.6	5.5
<b>Stock change</b>	25.3	
<b>Exports</b>	2172.6	5.0
<b>Imports</b>	2427.0	5.8
<b>GDP at factor cost</b>	6276.4	5.5
<b>Total factor employment (index)</b>		4.7
<b>Total factor productivity (index)</b>		0.9
<b>Real exchange rate (index)</b>		-0.4
<b>Headcount poverty rate ( percent)</b>	35.1	20.5

Note:

1. Unless otherwise noted, column for initial year shows data in LCU.

2. For the poverty rate, the base-year and simulation columns show base-year rate and simulation-specific final-year rates, respectively.

**Figure 4.3: GDP at Factor Cost ( percent growth)**

Table 4.2 presents the underlying data for government receipts and spending for 2009 as a share of nominal GDP. Direct taxes were 4.6 percent of GDP in 2009, import tariffs were 1.5 percent, and other indirect taxes (which include value-added taxes) were 9.5 percent of GDP. In total, this implies a 15.6 tax-to-GDP ratio. The 2010-2018 baseline maintains the 2009 tax rates, resulting in similar GDP shares as for the 2009 base year. Therefore, under the BASE simulation, direct taxes, import tariffs, and other indirect taxes in 2018 were 4.6, 1.4, and 9.4 percent of GDP, respectively; a 15.5 tax-to-GDP ratio. The share of public domestic debt to GDP is maintained constant, and therefore domestic borrowing increases as needed to maintain the share.

**Table 4.2: Government receipts and spending in first report year and by simulation in final report year ( percent of nominal GDP)**

	<b>Indicator</b>	<b>2009</b>	<b>base</b>
<b>Receipts</b>	<b>Direct taxes</b>	4.6	4.6
	<b>Import tariffs</b>	1.5	1.4
	<b>Export taxes</b>		
	<b>Other indirect taxes</b>	9.5	9.4
	<b>Private transfers</b>	0.0	0.0
	<b>Foreign transfers</b>	0.5	0.5

	<b>Factor income</b>	4.1	2.0
	<b>Domestic borrowing</b>	1.4	0.2
	<b>Foreign borrowing</b>	-3.3	0.6
	<b>Total</b>	18.2	18.8
<b>Spending</b>	<b>Consumption</b>	12.3	13.2
	<b>Fixed investment</b>	2.3	2.3
	<b>Stock change</b>		
	<b>Private transfers</b>	2.8	2.8
	<b>Foreign transfers</b>		
	<b>Domestic interest payments</b>	0.2	0.2
	<b>Foreign interest payments</b>	0.6	0.2
	<b>Domestic capital transfers</b>		
	<b>Total</b>	18.2	18.8

On the spending side, government consumption increases from 12.3 percent of GDP in 2009 to 13.2 percent of GDP in 2018, financed through increased foreign borrowing. Paraguay was accumulating reserves in 2009, so the model choice was to let foreign borrowing be the closure. Government consumption for 2009-2013 is based on Central Bank data, while consumption between 2014-2018 grows at the same rate as GDP (which in turn is based on IMF projections, as mentioned earlier). Fixed investment and private transfers are maintained as the 2009 share of GDP.

**Real government consumption grows by an average annual 6.6 percent in most sectors and 3.6 percent in “other infrastructure”** (Table 4.3). Specifically, government consumption in education, health, water and sanitation, and public administration are set to grow as explained earlier, and therefore public investment in these sectors adjusts accordingly.<sup>63</sup> On the other hand, the “other infrastructure” sector is modeled such that government investment in this sector is maintained constant as a share of GDP, resulting in an average annual 3.6 percent growth in real government consumption.

**Table 4.3: Real government consumption -- annual growth from first to final report year by simulation ( percent)**

	<b>2009</b>	<b>base</b>
<b>c-edupgov</b>	144.5	6.6
<b>c-edusgov</b>	66.4	6.6
<b>c-edutgov</b>	40.7	6.6
<b>c-saludgov</b>	193.6	6.6
<b>c-wtsn</b>	3.1	6.6
<b>c-otrinfra</b>	34.9	3.6
<b>c-admpub</b>	381.5	6.6
<b>total</b>	864.7	6.5

<sup>63</sup> Government consumption is exogenous in the baseline, with foreign borrowing clearing the government account. However, in later simulations, foreign borrowing is maintained as in the base and government consumption is endogenous (i.e., the simulation solves for a new level of government consumption).

**Human development indicators for education, health, and water and sanitation show progress between 2009 and 2018.** Table 4.4 presents the Millennium Development Goals that are the human development indicators utilized in the analysis. The table shows the 2009 base year value and the results estimated for 2018 under the Base simulation. These MDG values are not targeted but rather tracked as the model evolves. As shown earlier, the poverty rate decreases from 35.1 percent to 20.5 percent in 2018.

**Table 4.4: MDG Indicators -- summary (values in 1990, first report year, 2015 [goal], and final report year)**

	1990	2009	goal2015	Base (2018)
On-time completion of primary school	93.0	7.4	100.0	40.9
Under-5 mortality rate	40.0	19.0	13.3	15.5
Maternal mortality rate	150.1	125.3	37.5	86.2
Access to clean water	53.6	81.4	76.8	87.8
Access to safe sanitation	53.8	69.2	76.9	71.9

## Tax results

**The first alternative scenarios consider the effects of removing the exemptions on value added taxes.** These scenarios remove the 50 percent exemption that applies to all agricultural and processed food products, thus increasing the tax from 5 percent back to 10 percent. In addition, the scenarios remove exemptions to the imports of fuel. However, due to the lack of information for fuel, the choice was to make the rate on fuel close to the average rate of the products that were initially not exempt. The extra revenue received by the government via the higher taxes is then used either to fund increased expenditures in the human development sectors (that is, education, health, water and sanitation) or to increase public expenditure in other public infrastructure. These two simulations are referred to as “Exemp-HD” or “Exemp-Infra”. These first alternative scenarios thus allow quantifying the trade-off between higher private investment and consequently higher economic growth and lower poverty, versus higher levels of human development expenditure in education, health, water and sanitation. In addition, “Exemp-Infra” allows an analysis of a third alternative of higher public investment.

**The removal of VAT exemptions increases the tax-to-GDP ratio by between 0.7 to 0.8 points** (Table 4.6). Removing the exemptions increases total taxes as a share of GDP in 2018 from 15.49 (the result for Base) to 16.23 (Exemp-HD) or 16.30 (Exemp-Infra) depending on how the resources are spent. Direct tax rates and import tariff rates by construction remain the same and therefore Table 5.6 shows practically no changes in the ratio of these taxes to GDP in 2018. On the other hand, other indirect taxes, which capture the value added tax that has been changed, increase from 9.5 percent of GDP to 10.2 and 10.3 percent, respectively, for the Exemp-HD and the Exemp-Infra simulations.

**Real government consumption in primary education, health, and water-sanitation grows by 7.8 percent instead of 6.6 percent when the extra tax revenues are spent on human development** (Table 4.6). When the extra tax revenues are instead spent fully on investments in the “other infrastructure” sector, real government consumption in this sector increases from a 3.6 percent average annual growth rate to a 5.1 percent rate. The former simulation (Exemp-HD) results in an overall growth in real government consumption of 7 percent, rather than the 6.5

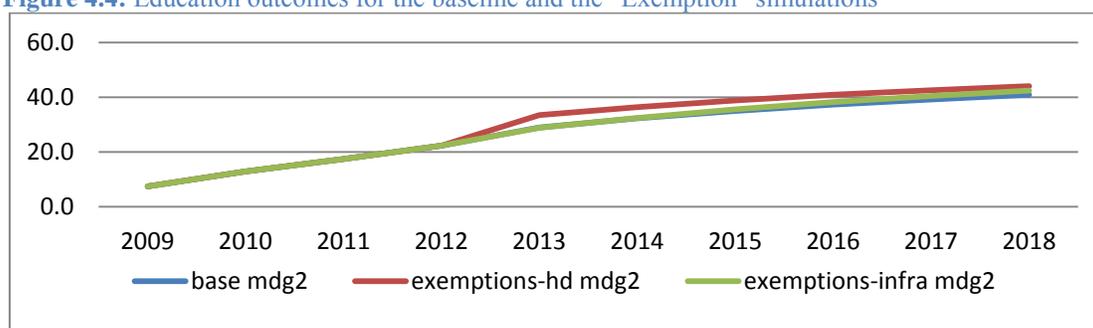
percent for the baseline. The latter simulation (Exemp-Infra) results in only a slightly higher real growth in government consumption (6.6 percent annually), whereas growth in government investment increases from a 5.5 percent annual growth to a 9.3 percent annual growth (Table 4.5).

**The removal of VAT exemptions has very little effect on GDP** (Table 4.5). When the extra tax revenues are spent on human development, the percent annual growth (between 2009-2018) of real GDP at factor cost decreases from 5.52 percent (Base) to 5.49 percent (Exemp-HD). Private consumption and private investment grow at a slower rate than for the Base simulation, with total factor employment remaining basically constant (a slight decrease). The exchange rate faces a slightly stronger appreciation with both exports and imports growing by less. If the extra tax revenues are instead spent on “other infrastructure”, GDP growth increases slightly to 5.64 percent annual growth. Private consumption and investment remain similar to the baseline, and total factor employment is slightly higher. The real exchange rate appreciates by less, while exports and imports grow by slightly more.

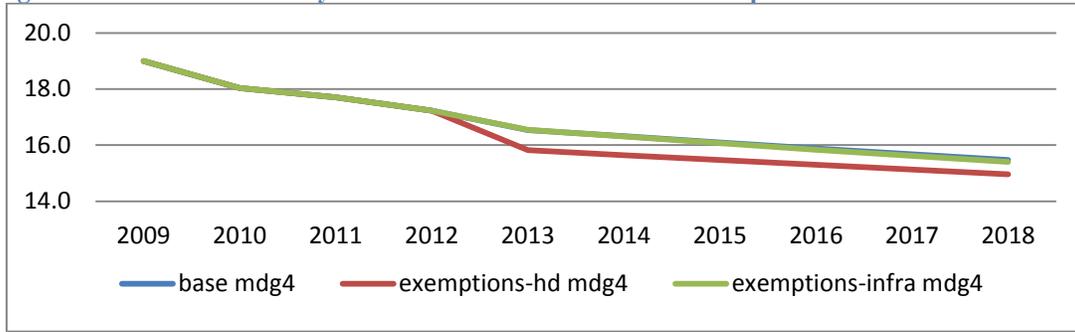
**The small negative effect on the private sector results in a small increase in poverty, but overall better education, health, and water-sanitation outcomes.** Poverty in 2018 increases to 20.7 as compared to the baseline values for 2018 (Table 4.5 and Figure 4.7) while the Gini coefficient remains practically unchanged (Figure 4.8). Although wages do not change, the removal of exemptions led to a decrease in the employment levels of the unskilled and semi-skilled labor force, a decrease in the return to private capital, and an increase in unemployment, all relative to the baseline (Tables 5.8 and 5.9). Since the extra tax revenues are spent on human development sectors, this leads to a higher demand for skilled workers (teachers, doctors, etc.), and slightly higher wages for this labor factor relative to the baseline. The extra expenditure leads to better outcomes in education, health, water and sanitation by 2018 (see Figures 4.4-4.6).

**On the other hand, if the extra tax revenues are instead spent on public infrastructure, poverty rates, as well as human development outcomes, are basically unchanged.** Poverty in 2018 is 20.4 under the “Exemp-Infra” simulation, with unchanged wages, and practically unchanged levels of employment of the unskilled and semi-skilled. The demand for skilled workers slightly increases while unemployment slightly decreases for all labor types, but the returns to private capital decrease as in the previous simulation. Outcomes for education, health, and water and sanitation are practically the same as the baseline (only very slight improvements).

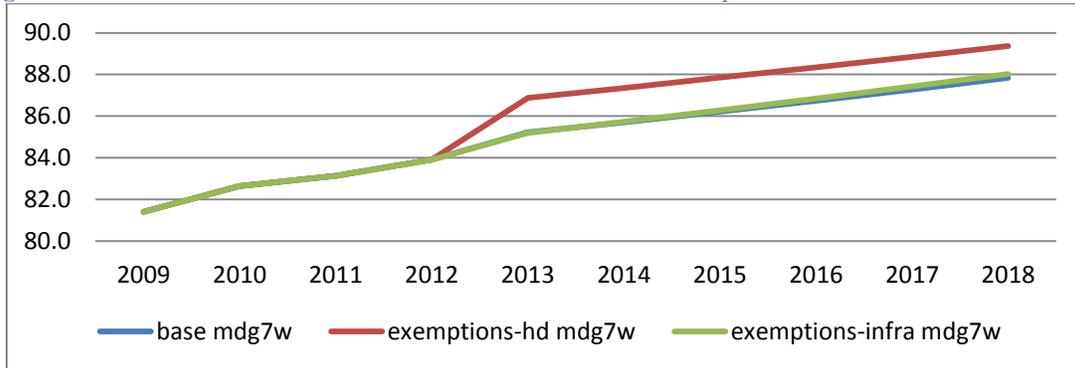
Figure 4.4: Education outcomes for the baseline and the “Exemption” simulations



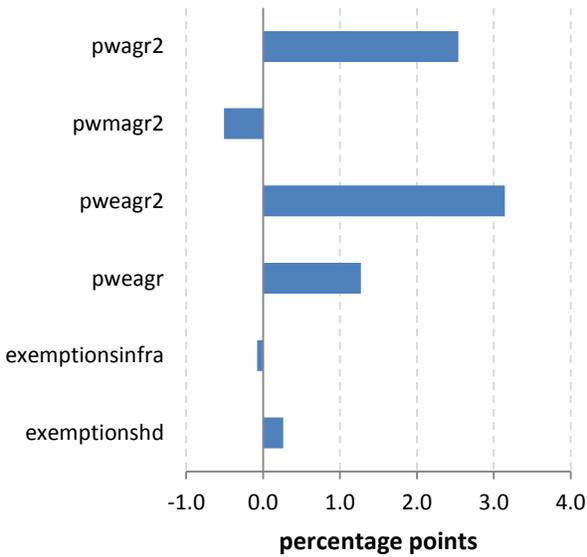
**Figure 4.5: Under-5 mortality rates for the baseline and the “Exemption” simulations**



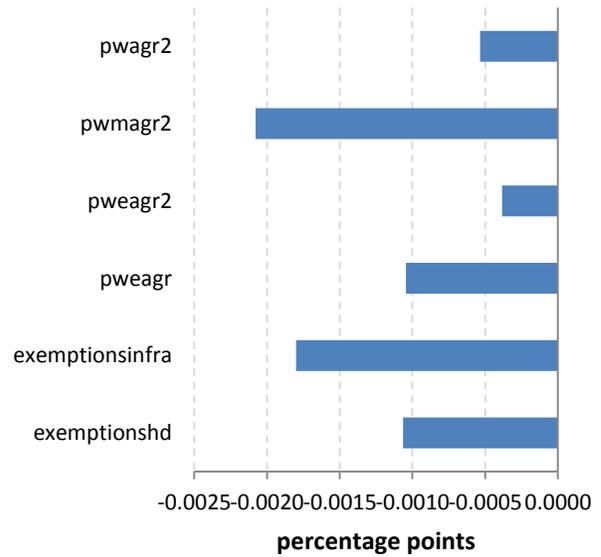
**Figure 4.6: Rates of access to clean water for the baseline and “Exemption” simulations**



**Figure 4.7: Change in Moderate Poverty by Simulation relative to Base**



**Figure 4.8: Change in Gini for Household Per Capita Income by Simulation relative to Base**



**Table 4.5: Real macro indicators by simulation (percent annual growth from first to final report year)**

	<b>2009</b>	<b>base</b>	<b>pweagr</b>	<b>pweagr2</b>	<b>pwmagr2</b>	<b>pwagr2</b>	<b>exemptions-hd</b>	<b>exemptions-infra</b>
<b>Absorption</b>	7302.4	5.78	5.37	4.82	5.93	4.98	5.75	5.89
<b>Consumption - private</b>	5351.8	5.74	5.27	4.66	5.92	4.85	5.62	5.74
<b>Consumption - government</b>	864.7	6.50	6.50	6.50	6.50	6.50	7.03	6.55
<b>Fixed investment - private</b>	894.9	5.69	5.10	4.24	5.84	4.40	5.60	5.73
<b>Fixed investment - government</b>	165.6	5.49	5.49	5.49	5.49	5.49	5.49	9.32
<b>Stock change</b>	25.3							
<b>Exports</b>	2172.6	4.96	4.93	4.40	5.05	4.52	4.86	5.07
<b>Imports</b>	2427.0	5.82	5.36	4.47	6.10	4.75	5.74	5.91
<b>GDP at factor cost</b>	6276.4	5.52	5.26	4.86	5.60	4.96	5.49	5.64
<b>Total factor employment (index)</b>		4.65	4.42	4.06	4.73	4.15	4.63	4.72
<b>Total factor productivity (index)</b>		0.87	0.85	0.80	0.88	0.81	0.86	0.91
<b>Real exchange rate (index)</b>		-0.42	0.19	1.10	-0.47	1.08	-0.47	-0.35
<b>Headcount poverty rate (percent)</b>	35.1	20.45	21.73	23.60	19.94	22.99	20.71	20.37

Note:

1. Unless otherwise noted, column for initial year shows data in LCU.
2. For the poverty rate, the base-year and simulation columns show base-year rate and simulation-specific final-year rates, respectively.

**Table 4.6: Real government consumption -- annual growth from first to final report year by simulation (percent)**

	<b>2009</b>	<b>base</b>	<b>pweagr</b>	<b>pweagr2</b>	<b>pwmagr2</b>	<b>pwagr2</b>	<b>exemptions-hd</b>	<b>exemptions-infra</b>
<b>Primary Educ c-edupgov</b>	144.5	6.6	6.6	6.6	6.6	6.6	7.8	6.6
<b>Secondary Educ c-edusgov</b>	66.4	6.6	6.6	6.6	6.6	6.6	7.0	6.6
<b>Tertiary Educ c-edutgov</b>	40.7	6.6	6.6	6.6	6.6	6.6	6.7	6.6
<b>Health c-saludgov</b>	193.6	6.6	6.6	6.6	6.6	6.6	7.8	6.6
<b>Water&amp;Sanit c-wtsn</b>	3.1	6.6	6.6	6.6	6.6	6.6	7.8	6.6
<b>Other Infra c-otrinfra</b>	34.9	3.6	3.6	3.6	3.6	3.6	3.6	5.1
<b>Pub Admin c-admpub</b>	381.5	6.6	6.6	6.6	6.6	6.6	6.6	6.6
<b>Total</b>	864.7	6.5	6.5	6.5	6.5	6.5	7.0	6.6

**Table 4.7:** Government receipts and spending in first report year and by simulation in final report year (percent of nominal GDP)

Indicator		Final year						exemptions-hd	exemptions-infra
		2009	base	pweagr	pweagr2	pwmagr2	pwagr2		
<b>Receipts</b>	<b>Direct taxes</b>	4.61	4.61	4.63	4.67	4.60	4.66	4.57	4.56
	<b>Import tariffs</b>	1.46	1.44	1.51	1.60	1.43	1.59	1.43	1.44
	<b>Export taxes</b>								
	<b>Other indirect taxes</b>	9.49	9.44	9.71	9.95	9.41	9.92	10.24	10.30
	<b>Private transfers</b>	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	<b>Foreign transfers</b>	0.50	0.50	0.55	0.63	0.49	0.62	0.50	0.50
	<b>Factor income</b>	4.06	1.99	1.97	1.97	2.00	1.97	1.95	1.97
	<b>Domestic borrowing</b>	1.36	0.16	0.17	0.18	0.16	0.18	0.16	0.16
	<b>Foreign borrowing</b>	-3.32	0.59	1.06	2.03	0.33	1.67	0.59	0.59
	<b>Total</b>	18.18	18.76	19.61	21.06	18.44	20.64	19.46	19.54
<b>Spending</b>	<b>Consumption</b>	12.27	13.21	13.72	14.60	13.01	14.34	13.90	13.17
	<b>Fixed investment</b>	2.35	2.35	2.45	2.60	2.33	2.57	2.34	3.20
	<b>Stock change</b>								
	<b>Private transfers</b>	2.83	2.83	2.97	3.18	2.78	3.12	2.84	2.81
	<b>Foreign transfers</b>								
	<b>Domestic interest payments</b>	0.16	0.16	0.17	0.18	0.16	0.18	0.16	0.16
	<b>Foreign interest payments</b>	0.57	0.21	0.30	0.49	0.16	0.43	0.21	0.21
	<b>Domestic capital transfers</b>								
	<b>Total</b>	18.18	18.76	19.61	21.06	18.44	20.64	19.46	19.54

**Table 4.8:** Employment by factor -- annual growth by simulation from first to final report year (percent)

	<b>2009</b>	<b>base</b>	<b>pweagr</b>	<b>pweagr2</b>	<b>pwmagr2</b>	<b>pwagr2</b>	<b>exemp-hd</b>	<b>exemp-infra</b>
<b>All labor</b>	286.3	4.67	4.35	3.86	4.77	3.98	4.62	4.67
<b>Unskilled labor (&lt; completed sec'y)</b>	203.6	4.43	4.10	3.58	4.53	3.70	4.36	4.43
<b>Semi- skilled labor (completed secondary)</b>	63.4	4.66	4.39	3.97	4.76	4.09	4.65	4.66
<b>Skilled labor (completed tertiary)</b>	19.2	6.95	6.64	6.17	7.08	6.32	6.99	6.96
<b>Private capital</b>	10600.0	4.13	3.95	3.70	4.17	3.74	4.10	4.10
<b>Land</b>	257.6	5.00	5.00	5.00	5.00	5.00	5.00	5.00

**Table 4.9:** Unemployment rate by labor type, simulation, and year (percent)

	<b>2009</b>	<b>2018</b>						
		<b>Base</b>	<b>pweagr</b>	<b>pweagr2</b>	<b>pwmagr2</b>	<b>pwagr2</b>	<b>exemp-hd</b>	<b>exemp-infra</b>
<b>All labor</b>	28.0	14.4	16.7	20.2	13.7	19.4	14.6	14.4
<b>Unskilled labor</b>	27.1	12.2	14.7	18.5	11.5	17.6	12.5	12.1
<b>Semi-skilled labor</b>	32.8	14.1	16.0	19.0	13.3	18.2	14.1	14.0
<b>Skilled labor</b>	19.6	30.3	32.0	34.7	29.4	33.9	30.0	30.2

## Commodity Price results

**The second set of alternative scenarios considers the effects of a decrease in commodity world prices.** Four specific scenarios are considered. The first scenario (“pweagr”) analyzes the effects of a 25 percent decrease in the world export price of soy and beef in 2013 that is maintained through 2018. (Since the effects of an increase in the world *import* price of these two commodities did not have much of an effect on Paraguay, this scenario was eliminated.) The next three scenarios focus instead on changes in world prices of all agricultural products: first a decrease in the world export price, then a decrease in the world import price, and then a combination of both price decreases (“pweagr2”, “pwmagr2”, and “pwagr2”, respectively).

**A decrease in the world export price of soy and meat results in slower GDP growth than the baseline.** In general, a decrease in export prices provides an incentive for producers to sell more to the domestic market. However, in the case of soy, 64 percent of its demand comes from the rest of the world (i.e., exports) and the rest as intermediate consumption while none is purchased as final domestic demand. The first direct effect of the shock (simulation “pweagr”) is a decrease in the quantity of exports of soy and meat, and an increase in the production of commodities, such as oils, that use soy as an important intermediate input. The first order effect is a depreciation of the exchange rate and slower growth of imports (that are now more expensive), while export growth in the final equilibrium stays relatively constant with respect to the baseline. In addition, since soy represents 40 percent of total outputs from the agricultural sector, the sector experiences a decrease in output growth. Employment growth in both the agricultural and beef sectors decreases (although a separate soy commodity exists, there is not a separate soy-producing sector in the SAM; it is rather subsumed under the general agricultural sector). In all, growth in private consumption decreases from a 5.7 annual percent growth (Base) to 5.3 percent (“pweagr”), while private investment decreases from 5.7 to 5.1 percent, and GDP from 5.5 percent to 5.26 percent.

**The negative effects on the private sector result in less of a decrease in poverty while inequality and the MDG indicators remain practically unchanged.** Relative to the baseline, in 2018 poverty decreases to 21.7 percent rather than the 20.5 reached in the Base simulation. Inequality is practically unchanged from 0.5257 to 0.5247. Similarly, the levels for education, health, and water and sanitation are similar to the original baseline.

**Under a simulation in which the world export price of all the agricultural products face a 25 percent decrease, GDP and poverty are hit hard.** GDP growth decreases to a 4.9 percent annual growth (see simulation “pweagr2”) rather than 5.5 percent as in the Base. Private consumption grows only at 4.7 percent per year rather than 5.7 and private investment at 4.2 rather than 5.7 percent. The real exchange rate faces a strong depreciation, with its index switching from a -0.42 percent appreciation to a 1.1 percent depreciation. Exports decrease from 5 percent growth to 4.4 while imports take a particularly hard hit as their growth drops from 5.8 percent per year to 4.5 percent. Since the majority of the labor force works in agriculture, the negative output effects result in much slower employment growth across all labor types. In total, all labor grows at 3.9 percent per year for the whole period rather than 4.7 percent as in the Base, and unemployment is higher. The results are a higher level of poverty in 2018 (23.6 percent) as compared to the 2018 value for the Base (20.5 percent). Inequality also decreases by the least

amount as compared to all the other simulations and the MDG indicators show the least improvement among all the simulations.

**A decrease in the import price of all agricultural commodities results in the most positive GDP and poverty results among all the simulations.** GDP growth increases from 5.5 (Base) to 5.6 percent per year (“pwmagr2”). Private consumption and investment grow more strongly, as do total factor employment, exports, and imports. Poverty reaches 19.9 percent by 2018, while inequality shows its strongest decline (of -0.002 points). All MDG indicators show the best progress as compared to the other world price simulations (but not as compared to the simulation that spends more on the human development sectors – “Exemp-HD”).

**A decrease of both the world export and world import prices of the agricultural commodities results in outcomes that fall between the two simulations.** Simulation “pwagr2” takes into account both the shock of a 25 percent decrease in the world export price analyzed under simulation pweagr2 and the 25 percent decrease in the world import price analyzed under simulation pwmagr2. However, the negative effects of the decrease in export prices seem to be stronger than the positive effect of a decrease in import prices.

## 5. Conclusions

**The Poverty and Social Impact Analysis focuses on the potential distributional and poverty effects of two distinct policy issues: (1) the trade-offs involved under different fiscal policies linked to tax exemptions; and (2) the possible impacts of a global economic slowdown.** The first set of policy issues has quantified the trade-offs that would result from reducing Value Added Tax exemptions (and thus potentially lowering consumption) and using those resources to expand human development-related public expenditures in education, health, water and sanitation (or alternatively used to expand other public infrastructure). The second set of policy issues illustrates the economywide effects of a potential new global economic slowdown through its effect on commodity prices and agriculture, given the high dependence of the Paraguayan economy on the agricultural sector. These results could shed light on possible distributional impacts of these fluctuations and possible mitigation options.

**The removal of VAT exemptions increases the tax-to-GDP ratio by a relatively small 0.7 to 0.8 points and has very little effect on GDP.** Spending the extra resources on the primary education, health, and water and sanitation sectors (a human development focus) results in higher government consumption in these sectors, and a small decrease in the growth of GDP at factor cost (from an annual 5.52 percent growth to 5.49 percent) and of private consumption and investment. Spending the extra resources instead on the “other infrastructure” sector, GDP growth increases slightly to 5.64 percent, private consumption and investment remain similar to the baseline, and total factor employment is slightly higher.

**The small negative effect on the private sector from the HD simulation results in a small increase in poverty, but overall better education, health, and water-sanitation outcomes.** This implies that there does indeed exist a trade-off between higher growth with lower poverty, on the one hand, and better human development outcomes. Nevertheless, the removal of the VAT exemptions is an overall small effect.

**If the extra tax revenues from the removal of the tax exemptions are instead spent on public infrastructure, poverty rates, as well as human development outcomes, are basically unchanged.** Although GDP outcomes are slightly better, very little is gained in terms of poverty, inequality, and human development outcomes.

**A decrease in the world export price of soy and meat results in slower GDP growth than in the baseline, but even more so when all agricultural commodities face a lower export price.** In general, Paraguay depends strongly on its agricultural sector, and therefore negative effects on agricultural production have strong negative effects on the overall employment level of the country.

**Only the simulation of a decrease in import prices or the simulation that redirects the extra tax revenues to public infrastructure result in better poverty outcomes than the baseline.** Inequality outcomes are best under these two simulations as well; however none of the simulations have much of an effect on the Gini coefficient.

## Chapter 5. Social spending, taxes and income redistribution in Paraguay<sup>64</sup> Sean Higgins (Tulane), Nora Lustig (Tulane), Julio Ramirez (Cadep), Billy Swanson (UC Davis)<sup>65</sup>

### Overall context

In 2010, Paraguay's GDP per capita was equal to US\$5,159 in PPP.<sup>66</sup> Paraguay's economy has historically reported slow rates of growth; higher commodity prices, however, led to higher growth rates since 2003 (with the exception of 2009, the year of the global financial crisis). As a result, poverty rates declined. According to the Dirección de Estadística, Encuestas y Censos (Office of Statistics, Surveys and the Census), in 2010, the overall incidence of poverty declined to 34.7 percent of the population (Figure 5.1).<sup>67</sup> Extreme poverty, however, has declined more slowly, and in 2010 this indicator registered an upturn to 19.4 percent of the population.<sup>68</sup> This situation helped fuel the government's decision to prioritize social policies targeting populations living in extreme poverty, especially in rural areas. In contrast with other Latin American countries, Paraguay's population has retained a significant rural component. In 2010, sixty percent of Paraguay's population was classified as urban and forty percent as rural. It is in the country's rural sector, moreover, where poverty, and especially extreme poverty, has been concentrated. Paraguay features high levels of inequality but similarly to most of the countries in the region, inequality has declined since 2003 (Figure 5.2).

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<sup>64</sup> This paper was prepared for the LAC Vicepresidency of the World Bank and is an output of the Commitment to Equity (CEQ) project. Led by Nora Lustig and Peter Hakim the *Commitment to Equity* (CEQ) project is designed to assess the progressivity of social spending and taxes, their impact on poverty reduction, and their redistributive effects. It does this through a comprehensive incidence analysis and a diagnostic framework. The incidence analysis addresses the following three questions: How much redistribution and poverty reduction does a country accomplish through social spending and taxes? How progressive are revenue collection and social spending? What could be done to further increase redistribution and improve re-distributional effectiveness? CEQ is the first framework to comprehensively assess the tax and benefits system in developing countries and to make the assessment comparable across countries and over time. Initially, CEQ has focused on Latin America. CEQ/Latin America is a joint project of the Inter-American Dialogue (IAD) and Tulane University's Center for Inter-American Policy and Research (CIPR) and Department of Economics. The project has received financial support from the Canadian International Development Agency, the Norwegian Ministry of Foreign Affairs, the United Nations Development Programme's Regional Bureau for Latin America and the Caribbean, and the General Electric Foundation. <http://www.commitmenttoequity.org/>

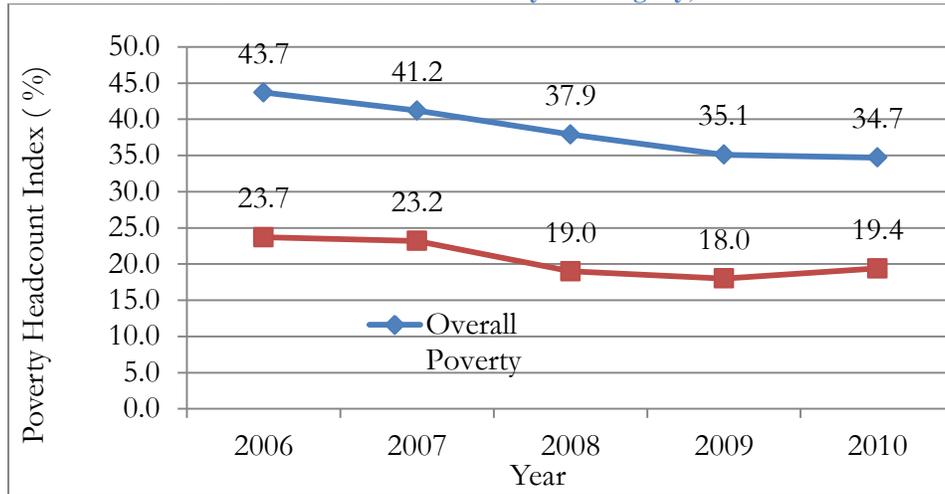
<sup>65</sup> The authors are grateful to Emily Travis for her research assistantship.

<sup>66</sup> PPP means purchasing power parity.

<sup>67</sup> The overall poverty lines used by the Dirección de Estadística, Encuestas y Censos in their calculations are: 525,960 guaraníes per month in metropolitan areas, 376,753 guaraníes per month in urban areas, and 325,707 guaraníes per month in rural areas. Using the international (moderate) poverty line of US\$ 4 PPP per person per day placed the overall level of poverty at 37.5 percent of the population in 2005, and at 27.2 percent for 2010.

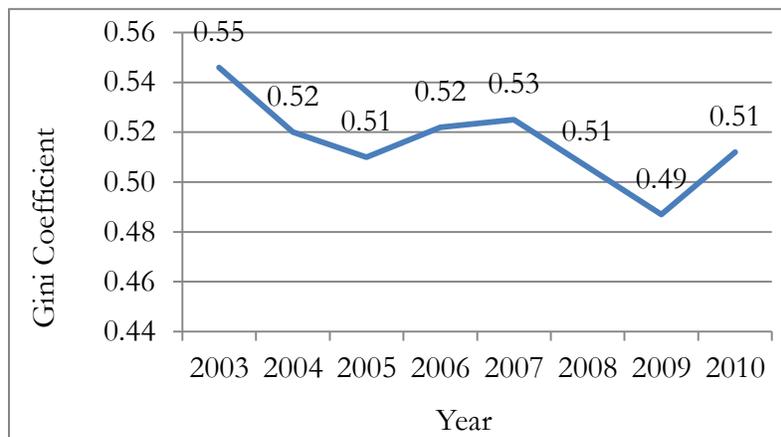
<sup>68</sup> The extreme poverty lines used by the Dirección de Estadística, Encuestas y Censos in their calculations are: 317,510 guaraníes per month in metropolitan áreas, 243,662 guaraníes per month in urban areas, and 225,470 guaraníes per month in rural areas.

**Figure 5. 1: The Evolution of Overall and Extreme Poverty in Paraguay, 2006-2010**



Source: Dirección de Estadística, Encuestas y Censos (Office of Statistics, Surveys and the Census) using the *Encuesta Permanente de Hogares* (Ongoing National Household Survey).  
 Note: The figures from 2006 through 2008 have been adjusted in accordance with new weighting factors.

**Figure 5. 2: The Evolution of Inequality in Paraguay, 2003-2010**

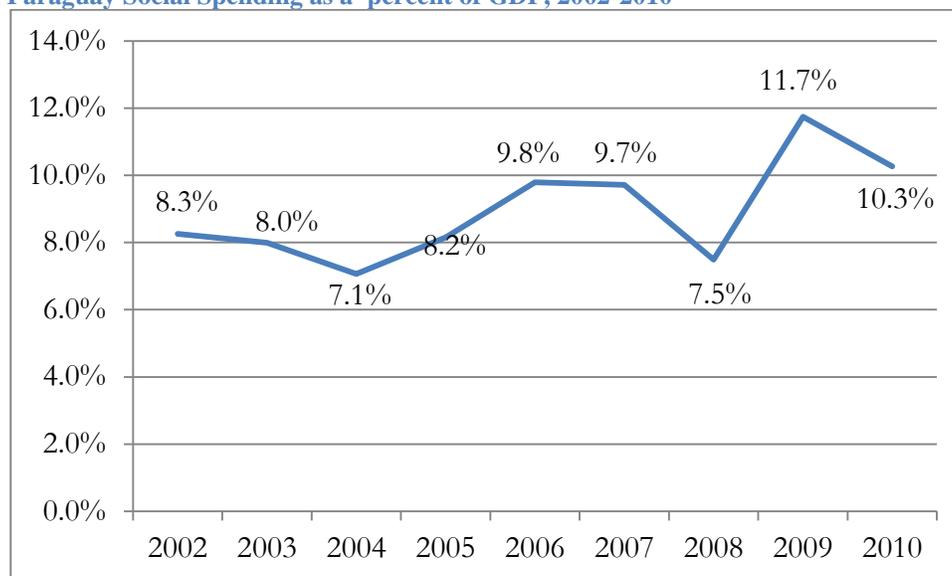


Source: Dirección de Estadística, Encuestas y Censos (Office of Statistics, Surveys and the Census) using the *Encuesta Permanente de Hogares* (Ongoing National Household Survey).  
 Note: The figures from 2003 through 2008 have been adjusted in accordance with new weighting factors.

Paraguay's government revenues and spending are around 20 percent of GDP, a government size similar to Mexico and Peru and about half as large as Argentina's and Brazil's. For tax revenue collection, the government relies heavily on the Value Added Tax. In 2012, a personal income

tax was enacted; before there was no direct income tax. According to government data, between 2002 and 2010, social spending grew from **8.2 percent** to **10.3 percent** of GDP (Figure 5.3).<sup>69</sup>

**Figure 5. 3: Paraguay Social Spending as a percent of GDP, 2002-2010**



Source: Ministerio de Hacienda (Ministry of Finance) and the Central Bank of Paraguay.

How much redistribution does Paraguay accomplish through social spending and taxes? How progressive are revenue collection and social spending? What could be done to further increase redistribution and improve re-distributional effectiveness? Using the *Encuesta Permanente de Hogares* (EPH) 2010, we apply standard incidence analysis to estimate the impact on inequality and poverty of direct taxes, indirect taxes, and social spending, here defined to include cash and food transfers and in-kind transfers in education and health in our benchmark scenario (and contributory pensions in the sensitivity analysis). Some caveats are in order. This exercise does not incorporate behavioral, life-cycle or general equilibrium effects. The analysis also does not look into the macroeconomic sustainability of taxation and social spending patterns. Nonetheless, this study is one of the most detailed incidence analyses for Paraguay to date. The paper is organized as follows. Section 2 presents a summary of Paraguay's social spending and taxes. Section 3 describes the data and methodology used in the incidence analysis.<sup>70</sup> Section 4 presents the main results. Section 5 concludes.

<sup>69</sup> This figure includes social spending at the central, departmental, and municipal levels, as well as spending by the National Electricity Administration on the social tariff for electric energy. Source: Ministerio de Hacienda.

<sup>70</sup> A more detailed description of certain aspects of the methodology is included in an Appendix.

## 1. Paraguay's tax and government benefits system

### Central government revenues

The Paraguayan Central Government is responsible for collecting government revenues, which are comprised of tax and non-tax revenues. Table 5.1 shows the relative size of each component of government revenues.

**Table 5.1: Central Government Revenues in Paraguay, 2005, 2008 and 2010.**

	2005		2008		2010	
	percent of GDP	percent of total	percent of GDP	percent of total	percent of GDP	percent of total
Current revenues	18.2	99.6	17.3	99.8	18.7	98.6
Tax Revenues	11.8	64.7	11.8	67.9	13.4	70.8
Income Taxes	2.1	11.3	2.1	12.3	2.2	11.4
Excise Tax (ISC) -- Fuel	1.7	9.1	1.4	8.0	1.1	5.9
Value Added Tax (IVA)	5.2	28.4	6.1	35.4	6.4	33.8
Custom Duties	1.8	9.6	1.4	8.3	1.6	8.5
Non-tax Revenues	5.8	31.8	4.5	26.1	4.4	23.4
Retirement Fund Contributions (*)	1.2	6.4	1.2	7.1	1.3	7.1
Royalties and Compensation	3.6	19.5	2.5	14.7	2.4	12.5
Non-tax Donations	0.1	0.7	0.4	2.1	0.0	0.1
Non-tax Transfers	0.4	2.1	0.6	3.4	0.8	4.2
Other Non-Tax Revenues	1.0	5.6	0.7	4.2	0.7	3.8
Capital revenues	0.1	0.4	0.0	0.2	0.3	1.4
TOTAL	18.3	100.0	17.3	100.0	19.0	100.0

Source: Ministerio de Hacienda (Ministry of Finance).

Note: (\*) Contributions made by private sector employers and employees to Paraguay's Social Security Institute (Instituto de Previsión Social), a decentralized governmental entity, were not included in these calculations.

Tax revenues are derived predominantly from four main taxes: the value added tax (Impuesto al Valor Agregado, or IVA), the tax on the income of commercial, industrial and service activities (essentially the corporate income tax, Impuesto a la Renta Actividades Comerciales, Industriales y de Servicios, or IRACIS), the selective consumption tax (an excise tax, Impuesto Selectivo a Consumo, or ISC), and custom duties (foreign trade tax). There are other taxes, such as the small business tax (Impuesto a la Renta del Pequeño Contribuyente, or IRPC), the farming income tax (Impuesto a la Renta de Actividades Agropecuarias, or IMAGRO), and other less significant taxes such as the single tax (el tributo único), the single tax on *maquilas*, registration and stamp duties (el impuesto a los actos y documentos), a vehicle tax (el patente fiscal), and others. A personal income tax (Impuesto a la Renta Personal, or IRP) was included in the country's 2004

fiscal reform, but its implementation has been postponed several times, up until its enactment in August of 2012.

On the other hand, the government's non-tax revenues are comprised mainly of contributions to the Retirement Fund, royalties and compensatory payments. The contributions to the Retirement Fund are deducted directly from the salaries of public sector officials and employees. The royalties and compensatory payments refer to revenues received by Paraguay from the operation of the binational hydroelectric plants at Itaipú and Yaciretá, the transfer of electric power to Brazil, and for inundated land (Argentina).

The government's revenues from taxes account for 70.8 percent of total government revenue, and are equivalent to 13.4 percent of GDP, indicating a low fiscal burden. One peculiar aspect of Paraguay's tax structure is its heavy reliance on revenues from indirect taxes, which include the IVA and the ISC, as well as custom duties. The IVA is the most important source of revenues, accounting, in 2010, for 33.8 percent of total government revenues, and 6.4 percent of GDP. The most important direct tax is the corporate income tax (IRACIS, which represents 11.4 percent of the government's total revenues and 2.2 percent of GDP). The farming income tax (IMAGRO) represents barely 0.3 percent of the government's tax revenues.<sup>71</sup> This points out a lack of coherence in the country's fiscal policy, given the fact that agriculture and livestock is the country's most important productive sector, contributing 18.3 percent of total GDP, far ahead of the industrial sector (10.7 percent), trade (15.7 percent), and other sectors.

#### Government spending

Paraguay has a limited tradition of delivering social services and benefits. Recently, in 2003, the need for such programs became a topic of public debate, which was met with a favorable response in terms of the approval of an increase in the budget for social spending. Starting in 2003, a series of non-contributory (welfare) programs were implemented. This trend gained further momentum in 2005, and accelerated again significantly between 2008 and 2010. Table 5.2 shows the components of social spending, and their relative sizes as a percentage of GDP in 2005, 2008 and 2010.

**Table 5. 2: Social Spending as a percentage of GDP in Paraguay, 2005, 2008 and 2010.**

	2005	2008	2010
<b>Education (*)</b>	3.95	3.47	4.44
<b>Health</b>	1.45	1.26	2.30
<b>Social Security</b>	2.46	1.67	1.90
<b>Social Assistance</b>	2.76	2.76	3.58
Social promotion and action (**)	0.14	0.74	1.41
Social Tariff for Electric Energy	0.00	0.00	0.05
Labor relations	0.01	0.01	0.01

<sup>71</sup> Another direct tax is the property tax, which is administered by municipal governments.

Housing and urban development	0.00	0.21	0.18
Other services (***)	0.16	0.13	0.04
<b>Total Social Spending</b>	<b>8.16</b>	<b>7.49</b>	<b>10.32</b>

Source: Authors' own calculations, based on Finance Ministry data.

Notes: (\*) Includes education spending at the elementary, secondary, and tertiary levels, as well as on cultural education and community enrichment. (\*\*) Includes assistance to people with special needs, social action services, social services from state governments, and promotion, assistance, and social action against discrimination; does not include the Social Tariff for Electric Energy which is listed separately. (\*\*\*) Includes dissemination of scientific and technological knowledge and a category for "other services."

## 2. The social protection system

Paraguay's social security system is based on the distribution of a defined set of benefits. In Paraguay there are two separate government-controlled social security agencies: one for public sector employees and one for private sector workers (the Social Security Institute [Instituto de Previsión Social, IPS]). In addition, there are private retirement and pension funds which are not regulated by any government institution. Social security programs account for 1.9 percent of GDP. This table does not include retirement payments disbursed by the IPS, which is the largest social security system for salaried private sector workers. In 2010, the Caja Fiscal, reserved for public sector workers, had 33,369 retirees receiving contributory pensions.

There are also many beneficiaries of non-contributory pensions: in 2012, there were 60,559 beneficiaries. The non-contributory pension programs and their benefits are described below.

### *Adultos Mayores en situación de pobreza con Pensión Alimentaría (Pension for Senior Citizens Living in Poverty)*

To access this benefit, an individual must meet the requirements of Law 3728, which are essentially to be living in poverty and be older than 65. In addition, potential beneficiaries must not have debts to the state, and their national identification card must not be expired. The Ministerio de Hacienda (Ministry of Finance) uses data from the Dirección General de Estadísticas, Encuestas y Censos (Office of Statistics, Surveys and the Census) to maintain a list of eligible individuals and select beneficiaries. In 2010 there were just 7,000 beneficiaries; in 2011 the number of beneficiaries increased to 25,000, and today there are 45,831 beneficiaries. The minimum size of the transfer is 25 percent of the legal monthly minimum wage; thus the minimum transfer equaled 376,871 guaraníes per month (\$4.63 PPP per day) in 2010.

### *Survivorship pensions*

The survivors of deceased pensioners and of people in an activity with the right to retirement are eligible to receive survivorship pensions. Survivors with the right to this pension are the spouse, children, and parents, provided that they lived at the expense of the deceased person, and there are no other beneficiaries. For the children of the deceased person to receive a survivorship pension, they must be single minors (unless they are disabled). The amount received by each beneficiary corresponds to a percentage of the original pension.

### *Disability pensions*

Individuals with a disability (whether natural or due to an accident) who are younger than 62 years old and worked for a minimum of ten years can receive a disability pension. Currently, there are just 473 disability pension beneficiaries.

### *Veterans of the Chaco War*

There are currently 1,240 veterans of the Chaco War who receive pensions and subsidies. These ex-soldiers receive benefits equal to 3,440,000 per month (\$42.35 PPP per day), in accordance with the Pensions Law. Their heirs (widows, minor children, or disabled children) have the right to receive up to 75 percent of the pension received by the veteran, which does not include the subsidy. Currently, there are 11,956 heirs of veterans receiving 1,290,000 guaraníes per month (\$15.88 PPP per day).

### *Heirs of Police and Military Killed in Action*

The widows, children, and parents of police officers and military personnel killed in action can receive a pension from the state, as long as they demonstrate dependence on the deceased person, in accordance with Law 3217/07. They receive a percentage of the salary or pension that would have corresponded to the deceased person. The percentages are 65 percent for widows and 25 percent for parents of the deceased person; if there are children, 45 percent goes to the widow and 20 percent is distributed between the children.

## 3. Social promotion and action programs

Social promotion programs in Paraguay currently include the so-called direct cash transfer programs, which are:

### *Tekoporã*

This is a conditional cash transfer program (CCT) for families living in extreme poverty. The program started in 2005 and includes beneficiaries in both rural and urban areas. It is the largest and the most widely known social program. Through Tekoporã close to 83,500 families living in extreme poverty receive monthly cash transfers of between 180,000 and 300,000 guaraníes (\$2.22 to \$3.69 PPP per day). In 2010, this program's budget totaled US\$ 71.2 million, equivalent to 0.39 percent of GDP. To be eligible for this program a family must live in conditions of extreme poverty. Families receiving this benefit are made up of pregnant women, dependent elderly family members over 65 years of age, or children under the age of 18. Indicators of extreme poverty include precarious living conditions, such as homes with dirt floors, mud walls, thatched roofs, and lacking electricity or access to clean drinking water and sanitation.

Families are selected for the program based on criteria of unmet basic needs (UBN), which are determined by region, based on the 2002 Population and Housing Census. In regions found to be of high priority, two instruments are employed: the "Ficha Hogar" is applied in order to determine families' demographic and socio-economic conditions, and the Quality of Life Index (QLI) is used to measure and classify six dimensions: health, formal education, income, housing,

public services and social well-being assets. Families with the lowest QLI indicators are selected to participate in the program.

Beneficiaries are required to comply with a set of conditions, including a health and education plan, which can be met by accessing local public services. Participating families commit themselves to: seek prenatal medical attention, participate in nutritional surveillance, growth, and weight control programs, ensure that children are vaccinated and attend school, and participate in nutritional programs. Adults in the family must also participate in literacy programs, toddlers in early childhood education programs, and school-age children must attend school.

A study of Tekoporã (Galeano, 2008) found that beneficiaries' incomes increased by 17 percent and extreme poverty was reduced from 51 percent to 45 percent among the beneficiary population. Moreover, approximately 13 percent of participants reported achieving greater access to credit, and among those living in extreme poverty, overall indebtedness fell by 45 percent (Imas, 2011).

### *Pro-País II*

This is the second most important program in terms of budget. In 2010 this program served 14,839 beneficiary families and had a budget of US\$ 8.3 million. This program is often classified as a sub-program of Tekoporã. Like Tekoporã, Pro-País is a conditional cash transfer program, and employs a similar system for locating and selecting beneficiaries. The main difference between these programs is that Pro-País is located in the urban areas making up the Greater Asunción metropolitan area,<sup>72</sup> and the program also finances community-based and productive projects costing up to US\$ 60,000.

### *Abrazo*

In 2010 this direct transfer program served 1,708 beneficiary families and had a budget of US\$ 2.2 million. The mission and target population of the Abrazo program are significantly different from those of Tekoporã and Pro-País II. Abrazo serves street children, who are selected to participate in the program by “promoters” employed by the National Secretariat of Children and Youth. The objectives of this program are: i) to reduce poverty, ii) guarantee the rights of the child, and iii) provide integrated health, education and protection services to boys and girls who work in public spaces within the city (Imas, 2011). Social workers provide the families of participating children with psycho-social support, and if needed, families also receive basic food rations or “bonos solidarios” (vouchers). The conditions that beneficiaries must fulfill include ensuring that the child continues to live at home, attends school, and is provided with necessary care.

### *Health and Education*

In 2010 spending on health and education in Paraguay was equivalent to 6.7 percent of GDP, totaling US\$ 1.2 billion. Spending on education is divided among three levels: elementary education, which serves children from preschool through eighth grade; secondary and technical

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<sup>72</sup> Asunción and the cities located within its zone of influence.

school, which serves students from ninth through twelfth grades; and higher education, which serves students at the university and doctoral levels. In 2010, the financing of these programs represented 42 percent, 19 percent, and 32 percent, respectively, of total spending on education. The remaining 7 percent was spent on cultural education and community enrichment. Part of the expenditure on educational programs covers the cost of nutritional programs (more widely known as the school lunch program), and programs that provide school supplies for elementary schools located in the poorest regions.

In regard to health services, according to data provided by the World Health Program, in 2008, an estimated 7 percent of the population of Paraguay had access to private medical care, 20 percent was served by the Social Security Institute (IPS), and the remainder relied on the public health care system. The public health care system is comprised predominantly of the Ministry of Public Health and Welfare, and by the military and police medical services. Our analysis includes benefits received both through the public contributory health system (via IPS) and through the free public health care system.

In 2009, spending on health care services rose dramatically by 63 percent -- an additional amount of US\$ 133.5 million. The rise was due to the expansion of free universal health care including vaccinations, primary care, and hospitals. That year (2009), health care expenditures represented 10.6 percent of the Central Government's total spending. In 2010, health care expenditures rose in relative terms, accounting for 11.6 percent of the Central Government's total expenditures.

This sustained expansion of health care spending, which increased nearly fourfold between 2005 and 2010, was directly associated with the implementation of free health care services, which include immunization, primary care, and direct access to hospitalization.

#### *Housing and Urban Development*

Expenditures on housing and urban development have virtually no effect on social spending. These expenditures consist of subsidies to low-income and middle-class families for buying or building a home, and loans at preferential rates for middle class families. The Ministry of Housing and Habitat (Secretaria Nacional de la Vivienda y el Habitat, or SENAVITAT) is responsible for these programs, which starting in 2010, have also provided subsidies to indigenous groups. Note that spending on housing and urban development is not included in our analysis due to the difficulty in identifying beneficiaries in the survey data.

## 4. Data and Methodology

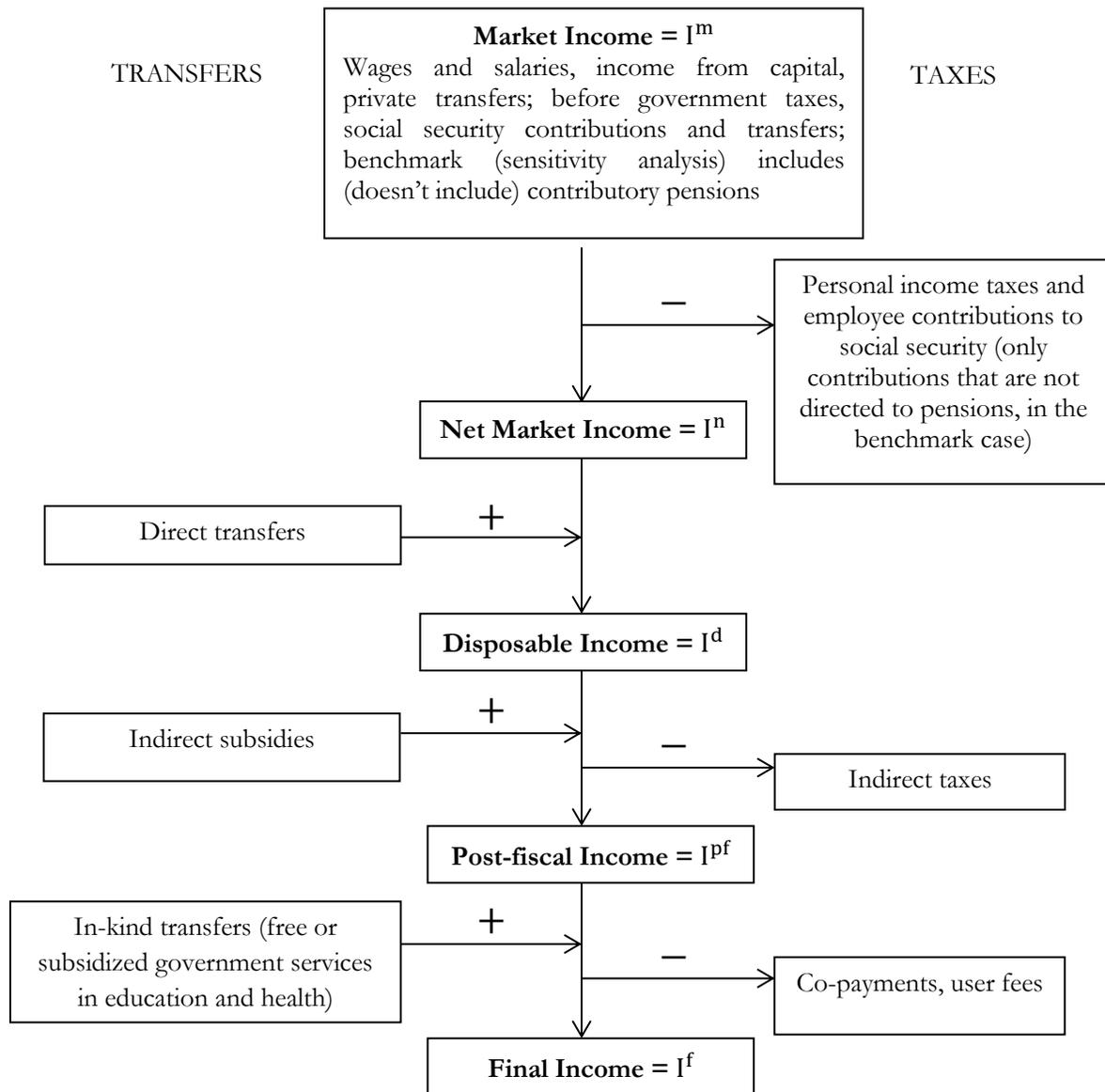
The micro data-set *Encuesta Permanente de Hogares* (EPH), 2010, was the principal source of data for this analysis. The EPH collects a range of variables on 6000 families and their members and samples from all regions of Paraguay except Alto Paraguay and Boquerón, whose populations consist of less than two percent of the total.

Many of the key variables used in this analysis are available directly from the EPH survey, such as household income by source, conditions of the home, and the level of education of each family member. However, several vital variables were not included in the survey. Among them are indirect taxes, employee and employer contributions to social security, the value of health services received, and information on non-contributory pensions. Thus, these income sources had to be imputed, simulated, or taken from secondary sources. This section will briefly describe

which variables were estimated and by what methodology. This information is summarized by Table A.1 in the Appendix.

These income sources are combined to form various income concepts. Diagram 1 summarizes the income concepts used in the incidence analysis.

**Diagram 5.1: Definitions of Income Concepts: A Stylized Presentation**



Source: Lustig and Higgins (2012)

Note: in some cases we also present results for “final income\*” which is defined as disposable income plus in-kind transfers minus co-payments and user fees.

In this paper, social spending includes direct transfers plus government spending on education and health in the benchmark case; in the sensitivity analysis, it also includes spending on contributory pensions. Direct taxes include property taxes, municipal taxes, and other taxes. There were no income taxes in Paraguay at the time of the survey (see section 2). Indirect subsidies include the Social Tariff for Electric Energy (Tarifa Social de Energía Eléctrica). Indirect taxes include the value added tax and combustibles tax.

It is important to note that, for lack of data, non-contributory pensions are not separated from contributory pensions. The requirements for eligibility to receive non-contributory pensions are prohibitively complicated<sup>73</sup> and, without a variable in the EPH data set to distinguish non-contributory from contributory pensions, any attempt at “projecting” likely recipients would be misleading. As a result, all non-contributory pensions enter into market income along with contributory pensions in the benchmark case. Then, in the sensitivity analysis, these funds are not part of market income and instead enter into government transfers.

All family income sources are reported in the EPH survey, including income from government transfers. The variable used to record direct transfers is noisy and in practice is a catch-all for any regular monthly income from any local or national organization or charity. Tekoporã is by far the largest transfer program in Paraguay when pensions are not considered; however, the monetary values in the Direct Transfers variable were often lower or several times higher than the projected Tekoporã transfer. Additionally, the EPH reported far fewer enrolled persons than the national totals according to Ministerio de Hacienda (Ministry of Finance, MH). This analysis employed the methodology developed in Souza, Osorio, and Soares (2011) to identify additional Tekoporã beneficiaries and correct for some beneficiaries not reporting the transfer or under-reporting the amount received.

Essentially, individuals who report a direct transfer of an amount exactly equal to a possible amount of Tekoporã are considered recipients. Let the number of recipients identified using this method be  $S$ , and the (larger) number of recipients in national accounts be  $N$ . Finally, let the difference between the number of beneficiaries reported in national accounts and the number reported in the survey be denoted  $H \equiv N - S$ . The next step is to “identify” the  $H$  remaining beneficiary households in the survey. A probit model is used on all households to determine the probability of program participation. The coefficients from this probit predict the probability of program participation  $\hat{p}$ . Next, we randomly select  $H$  households out of the  $S$  beneficiary households (note that  $H < S$ ), and match each of these  $H$  beneficiary households with the non-beneficiary household who has the closest probability of program selection  $\hat{p}$  (thus, the method is a propensity score matching type of technique) and identify those non-beneficiary households as beneficiaries. These imputed beneficiaries are then assigned the average benefit paid by the program, where the average benefit paid by the program refers to the mean benefit of the  $S$  households identified as beneficiaries in the first step. As a result of this imputation process, the total number of beneficiaries in the survey will equal  $N$ , the number of recipients reported in national accounts.

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<sup>73</sup> The legal document explaining the requirements is “Ley 2345: DE REFORMA Y SOSTENIBILIDAD DE LA CAJA FISCAL. SISTEMA DE JUBILACIONES Y PENSIONES DEL SECTOR PÚBLICO.”

For individuals who are not identified as Tekoporã beneficiaries but have positive values reported under the direct transfers variable, the amount is attributed to a different government program labeled as “Other Direct Transfers.” For imputed Tekoporã beneficiaries who have amounts reported for the direct transfers variable exceeding their imputed Tekoporã benefit, the amount that is “left over” (the difference between the value reported for direct transfers and the imputed Tekoporã transfer) is considered a transfer from a different government program and labeled as “Other Direct Transfers.”

Direct taxes are reported in the EPH but are not scaled to MH national totals because they are collected at the local and regional level for which there is no reliable aggregate data on taxes. Indirect taxes are not reported in the EPH. This analysis imputes the indirect tax burden using incidence estimates provided in BID (2010), in which the tables are calculated by population decile and sorted by market income, with separate estimates for the value added tax (VAT) and the combustibles tax. The incidence by decile from BID (2010) is applied to the EPH population by decile and scaled proportionally to the MH reported total revenue for the VAT and combustibles tax.

Data on indirect subsidies, or more precisely the Social Tariff for Electric Energy program, are not included in the EPH survey. Fortunately, the impact of this program is relatively straightforward to estimate using the available data in the EPH. Families report total monthly electricity bill payments. A family will automatically qualify if they use below a threshold amount of wattage per month, at which point their electricity bill is automatically capped and a percentage is deducted by a ladder scale of increasing percentages for lower watt-usage. To impute the benefits of supposed Social Tariff for Electric Energy beneficiaries, households paying at or below this cap are assumed to be beneficiaries. These assumed recipients are assigned an indirect subsidy equal to the difference in value between their electricity usage and payment. For example, households that reported paying 8,747 guaraníes per month or less in electricity (the lowest rung of the ladder scale) were assigned a transfer value equal to the 2010 price of 100 kilowatts of electricity minus 8,747 guaraníes.

This analysis estimates in-kind education benefits using the cost-per-student by level of education as a proxy. The EPH collects data on each family member’s level of education achieved and the current enrollment status. Students who report themselves as currently attending public school are assigned, as an in-kind transfer, the per-student spending on that education level, as reported by MH. For example, if a child reports currently attending public school and is within the age range for primary students, that student is assigned an in-kind benefit equal to the government’s education spending per primary student. The same procedure is applied to all students at all levels of public education.

In-kind transfers of health services are estimated using a similar logic. Recipients of free health care are first distinguished from those who pay into the public health care system. If the individual said “no” to having insurance and “yes” to “received a medical service within the last 3 months”, they are assigned a proportion of the national total spent on free health services

reported by MH. Otherwise, if the individual received a medical service and said “yes” to having public Instituto Público de Salud (IPS) insurance, then they are assigned the per-beneficiary proportion of the total spent on IPS health care reported by MH.

## 5. Results

This section discusses the impact of taxes and social spending on poverty and inequality in Paraguay. It is divided into five subsections. The first subsection quantifies the reduction in poverty and inequality in Paraguay across income concepts, and contextualizes these results by placing Paraguay in comparative perspective with other Latin American countries. The second subsection uses effectiveness indicators to quantify redistributive effectiveness in Paraguay, again placing the results in comparative perspective with other Latin American countries. The third subsection presents the incidence of taxes and social spending. The fourth subsection assesses the progressivity of taxes and social spending. The fifth subsection addresses the question of the underlying causes behind Paraguay’s low levels of inequality and poverty reduction.

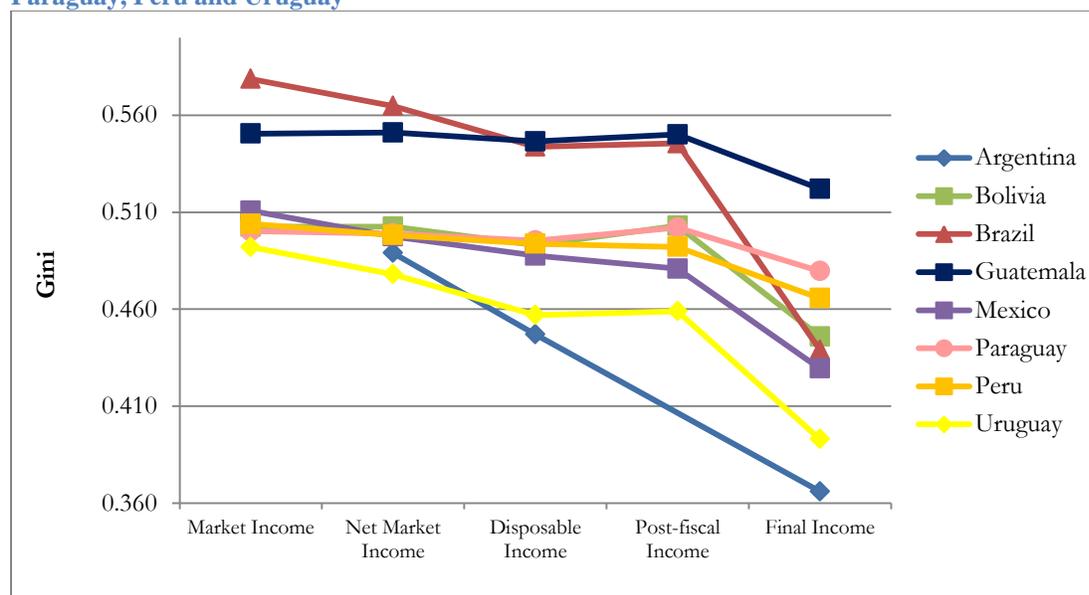
## 6. Impact of taxes and social spending on inequality and poverty

In comparison with other Latin American countries,<sup>74</sup> Paraguay redistributes relatively little through social spending and taxes. As shown in Figure 4, the market income Gini in Paraguay is 0.50, placing it at the less unequal end of our sample of countries (Argentina, Bolivia, Brazil, Guatemala, Mexico, Paraguay, Peru, and Uruguay) in terms of inequality before government intervention. However, direct taxes and transfers reduce the Gini coefficient by less than one percent, and indirect taxes reverse this progress: the post-fiscal income Gini coefficient is slightly higher than the market income Gini. Education and health spending are equalizing, but their effect is also limited compared to other countries. In terms of final income, Paraguay is the most unequal country, with a Gini coefficient of 0.48. From market income to final income, Paraguay only reduces inequality by 4.1 percent, which is less than all other countries in our sample: Guatemala reduces inequality by 5.2 percent, Peru by 7.6 percent, Bolivia by 12.4 percent, Mexico by 15.9 percent, Uruguay by 20.2 percent, Brazil by 24.1 percent, and Argentina by 25.2 percent.

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<sup>74</sup> The comparisons with other countries come from country studies in the Commitment to Equity (CEQ) project (see [www.commitmenttoequity.com](http://www.commitmenttoequity.com)). These studies are synthesized in Lustig and Pessino (2013) for Argentina, Paz et al. (2013) for Bolivia, Higgins and Pereira (2013) for Brazil, Morán and Cabrera (2012) for Guatemala, Scott (2013) for Mexico, Jaramillo (2013) for Brazil, and Bucheli et al. (2013) and for Uruguay.

**Figure 5. 4: Gini Coefficient for Each Income Concept in Argentina, Bolivia, Brazil, Guatemala, Mexico, Paraguay, Peru and Uruguay**



*Source:* For Paraguay, authors' calculations using *Encuesta Permanente de Hogares* (2010) and National Accounts; for Argentina, Lustig and Pessino (2013); for Bolivia, Paz et al. (2013); for Brazil, Higgins and Pereira (2013); for Guatemala, Morán and Cabrera (2013); for Mexico, Scott (2013); for Peru, Jaramillo (2013); for Uruguay, Bucheli et al. (2013). Note: The Ginis in this figure correspond to the benchmark case. For definitions of income concepts see Diagram 1 and the Appendix.

Table 3 shows the reduction in inequality and poverty across income concepts in Paraguay, in both the benchmark case and the sensitivity analysis. The table shows us that a significant number of the near-poor pay enough direct taxes to make them poor,<sup>75</sup> as the headcount index for net market income using the \$4 PPP per day poverty line, at 28.3 percent, is over one percentage point higher than the market income headcount index. This is also unique to Paraguay among countries in our sample: the others have much smaller increases in poverty caused by direct taxes. Direct transfers reduce poverty slightly, but their impact is overshadowed by the poverty-increasing impact of direct and indirect taxes: post-fiscal income poverty is higher than market income poverty using both the \$2.50 and \$4 PPP per day poverty lines.

**Table 5. 3: Taxes, Transfers, Inequality and Poverty in Paraguay, 2010.**

Benchmark: contributory pensions as part of market income					
<i>Indicator</i>	Market Income	Net Market Income	Disposable Income	Post-fiscal Income	Final Income
Gini	0.500	0.499	0.495	0.502	0.480
Headcount index at \$2.5 PPP/day	14.6	14.9	14.4	16.2	

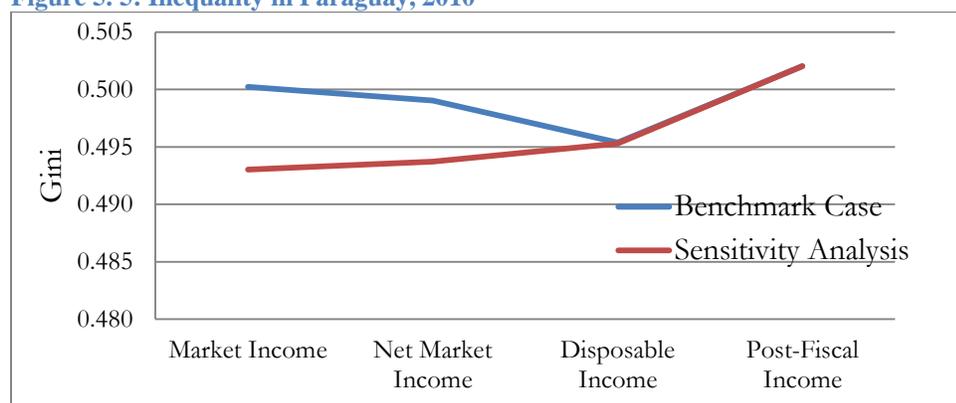
<sup>75</sup> Direct taxes include property taxes, municipal taxes, and other taxes, and are asked directly in the survey. Paraguay did not have a federal income tax at the time of the survey (see Section 2).

	percent	percent	percent	percent	
Headcount index at \$4 PPP/day	27.2	28.3	28.0	30.1	
	percent	percent	percent	percent	
Sensitivity Analysis 1: pensions are treated as a government transfer					
<i>Indicator</i>	Market Income	Net Market Income	Disposable Income	Post-fiscal Income	Final Income
Gini	0.493	0.494	0.495	0.502	0.480
Headcount index at \$2.5 PPP/day	15.0	15.3	14.4	16.2	
	percent	percent	percent	percent	
Headcount index at \$4 PPP/day	28.0	29.1	28.0	30.1	
	percent	percent	percent	percent	

Source: Authors' calculations using *Encuesta Permanente de Hogares* (2010) and National Accounts. Note: For definitions of income concepts see Diagram 1 and the Appendix.

Contributory pensions and non-contributory pensions (because the latter could not be separated from contributory pensions in the survey or by using program rules, as discussed in Section 3) are counted as part of the market income in the benchmark case but considered government transfer in the sensitivity analysis. Figure 5.5 presents the evolution of inequality across income concepts in the benchmark case and sensitivity analysis. Because pensions are treated changes the qualitative assessment of direct transfers. When they are not included in government transfers (the benchmark case), overall direct transfers are equalizing and the disposable income Gini is lower than the market income Gini.

Figure 5. 5: Inequality in Paraguay, 2010



Source: Authors' calculations using *Encuesta Permanente de Hogares* (2010) and National Accounts. Note: For definitions of income concepts see Diagram 1 and the Appendix.

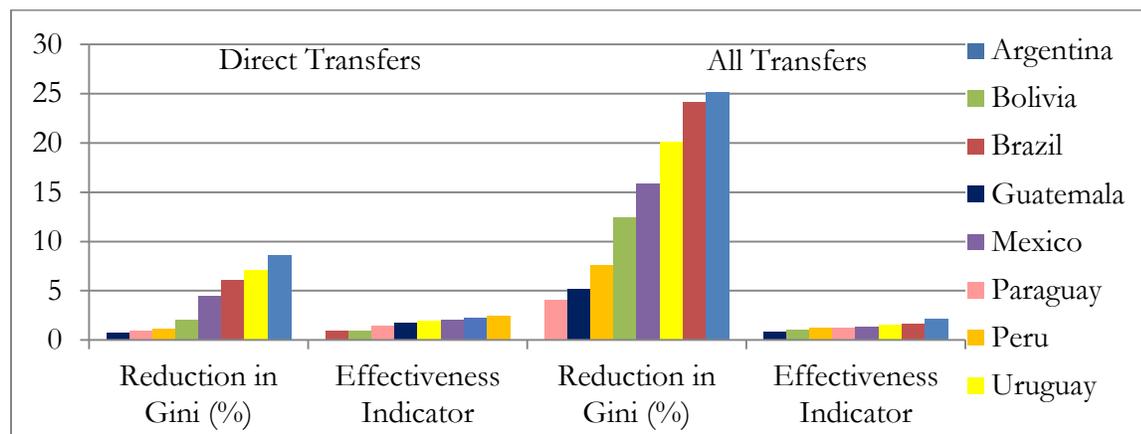
### Redistributive Effectiveness

The effectiveness indicator is defined as the effect on inequality or effect on poverty of the transfers being analyzed divided by their relative size. Specifically, it is defined as follows for the Gini (and would be similarly defined for any other inequality or poverty measure by

replacing the word Gini with the appropriate measure). For direct transfers, the effectiveness indicator is the proportional fall between the net market income and disposable income Ginis, divided by the size of direct transfers as a percent of GDP. Although the size of direct transfers is measured by budget size according to national accounts, only direct transfer programs that are captured by the survey (or otherwise estimated by the authors) are included, since they are the only programs that can lead to an observed change in income.<sup>76</sup> For direct and in-kind transfers, the effectiveness indicator is the proportional fall between the net market income and final income\* Ginis, divided by the size of the sum of direct transfers, education spending, and health spending as a percent of GDP. The formulas are in the Appendix.

Figure 6 shows the reductions in the Gini coefficient and the effectiveness of spending at reducing inequality, for Paraguay and the other seven Latin American countries included in the analysis. Given Paraguay's low spending, although it always has the lowest or second-lowest reduction in inequality among the eight countries, it is not always the least effective. Its redistributive effectiveness indicator for direct transfers is higher than that of Bolivia and Brazil (two high-spending countries that accomplish low reduction relative to the amount they spend). Its redistributive effectiveness indicator for all (direct and in-kind) transfers is higher than Bolivia and Brazil, and similar to two small-government countries who achieve low inequality reductions given the amount they spend: Mexico and Peru. In other words, although Paraguay is the worst performer in terms of reducing inequality when both direct and in-kind benefits are considered, the country performs in the middle of the pack in terms of the efficiency of each dollar spent at reducing inequality.

**Figure 5. 6: Reduction in Gini and Redistributive Effectiveness in Argentina, Bolivia, Brazil, Guatemala, Mexico, Paraguay, Peru and Uruguay.**



Source: For Paraguay, authors' calculations using *Encuesta Permanente de Hogares* (2010) and National Accounts; for Argentina, Lustig and Pessino (2013); for Bolivia, Paz et al. (2013); for Brazil, Higgins and Pereira (2013); for

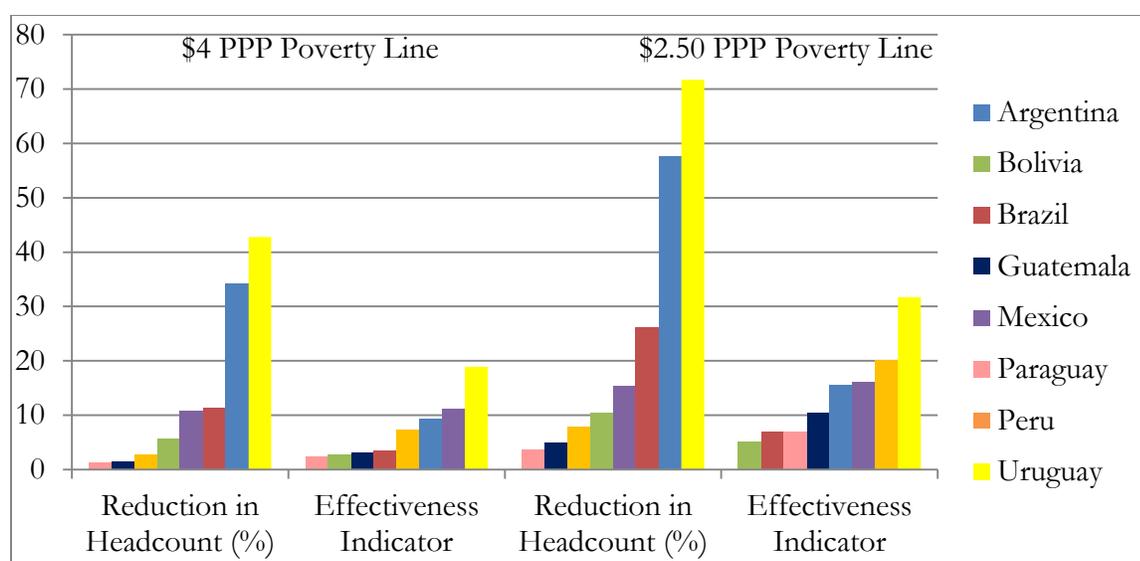
<sup>76</sup> Thus, the denominator of the effectiveness indicator, direct transfers as a percent of GDP, does not include spending on pensions in the benchmark case, but does include them in the sensitivity analysis.

Guatemala, Morán and Cabrera (2013); for Mexico, Scott (2013); for Peru, Jaramillo (2013); for Uruguay, Bucheli et al. (2013).

*Note:* The Gini reductions and effectiveness indicators in this figure correspond to the benchmark case. Reduction in Gini is the percent change between the market and disposable (final) income Ginis for Direct Transfers (All Transfers). For definitions of effectiveness indicators see the Appendix. For definitions of income concepts see Diagram 1 and the Appendix.

Figure 5.7 shows the reductions in the headcount index and the effectiveness of spending at reducing poverty. Paraguay performs worse than the seven other countries in terms of poverty reduction, and it also has a low effectiveness of every dollar it spends (the lowest at the \$4 PPP per day poverty line and third-lowest at \$2.50 PPP per day).

**Figure 5. 7: Decline in Headcount Index and Poverty Reduction Effectiveness in Argentina, Bolivia, Brazil, Guatemala, Mexico, Paraguay, Peru and Uruguay.**



*Source:* For Paraguay, authors’ calculations using *Encuesta Permanente de Hogares* (2010) and National Accounts; for Argentina, Lustig and Pessino (2013); for Bolivia, Paz et al. (2013); for Brazil, Higgins and Pereira (2013); for Guatemala, Morán and Cabrera (2013); for Mexico, Scott (2013); for Peru, Jaramillo (2013); for Uruguay, Bucheli et al. (2013).

*Note:* The headcount reductions and effectiveness indicators in this figure correspond to the benchmark case. The reduction in headcount is the percent reduction between the net market income and disposable income headcount indices. For definitions of effectiveness indicators see the Appendix. For definitions of income concepts see Diagram 1 and the Appendix.

### Incidence of Taxes and Social Spending

Looking at the changes in income caused by different income components at each market income decile provides additional information about both the progressivity of different taxes and transfers, as well as their relative weight in equalizing the income distribution and lifting individuals out of poverty. Table 5.4 provides the incidence of different taxes and transfer

programs by decile (groups of 10 percent of the population ranked by market income, where the first decile indicates the poorest group and the tenth decile indicates the richest group).

**Table 5. 4: Incidence of Taxes and Transfers in Paraguay, 2010.**

Deciles	Direct Taxes	Net Market Income	Flagship CCT	Other Direct Transfers	All Direct Transfers	Disposable Income	Indirect Subsidies	Indirect Taxes	Post-Fiscal Income	In-kind Education	In-kind Health	In-kind Transfers	Final Income
1	-1.2 %	-1.2 %	5.6 %	3.5 %	9.1 %	7.9 %	0.4 %	-28.0	-19.7	12.9 %	18.6 %	31.5 %	11.8 %
2	-2.5 %	-2.5 %	1.7 %	0.3 %	2.0 %	-0.5 %	0.2 %	-6.9	-7.2	6.5 %	10.2 %	16.7 %	9.5 %
3	-1.3 %	-1.3 %	0.7 %	0.5 %	1.1 %	-0.2 %	0.2 %	-7.6	-7.6	4.7 %	9.9 %	14.6 %	7.0 %
4	-2.2 %	-2.2 %	0.4 %	0.0 %	0.4 %	-1.8 %	0.1 %	-6.1	-7.8	4.4 %	7.9 %	12.4 %	4.6 %
5	-1.7 %	-1.7 %	0.3 %	0.1 %	0.3 %	-1.4 %	0.1 %	-7.2	-8.5	3.2 %	7.4 %	10.6 %	2.1 %
6	-2.9 %	-2.9 %	0.2 %	0.1 %	0.3 %	-2.7 %	0.1 %	-6.1	-8.7 %	2.5 %	5.5 %	8.0 %	-0.7 %
7	-2.0 %	-2.0 %	0.1 %	0.0 %	0.1 %	-2.0 %	0.1 %	-5.9	-7.8 %	2.9 %	6.0 %	8.9 %	1.1 %
8	-2.9 %	-2.9 %	0.0 %	0.0 %	0.0 %	-2.9 %	0.0 %	-5.1	-7.9 %	2.6 %	6.0 %	8.5 %	0.6 %
9	-3.1 %	-3.1 %	0.0 %	0.0 %	0.0 %	-3.0 %	0.0 %	-5.5 %	-8.5 %	2.3 %	4.6 %	6.9 %	-1.7 %
10	-4.8 %	-4.8 %	0.0 %	0.0 %	0.0 %	-4.8 %	0.0 %	-5.2 %	-10.0 %	1.1 %	1.9 %	2.9 %	-7.1 %
Total Population	-3.3 %	-3.3 %	0.2 %	0.1 %	0.3 %	-3.0 %	0.1 %	-6.1 %	-9.0 %	2.5 %	4.9 %	7.4 %	-1.6 %

*Source:* Authors' calculations using *Encuesta Permanente de Hogares* (2010) and National Accounts.

*Note:* The numbers in this figure correspond to the benchmark case. For definitions of income concepts see Diagram 1 and the Appendix.

Beginning with taxes, a grim picture emerges from the standpoint of reducing inequality and poverty. Although the rich pay a higher proportion of their income in direct taxes than the poor, all deciles pay between one and five percent of their income in direct taxes, which explains why net market income inequality is barely lower than market income inequality, and why net market income poverty is substantially higher. In most countries, the poorest deciles pay essentially none of their income in direct taxes. It is worth noting that in the case of Paraguay the amount of direct taxes paid by each household is determined using the direct identification method, i.e. the amount is taken directly from a survey question; in some of the other countries, direct taxes are not available in the survey and must be simulated according to the tax code. Indirect taxes are even more detrimental to the poor: the poorest decile spends 28 percent of its income, on average, on indirect taxes (VAT and combustibles tax). The amount of indirect taxes paid by each household is determined using incidence from a secondary source.

Turning to transfers, it is easy to see that direct transfers, indirect subsidies, and in-kind transfers in the form of free education and health services all benefit individuals in the poorer deciles more than those in richer deciles. However, when compared to other countries in Latin America, the percent increase in income for the poor from these transfers is low. For example, individuals in the poorest decile experience an income increase of 6 percent, on average, from the CCT Tekoporã. Although this figure is similar to the increase experienced by the poorest decile from CCTs in Bolivia in Peru, it is much lower than the increase in other countries: in Brazil, Bolsa Família increases the incomes of the poorest decile by 29 percent on average (Higgins and Pereira, 2013). Furthermore, it is far below the amount that the extreme poor would need to have

their incomes increased, on average, in order to be lifted out of extreme poverty (a 72 percent increase would be required).

Considering only direct taxes and direct transfers, individuals become net payers to the fiscal system in the second decile on average (this can be seen in the column labeled “Disposable income” in Table 4). This means that many poor individuals are paying more in direct taxes than they receive in direct benefits, which further impoverishes them despite the fact that they may already be unable to buy a basket of basic needs. In other countries, the poorest three deciles are always net recipients from the fiscal system when only direct taxes and direct transfers are taken into account: the poorest decile that is a net payer ranges from the fourth decile (Mexico) to the tenth (Brazil). When indirect taxes are taken into account, all deciles are net payers to the fiscal system, on average, in Paraguay. This is the only country where this occurs: in the other countries, the poorest decile that is a net payer to the fiscal system including indirect taxes is usually the third or fourth decile.

### Progressivity of Taxes and Social Spending

The terms “progressive” and “regressive” are used in two different senses in the literature on taxes and transfers (Lustig, Pessino, and Scott, 2013). We borrow their concise summary here:

The progressivity/regressivity of a transfer can be measured in absolute terms, by comparing taxes/transfers between quantiles, or in relative terms, by comparing taxes/transfers as a percentage of the (pre-tax/transfer) income of each quantile. In the tax incidence literature, where the fiscal application of the term “progressive/regressive” originated, it is used exclusively in the relative sense, while in the benefit (and tax-benefit) incidence literature it is common practice to use the absolute as well as the relative concepts, distinguishing these two terms explicitly (e.g. Lindert, Skoufias, and Shapiro, 2006; Scott, 2011) or equivalent ones: “weakly/strongly progressive,” “pro-poor/pro-rich” (e.g. O’Donnell et al., 2008; Wagstaff, 2012). The reason for the latter practice is that the issue of practical interest in the case of transfers is not regressivity in relative terms, which is rarely observed for transfers (making the description of a transfer as progressive in relative terms barely informative in benefits incidence analysis contexts), but the concentration of benefits on higher or lower income groups, or their redistributive efficiency. (Lustig, Pessino, and Scott, 2013)

Since this paper assesses the progressivity of both taxes and transfers, we have opted for the relative definition. Hence, a transfer is progressive when the proportion received (as a percentage of market income) decreases with income. This is consistent with an intuitively appealing principle: a transfer or tax is defined as progressive (regressive) if it results in a less (more) unequal distribution than that of market income.<sup>77</sup> We distinguish between transfers that are progressive in absolute terms and progressive in relative terms. A transfer will be progressive in absolute terms if the per capita amount received decreases as income rises. A transfer will be

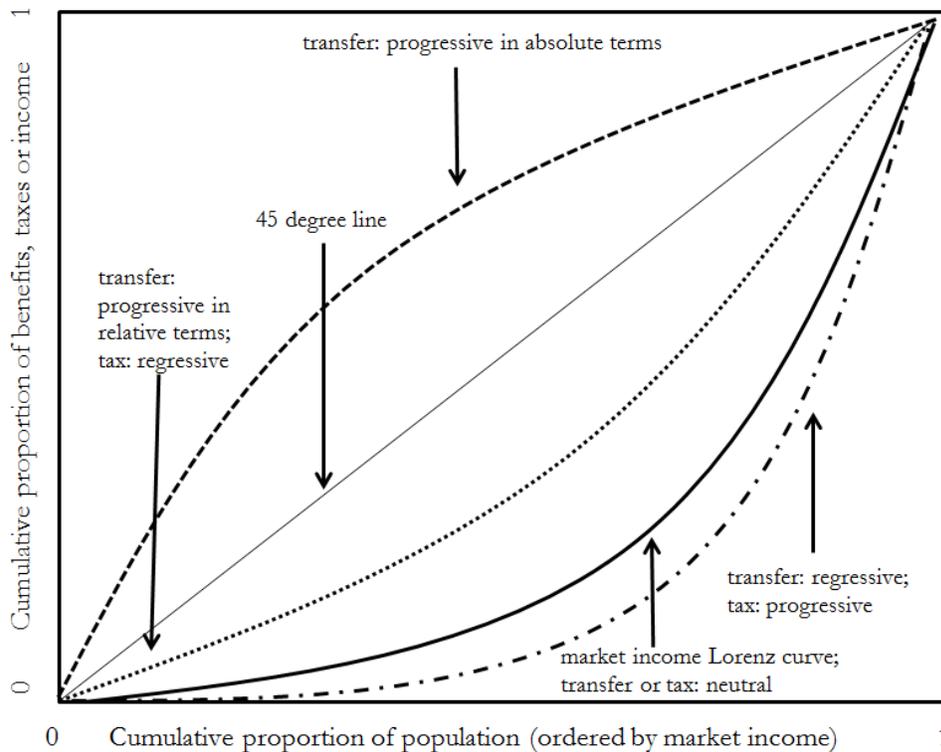
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<sup>77</sup> This claim only holds for transfers that are small relative to market income. If the transfer is large and enough redistribution occurs, even a transfer that is progressive in absolute terms can result in a more unequal income distribution: for example, if there are two individuals with market income vector (1,2) and they are given a large direct transfer (6,1)—which is progressive in absolute terms because the poorer individual gets more than half of total transfers—the new income distribution (7,3) is more unequal than the original distribution (1,2).

progressive in relative terms if the proportion received in relation to market income decreases as income rises but not so the per capita transfer.

Diagram 5.2 presents concentration curves that correspond to progressive, neutral, and regressive taxes and transfers. A more detailed discussion is included in Lustig and Higgins (2012). Note that when the concentration curve of a tax or transfer crosses the market income Lorenz curve, it cannot be considered everywhere progressive or regressive. Similarly, when the concentration curve of a transfer program crosses the 45 degree line, it cannot be considered everywhere progressive in relative or absolute terms (but is still everywhere progressive, as long as it does not also cross the market income Lorenz curve).

**Diagram 5.2: Concentration Curves and Progressivity**

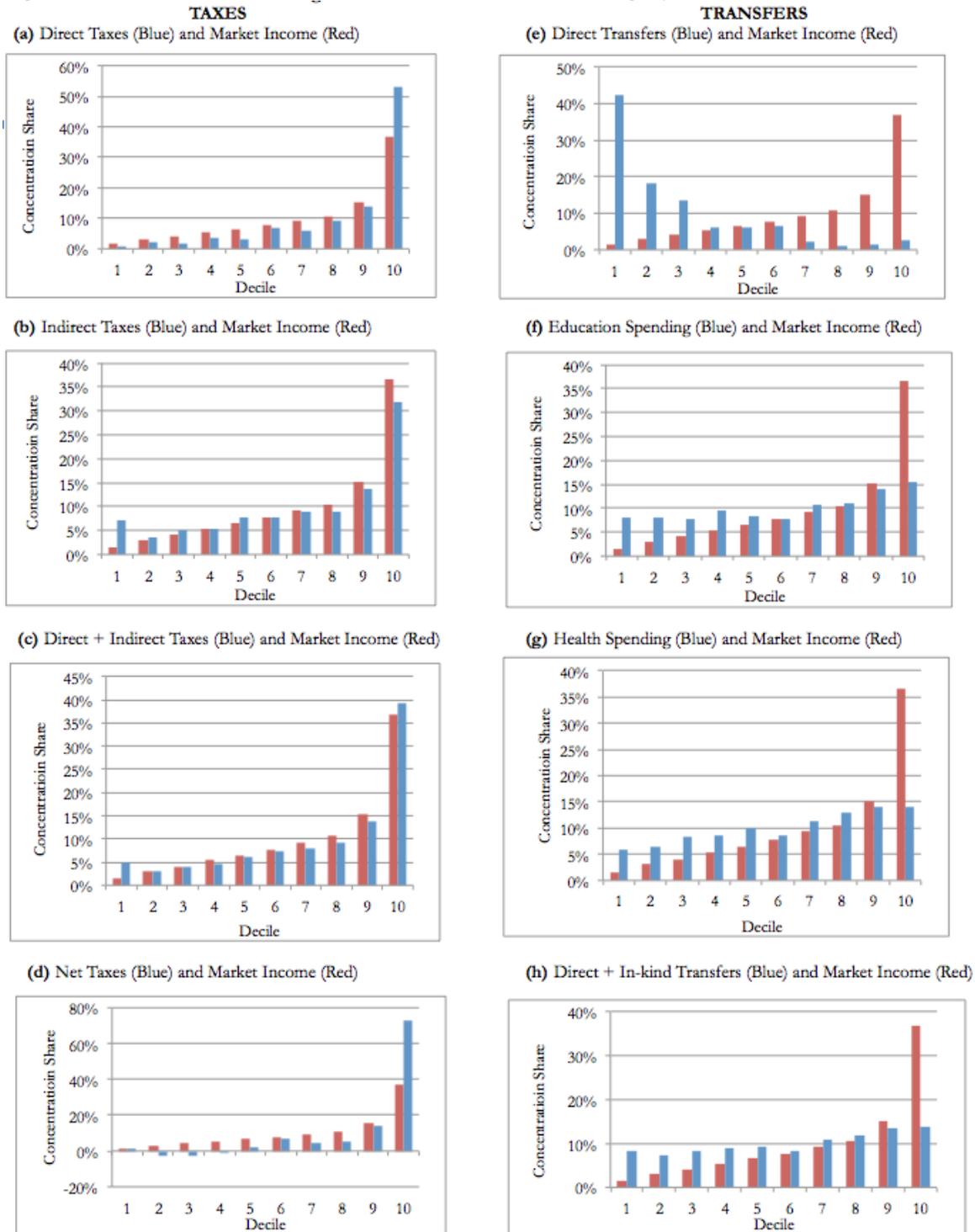


Source: Lustig and Higgins (2012).

In terms of concentration shares by decile, taxes are progressive (regressive) if the proportion paid is lower (higher) than the share of income for the poor and the opposite happens at the top of the income scale. A transfer is progressive (regressive) if the proportion received is higher (lower) than the share of income for the poor and the opposite happens at the top of the income scale. Furthermore, a transfer is progressive in absolute terms if the proportion received is higher than not only the share of income, but also the population share for the poorest decile, and this relationship declines as we move up to higher deciles. Figure 5.8 shows that direct taxes are progressive (panel a) and indirect taxes are regressive (panel b). Overall taxes appear to be very slightly regressive: the bottom decile pays a larger share of overall taxes than its income share,

and the second-poorest decile pays an equal share of taxes to its income share (panel c). We verify that overall taxes are slightly regressive by calculating their Kakwani coefficient, which is -0.02. In contrast, overall taxes in some countries, such as Guatemala, Mexico, Peru, and Uruguay, are progressive. The figure also shows that direct transfers are progressive in absolute terms (panel e). Total spending on education (panel f) and health (panel g), however, are progressive in relative terms only. When direct and in-kind transfers are added together, social spending is also progressive in relative terms only (panel h). Paraguay's social spending is less progressive than in the other countries in our sample, which is discussed in more detail below.

Figure 5. 8: Concentration Shares of Taxes and Transfers in Paraguay, 2010.



Source: Authors' calculations using *Encuesta Permanente de Hogares* (2010) and National Accounts.

As panel h of Figure 5.8 showed, social spending is progressive in relative terms in Paraguay. An analysis of the concentration coefficients of its components allows a more detailed comparison with other countries in Latin America. Figure 5.9 shows the concentration coefficients of various components of social spending. Social spending overall is progressive in relative terms in both the benchmark case (where social spending does not include pensions) and sensitivity analysis (where it includes pensions), with a concentration coefficient of 0.14 in the benchmark case.<sup>78</sup> In other countries, social spending is more progressive, with a concentration coefficient ranging from -0.17 (Uruguay) to 0.06 (Guatemala) in the benchmark case. Social spending is progressive in absolute terms in all countries except Guatemala and Paraguay.

Paraguay's flagship conditional cash transfer program Tekoporã is highly progressive in absolute terms, with a concentration coefficient of -0.47; this is more progressive than Bolivia's universal CCT Bono Juancito Pinto (-0.25) and Guatemala's Mi Familia Progresiva (-0.41), and less progressive than Argentina's Asignación Universal por Hijo (-0.52), Mexico's Oportunidades (-0.54), Brazil's Bolsa Família (-0.58), Uruguay's Asignaciones Familiares (-0.61), and Peru's Juntos (-0.65).

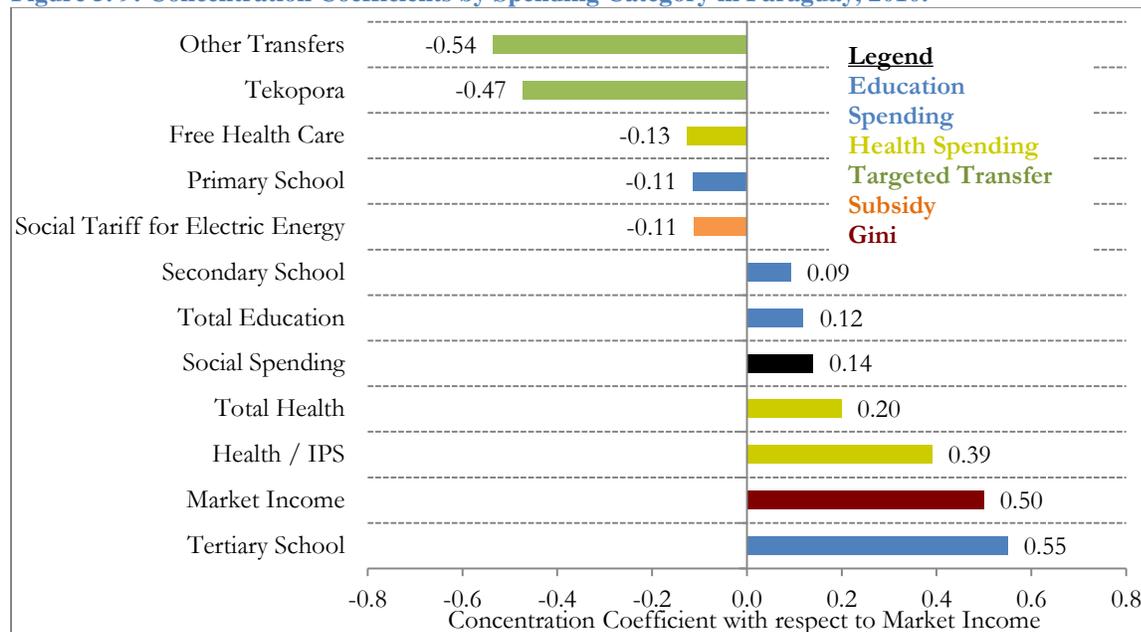
Overall education spending is progressive in relative terms, with a concentration coefficient of 0.12. In contrast, in all of the other countries included in the analysis, total education spending is progressive in absolute terms and has a negative concentration coefficient, ranging from -0.17 in Peru to -0.01 in Guatemala. Note that the concentration coefficients of total education spending include tertiary education; the absolute progressivity of education spending at lower levels is somewhat counterbalanced by tertiary education spending. In Paraguay, education spending at lower levels is not as progressive as it is in other countries: primary education spending is progressive in absolute terms, with a concentration coefficient -0.11. This is less progressive than in any other country in the analysis, where the concentration coefficients for primary education range from -0.43 (Uruguay) to -0.18 (Bolivia). Secondary education is progressive in relative terms, with a concentration coefficient of 0.27, making it less progressive than in any other country. Tertiary education is regressive, with a concentration coefficient of 0.55. This is abhorrent, especially when put in comparative perspective: all other countries in the analysis have tertiary education spending that is progressive in relative terms except Guatemala (0.59), ranging from only slightly progressive (0.47 in Uruguay) to substantially progressive in relative terms (0.24 in Argentina).

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<sup>78</sup> In the sensitivity analysis, the concentration coefficient of social spending (including pensions) is 0.20. In the remainder of this section, concentration coefficients always refer to the benchmark case. Concentration coefficients measure twice the area between the 45 degree line and the concentration curves pictured in Diagram 2. As a convention, any concentration curve that lies above the 45 degree line is treated as having a negative area between it and the 45 degree line. Hence, concentration curves range from -1 to 1, with a negative value indicating that the transfer is progressive in absolute terms, with -1 indicating the maximum degree of progressivity. A concentration curve that lies between the 45 degree line and the market income Lorenz curve will have a concentration coefficient that is positive but less than the market income Gini coefficient, indicating that the transfer is progressive in relative terms (i.e., the benefit as a share of income decreases with income, but not so for the absolute benefit). Finally, a concentration curve that lies below the market income Lorenz curve will have a concentration coefficient that is greater than the market income Gini and is regressive.

Total health spending is progressive only in relative terms, with a concentration coefficient of 0.20. The relative progressiveness of overall health spending stems from a combination of the absolutely progressive public health services and the benefits received from the public health insurance system IPS, which are progressive in relative terms. The public health systems in other Latin American countries range from having similar levels of progressivity in Guatemala and Peru to being progressive in absolute terms in Argentina, Bolivia, Brazil, and Uruguay.

**Figure 5. 9: Concentration Coefficients by Spending Category in Paraguay, 2010.**



Source: Authors' calculations using *Encuesta Permanente de Hogares* (2010) and National Accounts.

### Improving Inequality and Poverty Reduction, Effectiveness, and Progressivity

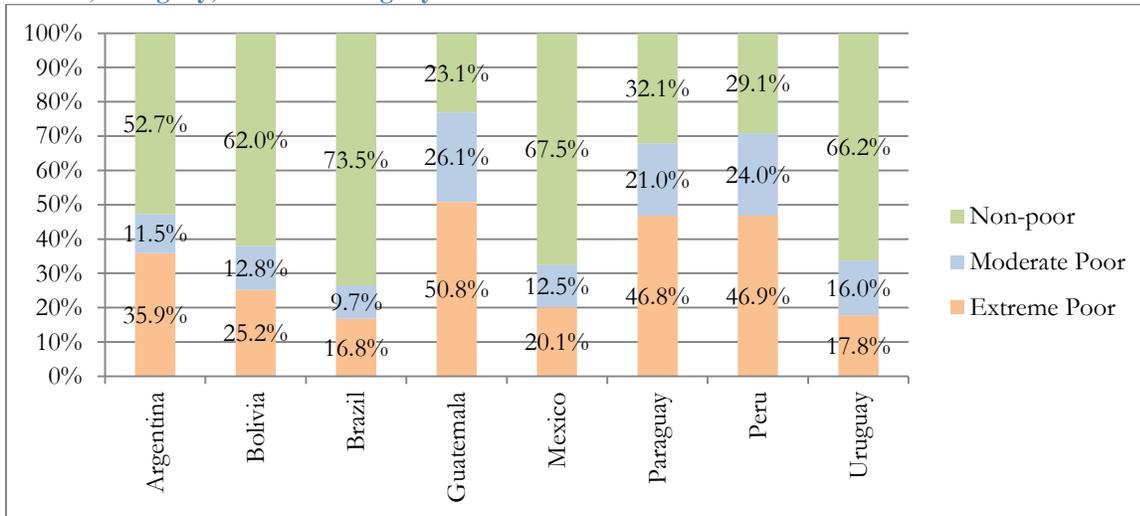
Here we highlight the areas in which the Paraguayan government could look to determine if there is space to improve its reduction of inequality and poverty, its redistributive effectiveness, and the progressivity of its taxes and social spending. An important caveat is that the results we have presented in this paper are standard incidence analysis with no behavioral, inter-temporal, or general equilibrium effects, and without a discussion of macro-sustainability. In addition, it is a one-year snapshot that does not analyze marginal effects.

First, the government could look to its direct transfer programs. Could the low reduction of inequality and absolute poverty caused by direct transfers be improved? To answer this question, we will address three sub-questions. First, are a large proportion of direct transfers going to the non-poor? Second, are a large portion of the poor covered by direct transfer programs? Third, what is the per capita benefit among members of beneficiary households that are poor?

Figures 10 and 11 seek to answer the first question for Paraguay, as well as provide comparative perspective. Figure 10 shows that 47 percent of direct transfers in Paraguay reach the extreme poor (those living on less than \$2.50 PPP per day, in terms of household per capita market

income), which is among the highest of the countries analyzed. Furthermore, 68 percent of direct transfers reach the moderate or extreme poor (those living on less than \$4 PPP per day), again among the highest of the countries analyzed. Figure 5.11 shows that 85 percent of beneficiaries are moderately or extremely poor in Paraguay, making direct transfers more pro-poor by this metric than in any other country. Thus, to answer the first question, the problem of low poverty reduction caused by direct transfers is *not* a result of a large proportion of direct transfers going to the non-poor.

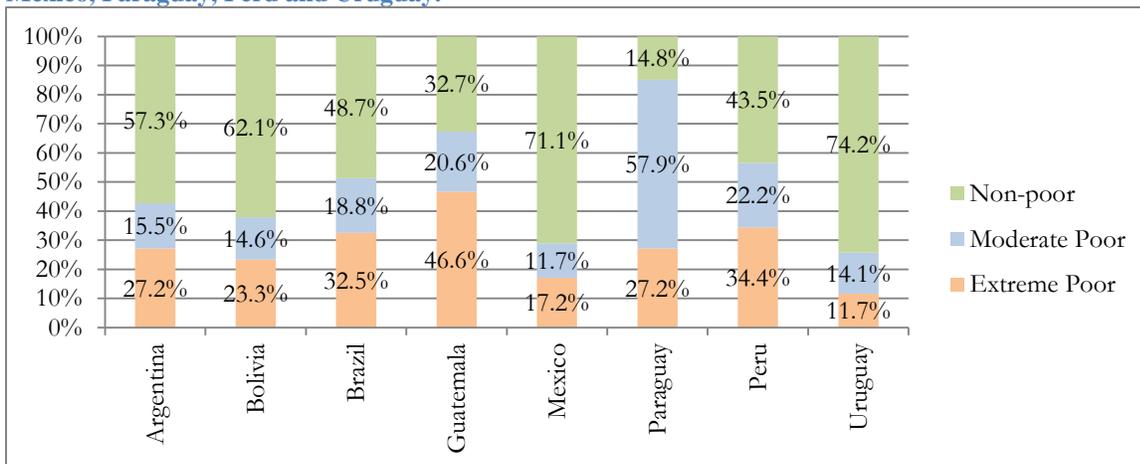
**Figure 5. 10: Percent of Direct Transfer Benefits Going to the Poor in Argentina, Bolivia, Brazil, Guatemala, Mexico, Paraguay, Peru and Uruguay.**



Source: For Paraguay, authors’ calculations using *Encuesta Permanente de Hogares* (2010) and National Accounts; for Argentina, Lustig and Pessino (2013); for Bolivia, Paz et al. (2013); for Brazil, Higgins and Pereira (2013); for Guatemala, Morán and Cabrera (2013); for Mexico, Scott (2013); for Peru, Jaramillo (2013); for Uruguay, Bucheli et al. (2013).

Note: The extreme poor have household per capita market income below \$2.50 PPP per day. The moderate poor have household per capita market income between \$2.50 PPP per day and \$4 PPP per day.

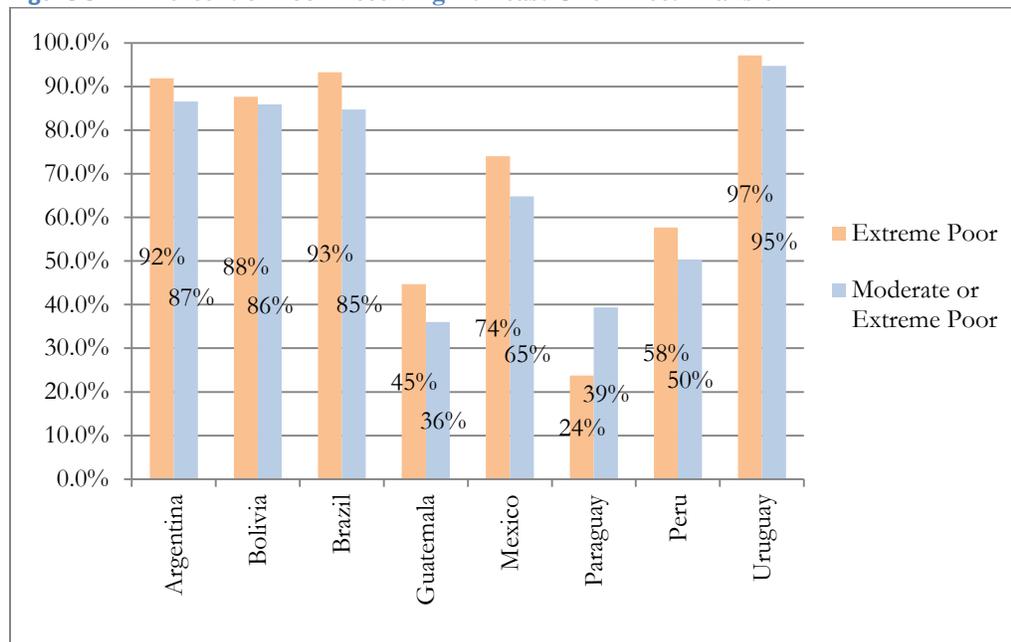
**Figure 5. 11: Percent of Direct Transfer Beneficiaries who are Poor in Argentina, Bolivia, Brazil, Guatemala, Mexico, Paraguay, Peru and Uruguay.**



Source: For Paraguay, authors' calculations using *Encuesta Permanente de Hogares* (2010) and National Accounts; for Argentina, Lustig and Pessino (2013); for Bolivia, Paz et al. (2013); for Brazil, Higgins and Pereira (2013); for Guatemala, Morán and Cabrera (2013); for Mexico, Scott (2013); for Peru, Jaramillo (2013); for Uruguay, Bucheli et al. (2013). Note: The extreme poor have household per capita market income below \$2.50 PPP per day. The moderate poor have household per capita market income between \$2.50 PPP per day and \$4 PPP per day.

Figure 5.12 seeks to answer the second question: are a large portion of the poor covered by direct transfer programs? In Paraguay, just 24 percent of the extreme poor are beneficiaries of direct transfer programs. This proportion is significantly lower than in any other country analyzed here. Furthermore, just 39 percent of the extreme or moderate poor are beneficiaries of direct transfer programs, which is a lower proportion than in all of the other countries except Guatemala. So, to answer the second question, one reason that poverty is not reduced much by direct transfers is that most of the poor are *not covered* by a direct transfer program.

**Figure 5. 12: Percent of Poor Receiving At Least One Direct Transfer**



Source: For Paraguay, authors' calculations using *Encuesta Permanente de Hogares* (2010) and National Accounts; for Argentina, Lustig and Pessino (2013); for Bolivia, Paz et al. (2013); for Brazil, Higgins and Pereira (2013); for Guatemala, Morán and Cabrera (2013); for Mexico, Scott (2013); for Peru, Jaramillo (2013); for Uruguay, Bucheli et al. (2013).

Note: The extreme poor have household per capita market income below \$2.50 PPP per day. The moderate poor have household per capita market income between \$2.50 PPP per day and \$4 PPP per day.

For those who *are covered*, do they receive enough to escape poverty? Table 5 shows that the answer to this question is no. An extremely poor individual whose household benefits from at least one direct transfer program receives, on average, just \$0.38 PPP per day in household per capita terms. In many cases, this transfer will not be enough to raise the household above the \$2.50 PPP per day extreme poverty line. So, to answer the third question, another reason that poverty is not reduced much by direct transfers is that the per capita benefits reaching beneficiary poor households are low.

**Table 5. 5: Average Benefits per Member of a Beneficiary Household in Paraguay, 2010.**

Groups:	y < 1.25	1.25 < y < 2.5	y < 2.5	2.5 < y < 4	y < 4	4 < y < 10	10 < y < 50	y > 50	y > 4	Total
Tekoporã	\$0.32	\$0.37	<b>\$0.35</b>	\$0.40	<b>\$0.36</b>	\$0.47	\$0.80	\$0.50	<b>\$0.52</b>	\$0.02
Other Direct Transfers	\$0.71	\$0.67	<b>\$0.69</b>	\$0.68	<b>\$0.69</b>	\$0.20	\$0.62	\$0.00	<b>\$0.25</b>	\$0.00
Tekoporã + Other Direct	\$0.38	\$0.39	<b>\$0.38</b>	\$0.08	<b>\$0.18</b>	\$0.43	\$0.78	\$0.50	<b>\$0.48</b>	\$0.03
Social Tariff for Electric Energy	\$0.01	\$0.01	\$0.01	\$0.01	\$0.01	\$0.01	\$0.02	\$0.04	\$0.02	\$0.08
Education: primary	\$0.81	\$0.86	<b>\$0.84</b>	\$0.72	<b>\$0.79</b>	\$0.72	\$0.76	\$0.84	<b>\$0.73</b>	\$0.76
Education: secondary	\$1.67	\$2.18	<b>\$1.95</b>	\$2.14	<b>\$2.03</b>	\$1.96	\$2.25	\$2.54	<b>\$2.07</b>	\$2.06
Education: tertiary	\$16.65	\$13.96	<b>\$15.46</b>	\$6.53	<b>\$9.62</b>	\$9.55	\$10.93	\$13.97	<b>\$10.81</b>	\$10.75
Health	\$1.99	\$0.80	<b>\$1.06</b>	\$22.02	<b>\$4.77</b>	\$1.16	\$1.46	\$1.54	<b>\$1.34</b>	\$1.41
Pensions	\$6.33	\$2.65	<b>\$3.23</b>	\$9.48	<b>\$4.08</b>	\$2.79	\$7.06	\$40.95	<b>\$8.30</b>	\$8.18
Average Income	\$0.72	\$1.88	<b>\$1.45</b>	\$3.23	<b>\$2.29</b>	\$6.70	\$18.14	\$114.40	<b>\$14.14</b>	\$10.77
Population Shares by group	5.6 %	9.4 %	<b>15.0 %</b>	13.4 %	<b>28.4 %</b>	38.9 %	31.0 %	1.7 %	<b>71.6 %</b>	100.0 %

Source: For Paraguay, authors' calculations using *Encuesta Permanente de Hogares* (2010) and National Accounts; for Argentina, Lustig and Pessino (2013); for Bolivia, Paz et al. (2013); for Brazil, Higgins and Pereira (2013); for Guatemala, Morán and Cabrera (2013); for Mexico, Scott (2013); for Peru, Jaramillo (2013); for Uruguay, Bucheli et al. (2013). Note: Benefits are in purchasing power parity (PPP) adjusted dollars of 2005. Groups indicate income groups; for example, "1.25 < y < 2.5" indicates individuals with household per capita income between \$1.25 and \$2.50 PPP per day.

As a result of the above discussion, two policy measures can be recommended on the spending side if they are within the fiscal capacity of the government: first, to seek to expand coverage of direct transfer programs among the poor, and second, to increase the transfer sizes paid to the beneficiaries of targeted anti-poverty programs.

On the tax side, taxes should be made more progressive. Overall taxes are slightly regressive, mainly due to the fact that regressive indirect taxes make up a large component of overall taxes.

## 7. Conclusions

We presented results of applying a standard incidence analysis of taxes and social spending in Paraguay using the *Encuesta Permanente de Hogares* (2010). The analysis was conducted for a benchmark case, in which pensions were considered part of market income, and a sensitivity analysis, in which they were considered a government transfer. The results were placed in comparative perspective with seven other countries for which a comparable incidence analysis has been undertaken as part of the Commitment to Equity project. The main results are as follows.

1. Paraguay achieves only a small reduction in inequality and poverty when direct and indirect taxes, direct and in-kind transfers, and indirect subsidies are considered. In comparison with seven other Latin American countries, it performs worst or among the worst in terms of poverty reduction, inequality reduction and poverty reduction effectiveness, and closer to the middle of the pack in terms of redistributive effectiveness.
2. Direct transfers are progressive, indirect taxes are somewhat regressive and overall taxes are slightly regressive.
3. Social spending is progressive in relative terms, but less so than in any of the other countries analyzed. (In most of the other countries, social spending is progressive in absolute terms.) Education spending and health spending are each progressive in relative terms, but also less progressive than in other countries. Spending on tertiary education is regressive, which only occurs in Paraguay and Guatemala.
4. The small reduction in extreme and moderate poverty is not a result of a large proportion of direct transfer benefits going to the non-poor. Instead, it is a result of low coverage among the poor by direct transfer programs, and low per capita transfers to those who are covered. A larger reduction in poverty might be achieved by attempting to expand coverage and increase transfer sizes, if these policy measures are fiscally possible.

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## 9. Appendix

### A1. Definitions of Income Concepts<sup>79</sup>

As usual, any incidence study must start by defining the basic income concepts. In our study we use five: market, net market, disposable, post-fiscal and final income. One area in which there is no agreement is how pensions from the contributory system should be considered. Some authors treat them as part of market income and others place them under government transfers, and others exclude them altogether. Since this is an unresolved issue, in our study we defined a benchmark case in which contributory pensions are part of market income. We also did a sensitivity analysis where pensions are classified under government transfers.

In what follows, we present the precise definitions of each income concept used in the benchmark case and the sensitivity analysis.

*Market income* is defined as:

$$I^m = W + IC + AC + IROH + PT + SSP \text{ (benchmark)}$$

$$I^{ms} = W + IC + AC + IROH + PT \text{ (sensitivity analysis)}$$

Where,

$I^m, I^{ms}$  = market income<sup>80</sup> in benchmark and sensitivity analysis, respectively.

W = gross (pre-tax) wages and salaries in formal and informal sector; also known as earned income.

IC = income from capital (dividends, interest, profits, rents, etc.) in formal and informal sector; excludes capital gains and gifts.

AC = autoconsumption; also known as self-production.

IROH = imputed rent for owner occupied housing; also known as income from owner occupied housing.

PT = private transfers (remittances and other private transfers such as alimony).

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<sup>79</sup> For more details on concepts and definitions, see Lustig and Higgins (2012).

<sup>80</sup> Market income is sometimes called primary income.

SSP = retirement pensions from contributory social security system.

*Net Market income* is defined as:

$$I^n = I^m - DT - SSC \text{ (benchmark)}$$

$$I^{ns} = I^{ms} - DT - SSC^s \text{ (sensitivity analysis)}$$

Where,

$I^n, I^{ns}$  = net market income in benchmark and sensitivity analysis, respectively.

DT = direct taxes on all income sources (included in market income) that are subject to taxation.

SSC/  $SSC^s$  = respectively, all contributions to social security except portion going towards pensions<sup>81</sup> and all contributions to social security without exceptions.

*Disposable income* is defined as:

$$I^d = I^n + GT \text{ (benchmark)}$$

$$I^{ds} = I^{ns} + GT^s \text{ (sensitivity analysis)}$$

Where,

$I^d, I^{ds}$  = disposable income in benchmark and sensitivity analysis, respectively.

GT = direct government transfers; mainly cash but can include transfers in kind such as food.

$$GT^s = GT + SSP$$

*Post-fiscal income* is defined as:

$$I^{pf} = I^d + IndS - IndT \text{ (benchmark)}$$

$$I^{pfs} = I^{ds} + IndS - IndT \text{ (sensitivity analysis)}$$

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<sup>81</sup> Since here we are treating contributory pensions as part of market income, the portion of the contributions to social security going towards pensions are treated as 'saving.'

Where,

$I^{pf}, I^{pfs}$  = post-fiscal income in benchmark and sensitivity analysis, respectively.

InoS = indirect subsidies (e.g., lower electricity rates for small-scale consumers).

InOT = indirect taxes (e.g., value added tax or VAT, sales tax, etc.).

*Final income* is defined as:

$$I^f = I^{pf} + \text{InkindT} - \text{CoPaym (benchmark)}$$

$$I^{fs} = I^{pfs} + \text{InkindT} - \text{CoPaym (sensitivity)}$$

Where,

$I^f, I^{fs}$  = final income in benchmark and sensitivity analysis, respectively.

InkindT = government transfers in the form of free or subsidized services in education and health; urban and housing.

CoPaym = co-payments, user fees, etc., for government services in education and health.<sup>82</sup>

Because some countries do not have data on indirect subsidies and taxes, we also defined *Final income\** =  $I^{f*} = I^d + \text{InkindT} - \text{CoPaym}$ .

## **A2. Construction of Income Concepts**

### **i. Allocating Taxes and Transfers at the Household Level<sup>83</sup>**

Unfortunately the information on direct and indirect taxes, transfers in cash and in-kind, and subsidies cannot always be obtained directly from household surveys. Thus, one of the most important aspects of CEQ is a detailed description of how each component of income is calculated (for example, directly drawn from the survey or simulated) and the methodological assumptions that are made while calculating them. When taxes and transfers can be obtained directly from the household survey, we call this the Direct Identification Method. When the direct method is not feasible, one can use the inference, simulation, imputation or alternate

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<sup>82</sup> One may also include participation costs such as transportation costs or foregone incomes because of use of time in obtaining benefits. In our study, they were not included.

<sup>83</sup> Taken from Lustig and Higgins (2012).

survey methods (described in more detail below). As a last resort, one can use secondary sources: e.g., incidence or concentration shares by quintiles or deciles that have been calculated by other authors as is done by Goñi et al. (2011) for instance. Finally, if none of these options can be used for a specific category, the analysis for that category will have to be left blank. The six methods one can use to allocate taxes and transfers are described below.

### *Direct Identification Method*

On some surveys, questions specifically ask if households received cash benefits from (paid taxes to) certain social programs (tax and social security systems), and how much they received (paid). When this is the case, it is easy to identify transfer recipients and taxpayers, and add or remove the value of the transfers and taxes from their income, depending on the definition of income being used.

### *Imputation Method*

The imputation method uses some information from the survey, such as the respondent reporting attending public school or receiving a direct transfer in a survey that does not ask for the amount received, and some information from either public accounts, such as per capita public expenditure on education by level, or from the program rules.

### *Inference Method*

In some cases, transfers from social programs are grouped with other income sources (in a category for “other income,” for example). In this case, it might be possible to infer which families received a transfer based on whether the value they report in that income category matches a possible value of the transfer in question.

### *Simulation Method*

In the case that neither the direct identification nor the inference method can be used, transfer benefits can sometimes be simulated, determining beneficiaries (taxpayers) and benefits received (taxes paid) based on the program (tax) rules. For example, in the case of a conditional cash transfer that uses a proxy means test to identify eligible beneficiaries, one can replicate the proxy means test using survey data, identify eligible families, and simulate the program’s impact. However, this method gives an upper bound, as it assumes perfect targeting and no errors of inclusion or exclusion. In the case of taxes, estimates usually make assumptions about informality and evasion.

The four methods described above rely on at least some information taken directly from the household survey being used for the analysis. As a result, some households receive benefits, while others do not, which is an accurate reflection of reality. However, in some cases the household survey analyzed lacks the necessary questions to assign benefits to households. In this case, there are two additional methods.

### *Alternate Survey*

When the survey lacks the necessary questions, such as a question on the use of health services or health insurance coverage (necessary to impute the value of in-kind health benefits to households), an alternate survey may be used by the author to determine the distribution of benefits. In the alternate survey, any of the four methods above could be used to identify beneficiaries and assign benefits. Then, the distribution of benefits according to the alternate survey is used to impute benefits to all households in the primary survey analyzed; the size of each household's benefits depends on the quantile to which the household belongs. Note that this method is more accurate than the secondary sources method below, because although the alternate survey is somewhat of a "secondary source," the precise definitions of income and benefits used in CEQ can be applied to the alternate survey.

### *Secondary Sources Method*

When none of the above methods are possible, secondary sources that provide the distribution of benefits (taxes) by quantile may be used. These benefits (taxes) are then imputed to all households in the survey being analyzed; the size of each household's benefits (taxes) depends on the quantile to which the household belongs.

## **ii. Construction of Income Concepts: Paraguay**

The methods used in Paraguay are presented in Table A1.

Table A1. Construction of Income Concepts in Paraguay.

<b>MARKET INCOME</b>	
Autoconsumption	Not included
Imputed rent for owner occupied housing	Included
Earned and Unearned Incomes of All Possible Sources Including Social Security Pensions and Excluding Government Transfers	Included. Pensions are only included in market income in the benchmark case.
<b>NET MARKET INCOME=MARKET INCOME - (DIRECT TAXES AND EMPLOYEE CONTRIBUTIONS TO SOCIAL SECURITY)</b>	
Direct Taxes	Subtracted from Market Income to generate Net Market Income. <u>Direct Identification Method.</u> The survey question for this variable appears on the survey as, "Algún miembro del hogar pagó por impuesto inmobiliario, tasas municipales,

	asfalto, tasa de cementerio, etc?. Cuánto?"
Employee contributions to social security	Not included.
<b>DISPOSABLE INCOME = NET MARKET INCOME + DIRECT GOVERNMENT TRANSFERS</b>	
Tekoporã (Flagship CCT)	<u>Inference and Simulation Methods</u> . See explanation in section 3.
Other direct transfers	<u>Inference and Simulation Methods</u> . This variable was calculated as follows: (Other Regular Monthly Income) minus (Estimated Tekopora Contributions), where the latter is estimated as described in section 3. Zeroes are placed in all observations where the (Other Reg...) is smaller than (Estimated Tek...)
Pensions	<u>Direct identification</u> . In the benchmark case, pensions were already included in market income so they are not added here. In the sensitivity analysis, they were not included in market income, and are added here. As described in section 3, there is no reliable way to separate contributory from non-contributory pensions in EPH.
<b>POST-FISCAL INCOME = DISPOSABLE INCOME + INDIRECT SUBSIDIES - INDIRECT TAXES</b>	
Indirect subsidies	<u>Imputation Method</u> . This is equivalent to Paraguay's Tarifa Social, a public program that discounts electricity bills for families with low usage. Using the current price of electricity per 100kw/h in Paraguay, and the variable in our survey for "money spent on electricity," we estimate who would be eligible as a Tarifa recipients. Then working backwards from how much they spent, we estimate the likely benefits they have received.
Indirect taxes	<u>Secondary Sources</u> . There are two Indirect Taxes in Paraguay. There is the Value Added Tax and a tax on combustibles. Incidence for

	both comes from BID (2009).
<b>FINAL INCOME = POST-FISCAL INCOME + GOVERNMENT IN-KIND TRANSFERS/FINAL INCOME* = DISPOSABLE INCOME + GOVERNMENT IN-KIND TRANSFERS</b>	
In-kind education	<u>Imputation Method.</u> The education benefit is based on cost per student by level. This benefit is applied to students who report attending public school. If they attend Primary School (imputed by their age, and if they said "yes" to currently attending school), they are assigned an in-kind benefit equal to the government's per student spending on Primary school. We did the same for Secondary and Tertiary.
In-kind health	<u>Imputation Method.</u> There are two types of in-kind health: free and paid. If the individual said "no" to having insurance and "yes" to "received a medical service within the last 3 months", they are assigned a proportion of National total spent on free health services. Otherwise, if the individual received medical service and said "yes" to having insurance then they are assigned a proportion of the National sum spent on recipients of IPS health care (Instituto Publico de Salud), which is the public health administration system.
<b>SCALED-UP INCOMES, TAXES AND TRANSFERS FOR INCIDENCE ANALYSIS INCLUDING GOVERNMENT IN-KIND TRANSFERS</b>	
Scaling up factor and method	All variables on Taxes, Spending are scaled proportionally to national totals. That is, the original (unscaled) variables provides the proportion of the National total amount. Scaled totals are used for calculating inequality, effectiveness, incidence, concentration shares, and progressivity. Non-scaled totals are used for calculating poverty and transfer sizes. (For an explanation of why, see Lustig and Higgins, 2012.)

### A3. Effectiveness Indicators<sup>84</sup>

In mathematical notation, let  $X(I^j)$  be the inequality or poverty measure of interest (e.g., the Gini coefficient or headcount index), which is defined at each benchmark case income concept  $j = m, n, d, pf, f, f^*$  (market income, net market income, disposable income, post-fiscal income and final income) and each sensitivity analysis income concept  $j = ms, ns, ds, pfs, fs, f^*s$ . Let  $S^D$  be total public spending on the direct transfer programs captured by the survey or otherwise estimated by the authors, measured by budget size in national accounts (note that in the sensitivity analysis this concept includes spending in social security pensions), and let  $S^H, S^E$  and  $S^U$  be total public spending on health, education, and (where included) housing programs, respectively. Then the effectiveness indicator for direct transfers is defined as:

$$\frac{(X(I^n) - X(I^d))/X(I^n)}{S^D/GDP}$$

and the effectiveness indicator for direct and in-kind transfers is defined as:

$$\frac{(X(I^n) - X(I^{f^*}))/X(I^n)}{(S^D + S^H + S^E + S^U)/GDP}$$

Note that in the sensitivity analysis, when contributory pensions are considered a government transfer, they are not part of net market income but are part of disposable income, thus some of the change between  $X(I^{ns})$  and  $X(I^{ds})$  is attributable to contributory pensions, and therefore in the sensitivity analysis  $S^D$  must include spending on contributory pensions. In the benchmark case, however, contributory pensions are already included in net market income, so  $S^D$  does not include any spending on contributory pensions. Also note that  $S^U$  should only be included in the denominator of the effectiveness indicator for direct and in-kind transfers if housing programs

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<sup>84</sup> Taken from Lustig and Higgins (2012).

## Chapter 6. Equality of Opportunities and Public Spending in Paraguay, by Jose Cuesta and Pablo Suárez Becerra

### Abstract

**Previous studies in Paraguay have found that circumstances one is born to and has no control over—such as gender, parents’s socioeconomic status, or location—determine whether or not children have access to critical opportunities in education and basic services such as water and sanitation.** This report extends such previous analyses in four directions. First, it updates the previous estimates of the Human Opportunities Index (HOI) for 2009 and 2010. Second, it shows the evolution of opportunities between 2003 and 2010. Third, it analyzes a health opportunity, timely and affordable access to health care. Fourth, it links the analysis of opportunities with public spending. This analysis partly confirms results from previous studies. Gender is not found to be a critical circumstance, while speaking only Guarani at home and departmental location of residence play a larger role than previously acknowledged. Between 2003 and 2010, the HOI improved for almost all opportunities considered, although at different paces and with different dynamics. These improvements are better explained as coverage increases rather than equalizing effects (that is, from increases across the board rather than disproportionate gains for the most disadvantaged). Finally, public spending on education for children age 5 to 17 is neither pro-poor nor pro-rich and slightly progressive, with distinct distributive incidences for *elemental* and secondary education spending. Public spending on health care is neither progressive nor regressive and concentrates on middle-income groups. This analysis also suggests a simple method to identify circumstance groups that would benefit the most from targeted additional public spending on specific opportunities.

**Key words:** Opportunities, public spending, incidence analysis, Paraguay

### Introduction

**Paraguay has experienced impressive growth rates since 2003, the strongest period of economic performance since the 1970s (World Bank 2010).** The country has weathered the global financial crisis and is the holder of the world’s fourth largest growth rate in 2010 (World Bank 2013). Substantive poverty reduction has accompanied this economic growth. In fact, poverty incidence declined by 10 percentage points between 2002 and 2007. Yet, by 2008, almost two out of five Paraguayans remained poor, and one out of five lived in extreme poverty (World Bank 2010). Moreover, extreme poverty has declined much more modestly in that period, and the distribution of incomes and assets remains very unequal. With a Gini coefficient exceeding 0.52, only Honduras, Colombia, and Brazil are more unequal than Paraguay in a region that is already the most unequal in the world (World Bank 2013). More than 40 percent of total income is in the hands of the richest 10 percent of the population, and just 2 percent of the agricultural establishments in the country own almost 82 percent of the agriculturally exploited land (World Bank 2009).<sup>85</sup> Similarly, welfare is marked by urban and rural disparities,<sup>86</sup> as

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<sup>85</sup> About 6,400 farms account for 20 million of the 24 million hectares in agricultural use, or half of Paraguay’s total area of 40 million (World Bank 2009).

observed in the incidence of poverty and the access to drinkable water, safe sanitation and public health care, among others.

**Previous studies in Paraguay have shown that circumstances like parental education, household income, number of siblings, and geographical location still determine access to basic services.**<sup>87</sup> Existing estimates of the status of equal opportunities in Paraguay portay a mixed picture: the HOI (see below) in Paraguay is below the regional average (for 19 countries) in Latin America, but has grown faster than the regional average. This confirms some degree of catching up. However, World Bank projections indicate that Southern Cone countries will not achieve universal access to education (school enrollment and completion of sixth grade on time) before 2046, possibly longer in Paraguay, because the country continues to have the lowest educational ranking on the HOI among its neighbors (Molinas et al. 2010, 50).

**As in other cases, future poverty and inequality reduction in Paraguay will depend critically on the extent to which the generation of the current poor—particularly their children—can unshakle themselves from circumstances such as their region of birth and residence and parents’ educational attainments and socioeconomic status, which may limit their ability to realize their full potential in life.** These limitations on potential could take the form of barriers to education up to a certain level, the inability to work in an occupation befitting their level of human capital, or simply restriction of the ability to migrate to search for better economic opportunities. What is the extent to which an individual, irrespective of the circumstances to which he or she is born, has access to some of the most basic opportunities to realize ones productive potential? That is the central question addressed in this paper.

**The analysis here addresses three specific queries:** (i) are children in Paraguay given equal opportunities early in their lives to allow them to build a dignified and productive life of their choosing?; (ii) Do their gender, parents’ socioeconomic status, family structure, and the region where they grew up as children hinder access to these basic services? If so, which of these circumstances plays a stronger role in limiting opportunities? (iii) Going forward, what is the most efficient way to expand the provision of basic services to best improve the equality of opportunities in Paraguay?

**To answer these questions, this analysis expands existing studies on the equality of opportunities in Paraguay—World Bank (2010) and Molinas et al. (2010)—in four directions.** First, previous HOI estimates for 2008 are updated to include 2009 and 2010. Second, the number of opportunities analyzed is extended, and now includes public health care—alternative definitions for some educational opportunities are also used. Third, using

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<sup>86</sup> According to World Bank’s (2010) latest Paraguay Poverty Assessment, over half of the poor and more than two-thirds of the extreme poor are located in rural areas of Paraguay. With only 41.4 percent of the population, rural households had a disproportional amount of the poor (53.5 percent) and the extreme poor (67.5 percent) in 2008.

<sup>87</sup> In fact, different circumstances have distinctive impacts across opportunities. Parental education, household income, and number of siblings have reportedly the largest impacts on school attendance, while parents’ education and child’s gender matter the most for completion of sixth grade. Yet, the urban or rural location is the most important driver behind disparities in access to sanitation, water, and electricity (see the latest World Bank Poverty Assessment, World Bank [2010]).

multiple rounds of the *Encuesta Permanente de Hogares* (EPH, Permanent Household Survey), analysis includes the dynamics of the HOI and its key contributors since 2003. Fourth, the analysis of opportunities, specifically the HOI, is linked with public spending in education and health care in 2004 and 2009.

**The rest of the paper is organized as follows: section 2 lays out the concepts and methodology of the basic human opportunities framework.** Section 3 describes the application of the methodology to Paraguay, while section 4 reports key results on the status and evolution of the HOI for educational, health, and housing opportunities. Section 5 presents the results of the benefit incidence analysis from the opportunity perspective, and section 6 summarizes the findings and implications for the future.

## 1. The Human Opportunity Index: Concepts and Measurement

**A large body of social science literature has been concerned for some time with equality of opportunity.** Amartya Sen (1977, 2001) has been deeply influential in arguing for an equitable distribution of “capabilities,” which essentially are a person’s ability and efforts to convert resources into outcomes they have reason to enjoy. John Roemer’s (1998) *Equality of Opportunity* was the first to formalize an equality of opportunity principle and remains the most relevant piece of academic literature underpinning this analysis of Paraguay. “Opportunity” in Roemer’s context, and in the context used throughout this report, is understood as the set of basic services or goods that make it possible for an individual to lead a life with dignity and freedom of choice. Circumstances are attributes of individuals for which society believes individuals should not be held accountable, and which affect their ability to achieve access to the advantage (opportunity) that is being sought. Roemer argues that policy should work to equalize opportunities *independent* of circumstances and that outcomes should depend only on effort.

**The World Bank’s (2006) *World Development Report: Equity and Development* argues that inequality of opportunity, both within and among nations, results in wasted human potential and weakens prospects for overall prosperity.** Conducting an analysis of inequality of opportunity, however, requires a measure or a set of measures that provide a practical way to track a country’s progress toward equalizing opportunities for all its citizens. To be useful to analysts and policy makers alike, such a measure must combine a few attractive properties: intuitive appeal, simplicity, practicality (especially in relatively data-scarce environments), and sound microeconomic foundations to ensure that it has an interpretation that is consistent with its objective.

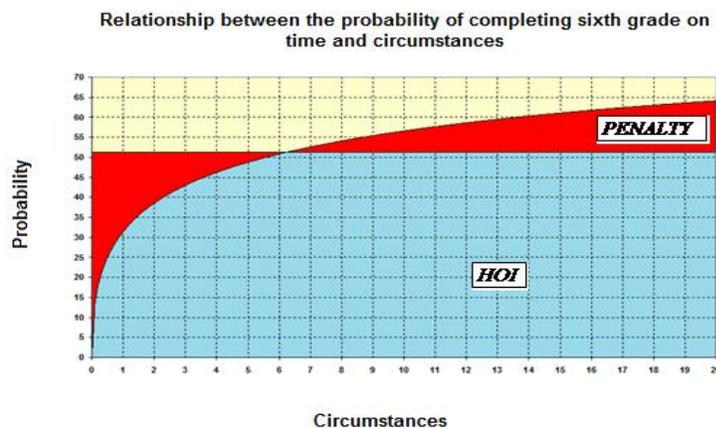
**Much of the empirical work in developing countries until recent times has focused on measuring (and comparing) average rates of access to goods or services in health and education for the general population and different subgroups within.** What has been lacking for the most part is an intuitive and unified framework to address a range of questions across different types of opportunities, such as: How far away is a country from universalizing each type of opportunity? How unequally are available opportunities distributed across different subgroups of the population? How important are circumstances to which an individual is born

into in determining access to opportunities? Which circumstances matter for access, and in that sense, contribute the most to inequality in access? What would it take, in terms of resources, to reduce inequality in opportunities when providing universal access is clearly not possible in the near term?

**The HOI measures how far a society is from universal provision of basic services and goods, such as sanitation, clean water and education, and the extent to which those goods and services are unevenly distributed.**<sup>88</sup> A key feature of the HOI is that it not only takes into account the overall coverage rates of these services, but also how *equally* the coverage is distributed—by measuring the extent to which those *without* coverage are concentrated in groups with particular circumstances (for example, economic status, gender, parental education, ethnicity, and so on), which are conditions a child is typically born into. More specifically, *HOI is an inequality-sensitive coverage rate* that incorporates: (i) the average coverage of a good or service that society accepts should be universal (which implies that the *individual* is not held responsible for lack of access) and (ii) whether it is allocated according to an equality of opportunity principle.

**The HOI is defined as the difference between two components: the overall coverage rate of the opportunity (*C*); and a “penalty” for the share of access to opportunities that is allocated in violation of the equality of opportunity principle (*P*).  $HOI = C - P$ , which implies that the maximum value on the HOI that a particular opportunity can take is the average access (or coverage) rate for that service. It also implies that an HOI value of 1 would be possible only when access is *universal* (*C* is equal to 1 and *P* is equal to 0).**

Figure 6. 1: Graphical Interpretation of HOI



Source: Adapted from Molinas et al. (2010).

<sup>88</sup> This discussion draws from three sources: Barros et al. (2009) and Molinas et al. (2010).

**Figure 6.1 shows a simple graphical interpretation of the HOI. It plots the probability of a child of a particular circumstance (for example, percentile of per capita income or wealth) completing sixth grade on time, with circumstance (on the horizontal axis) improving from left to right.** The horizontal line is the average coverage rate for the entire population of children. The curved line shows access rates for different levels of circumstance. There is no equality of opportunity in this case, since the probability of access to the opportunity is positively correlated with circumstance, which is shown by the fact that the curved line does not coincide with the horizontal line. Opportunities allocated in the red area above the average coverage violate the equality of opportunity principle: they show dependence of the access to education on income or wealth. There is an intuitive interpretation of the red area: it is the share of the total number of opportunities that are “misallocated” across groups of different circumstances, which is to say allocated to children with better circumstances so that they have higher than average access to the opportunity.<sup>89</sup> The HOI corresponds to the blue area in the graph, which is the area below the curved line discounted by the red area above the average coverage rate. A second interpretation of the HOI invokes an index ( $D$ ), equivalent to  $(P/C)$ , which is known as the “inequality of opportunity” or “dissimilarity” index. The  $D$ -index corresponds to the share of opportunities that would have to be reallocated across groups—for an unchanged rate of overall coverage—to achieve equality of opportunity, out of the total amount of opportunities available in society;  $HOI = C - P = C \times (1 - D)$ .

**Box 6.1 outlines a simple example of how the HOI is measured, using a hypothetical situation with two countries with identical population of children and average coverage rate of primary school enrollment.** The example demonstrates how the HOI is sensitive to inequality in coverage and how it would change in response to an increase in overall coverage or reallocation favoring the more disadvantaged group.

**Box 6.1: The HOI—A Simple and Intuitive Example**

Consider two countries, A and B, each with a total population of 100 children. Each country has two groups of children, I and II, which consist of the top 50 percent and bottom 50 percent by per capita income, respectively. Coverage rate of school enrollment (or the average enrollment rate) for both countries is 0.6, that is, 60 children attend school in each country. The table below shows the number of children going to school in each group for each country.

Group of circumstances	Number of children age 6–10 years enrolled in primary school	
	Country A (100 children)	Country B (100 children)
Group I (top 50 percent by income)	40	35
Group II (bottom 50 percent by income)	20	25
Total	60	60

Given the total coverage rate, the principle of equality of opportunity will hold true for each country if each of the two groups in each country has the same rate of coverage, that is, if each group has 30 children going to school. But in reality, group II has 20 enrollments in country A and 25 in country B. This suggests firstly that opportunities are unequally distributed, and secondly, that the inequality of opportunities is higher in country A. The  $D$ -index is the share of total

<sup>89</sup> This also implies that the red area is the share of total opportunities that would have to be reallocated to children with lower than average opportunities to achieve equality of opportunities for a given level of coverage.

enrollments that is “misallocated,” namely 10/60 and 5/60 for A and B, respectively. Therefore,  $HOI_A = C_0 (1 - D) = 0.6 \times (1 - 10/60) = 0.50$ ;  $HOI_B = C_0 (1 - D) = 0.6 \times (1 - 5/60) = 0.55$ .

Thus, even though both countries have equal coverage rates for enrollment, the higher inequality of opportunity in country A leads to the D-index being higher for A than for B, and the HOI being higher for B than for A. It is also easy to see that the HOI will increase in a country if: (i) the number of enrollments in each group increases equally (in proportionate or absolute terms); (ii) if enrollment for any group increases without decreasing the coverage rates of the other group; and (iii) if enrollment for group II increases, keeping the total number of children enrolled unchanged (implying enrollment in group I reduces by an equivalent amount). These three features relate to the “scale,” “Pareto improvement,” and “redistribution” properties of the HOI, respectively—properties that are intuitively appealing.

*Source:* Author’s compilation.

**The HOI is an inequality sensitive coverage rate in the sense that it improves when inequality decreases with a fixed number of opportunities in a society, or when the number of opportunities increases and inequality stays constant.** In more formal terms, the properties of the HOI guarantee that the improvement in the index is sensitive to: (i) the overall coverage—when the coverage for all groups increases by factor  $k$  the HOI increases by the same factor; (ii) Pareto improvements—when the coverage for one group increases without decreasing the coverage rates of other groups, the HOI increases; (iii) redistribution of opportunities—when the coverage rate of a vulnerable group increases for a constant overall coverage rate, there is decrease in inequality and an increase in the HOI.

**To compute an HOI for a particular opportunity for the children of a country, household survey data are essential. To allow computation of an HOI for education and health opportunities, the survey must have a minimum set of information at the individual (child) or household level, as appropriate.** Examples of information needed would include whether the child is attending school or not, grade level, last grade completed, and health indicators such as weight and height of child and whether the child has been immunized. Computing an HOI for access to basic infrastructure, like safe water, electricity and sanitation, would require that household-level information on these indicators be available. With regard to circumstances, the minimum information needed to make the analysis meaningful would be gender, age and location (urban/rural and/or regional) of the child; demographic characteristics of the household (size and composition); characteristics of parents (gender, age, and education); and some measure of household income, consumption, or wealth.

**In practical terms, computing an HOI for a particular opportunity when the number of circumstances is relatively large (more than three) requires an econometric exercise, which involves obtaining a *prediction* of the D-index from observed access to opportunities and circumstances among children.** In simple terms, the exercise consists of running a logistic regression model to estimate the relationship between access to a particular opportunity and circumstances of the child, on the full sample of children for whom the HOI measure will be constructed. The estimated coefficients of the regression are used to obtain, for each child, his/her predicted *probability* of access to the opportunity, which is then in turn used to estimate the D-index, the coverage rate, and eventually the HOI.<sup>90</sup>

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<sup>90</sup> See appendix 1 as well as Molinas et al. (2010) for more technical details on the econometric exercise.

**Change in the HOI over time can be used to assess progress in access to opportunity in a society, taking into account both universality of access and inequality in access among different circumstance groups.** To help understand the factors that contribute to a change in the HOI, a decomposability property of the HOI is useful. A change in HOI can be decomposed into: (i) a *composition* effect, which refers to changes in the distribution of circumstances (for example, if the distribution of wealth improves, chances of accessing opportunities are likely to increase); (ii) a *scale* effect, which refers to proportional change in the coverage rate of all groups (for example, if there is policy directed toward increasing coverage of an opportunity across all groups); (iii) an *equalization* effect, which refers to change in the coverage of vulnerable groups (groups with coverage below the national average), with the average coverage rate held unchanged—in other words, a move toward greater (or less) inequality for the same average level of coverage.

**Interpretations of the three decomposed components are quite intuitive. A positive composition effect shows whether the underlying circumstances that children are born into are improving over time, as a result of demographic changes, economic growth, or social progress.** A positive scale effect shows whether opportunities are improving for all groups in the society, perhaps as result of public policy or social progress, for example, increased awareness among all households. The equalization effect in essence indicates the trend in equity in a society, showing whether available opportunities are distributed more equitably among its members, so that the circumstances a child is born into begin to matter less for access to basic goods and services.

**The HOI—as described above—is an indicator of coverage discounted by the level of inequality in access along the dimensions of the circumstances of the child.** While this composite indicator is informative in itself, what is of paramount interest, particularly from the point of view of policy, is information on circumstances that are most salient in explaining the observed inequality. This analysis uses a method that allows the unraveling of the sources of inequality for a given level of an HOI using a technique known as the Shapley value decomposition. The basic idea is to find the increase in inequality that would occur if a given circumstance was added to a set of preexisting circumstances.<sup>91</sup>

## 2. Choice of Opportunities and Circumstances for Paraguay

**The HOI methodology focuses on opportunities to improve a person’s ability to expand his or her future production possibility frontier by investing in human capital in the early stages of his or her life cycle.** For this reason, this analysis focuses on a number of basic services that are critical early in life to provide the opportunities to allow a child to grow up in a

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<sup>91</sup> Implementing this method is complicated by the fact that the circumstances can be correlated with each other. Therefore to identify the contribution of any specific circumstance, an analysis would need to consider the addition this circumstance will make to the inequality for all possible subsets and permutations of the rest of the circumstances. Once these specific contributions are known, a weighted average across all permutations is used to obtain the overall impact of a circumstance on inequality (Hoyos and Narayan 2011).

reasonably healthy environment, receive education, and access affordable health services to function productively in Paraguay's society.

**Of course, the variables that can be analyzed as opportunities and the variables that can be used as circumstances in an analysis of this sort are also determined by available information. Most of the HOI analysis in Paraguay relies on the subsequent rounds of the *Encuesta Permanente de Hogares*, the Permanent Household Survey (EPH), between 2003 and 2010.** The EPH is an annual survey of approximately 20,000 individuals<sup>92</sup> typically conducted between October and January each year.<sup>93</sup> This sample is representative of the country and of each of the seven large regional groups within the country: that is, Asunción, Concepción, Caaguazú, Itapúa, Alto Paraná, Central and “others” which includes the departments of San Pedro, Cordillera, Guairá, Caazapá, Misiones, Paraguari, Ñeembucú, Amambay, Canindeyú, and Presidente Hayes.<sup>94</sup> By computing the HOI for a comparable set of opportunities using identical circumstances over time, the analysis can identify trends in Paraguay's HOI for a meaningful length of time. In addition, the analysis also focuses on the relationship between public spending and opportunities for education (2004 and 2009) and medical attention (for 2009). However, this paper does not include a fiscal incidence analysis for 2010, because the 2010 EPH does not report the location for all households—nor for 2011, because the 2011 EPH does not report households' out-of-pocket spending on education and health care activities.

**The analysis includes only children under the age of 18 years for all the opportunities studied. In addition to the intrinsic value of measuring access of key goods and services by children, focusing on the young children also obviates the need to make the distinction between access and utilization related to effort, attitudes, or preferences of the child or the child's parents.** What this implies is that as long as society agrees on universalizing an opportunity, it must ensure utilization by children, independent of the preferences of the child or the child's family. For example, a child may have access to a school at a reasonably close location, but may not attend school because the parents do not value education or because the school is of a low quality or too distant. In such instances, that child will be treated as having no access to school. If this is a basic service, society must ensure that the child uses the service, which might entail not only having a school nearby, but also maintaining schools at a level of quality or requiring obligatory attendance. It is worth noting, however, that assuming that children do not take any part on decisions associated with his or her health care or education is not free of caveats. Personal maturity and family dynamics may make this generalization troublesome, more so as one approaches the age of majority. Furthermore, education in Paraguay is mandatory only until the age of 14, increasing the probability of teenagers engaging in labor activities, and therefore perhaps having more say in household decision making. These considerations are assumed away for simplicity.

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<sup>92</sup> Sample sizes in 2003 and 2004 were larger, around 43,000 and 34,000 individuals respectively.

<sup>93</sup> Exceptions are the surveys of 2003 and 2004 which started in August, the survey of 2005 which started in November and ended in February 2006, and the survey of 2006 which started in October and ended in March 2007.

<sup>94</sup> Data are not collected for the departments of Alto Paraguay and Boqueron, the least populated of the country, with about 1 percent of Paraguay's total population.

**Another consideration is the quality of service. Basic goods and services are usually not homogeneous: their quality varies tremendously.** This is particularly true of opportunities analyzed in this study, such as education, health care, and housing. A relatively simple approach to measuring education quality is to focus on timely progression through school. While going to school provides a sense of inclusion, timely progression may reflect children’s adequate progress. This is, of course, no substitute for a more direct measuring of learning, such as standardized test scores. Unfortunately, information on test scores in Paraguay could not be readily matched to EPH data. For this reason, analysis is limited to disparities in attendance for a broad group of children aged 5 to 17; timely start and completion in the first and second cycles; and completion of third cycle of primary education. Table 6.1 below summarizes these opportunities.

**For health care opportunities, quality is partly accounted for in the definition of the opportunity itself, which—as explained below—considers timely and affordable access to medical attention.**<sup>95</sup> Furthermore, EPHs allow discriminating across different types of safety of water and sanitation services. This is not the case, however, for electricity provision; EPHs do not capture quality issues such as frequency and severity of blackouts or disruptions in service.

### **Opportunities considered**

**This analysis focuses on three broad categories of opportunities that are critical for an individual, especially during early childhood.** They are: (i) the opportunity to receive adequate education; (ii) the opportunity to receive required medical attention<sup>96</sup> in a timely and affordable way; and (iii) the opportunity to grow up in a household with housing conditions that are sufficient to provide a safe, stable, and a stimulating childhood (table 5.1).

**Assessing the opportunity to acquire adequate education uses a broad subset of indicators related to current status of attendance in schools (ages 5–17); timely start of primary education (age 6-7); timely completion of sixth grade (age 13); and completion of ninth grade (ages 16–17)**<sup>97</sup>. These are relevant opportunities in a country like Paraguay, where education attendance between grades first and sixth is almost universal, but after sixth grade,

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<sup>95</sup> Interestingly, only about 2 percent of Paraguayans who reported being ill or having accident in the last 90 days of 2010 purposefully opted out of public medical services because they considered them either too expensive, unavailable or of too low quality. Another reported reason for not seeking medical attention when suffering an illness or accident is that respondents did not consider the illness or ailment to be serious or they were “too busy” to seek attention (about 5 percent of the sick). These cases imply that, in effect, the condition was perceived as not severe enough for medical attention. In that case, these individuals were not included in this analysis of access. Therefore, we consider that people demand health care if they were ill or had an accident and they did consider it as serious enough to seek attention.

<sup>96</sup> The focus here is on medical attention that can be individualized. Thus public health interventions are not considered here because these interventions are public goods. We also face limitations of the survey to determine their beneficiaries.

<sup>97</sup> The official age to start first grade in Paraguay is 6 years. Given that the surveys are typically collected between October and January and the academic course starts in April, the analysis considers starting first grade on time if a 6 or 7 year old child attends or has completed first grade at the time of the survey. For consistency, finishing sixth grade on time is analyzed across children aged 13 as by that age, anyone who started on time first grade—at age 6—and did not drop out or repeat would have finished sixth grade.

enrollment rates markedly start declining. Another area widely acknowledged to being critical for educational policy, preschool, is not compulsory in Paraguay. However, this analysis focuses on access, disparities, and trends in preschool, the last stage of *initial* education in Paraguay and directed toward children age 5. It is important to note that the analysis is an overestimation of the disparities that underline access differentials if parents purposefully decide to not send their children to preschool. In effect, evidence shows that in Paraguay, children age 5 do not attend preschool because parents consider them as not having the appropriate age (65 percent of those not attending). Families reporting economic issues or school availability and quality reasons are less than 5 percent.<sup>98</sup>

**Table 6.1: Opportunities in Paraguay**

<b>Opportunities</b>	<b>Description</b>
<b>I. Education</b>	
Attend school	Children age 5–17 attend school
Attend preschool	Children age 5 attend preschool
Start school on time	Children age 6–7 attend first grade of primary
Finish sixth grade on time	Children age 13 have finished sixth grade
Finish ninth grade	Children age 16–17 have completed ninth grade
<b>II. Health</b>	
Timely and affordable access to health care	Children age 0–17 suffering an illness or accident in the last 90 days who demand medical attention access timely and affordable health care services
<b>III. Housing</b>	
Access to drinkable water	Children age 0–17 live in households with access to drinkable water <sup>a</sup>
Access to safe sanitation	Children age 0–17 live in households with access to safe sanitation <sup>b</sup>
Access to electricity	Children age 0–17 live in households with access to electricity

Source: Authors' compilation.

a. Sources of drinkable water considered are ESSAP, SENASA, community network, private provider, artesian wells, protected and unprotected ground wells, and bottled water. Unsafe sources of drinkable water are unprotected springs, rainfall, and surface water.

b. Sources of sanitation considered safe include sewage and septic tank. Unsafe sources are considered latrines and surface disposal.

**For the opportunity related to timely and affordable public or private health care, the focus is on whether the child is growing up in a household that can afford health care when needed. More specifically, the analysis identifies households in which a child suffered an illness or accident that was considered serious enough to seek medical attention.** Among those cases, the analysis further identifies those who responded that although willing to receive attention, they did not seek it because medical services are not close by, are too expensive, or are not sufficiently good to effectively demand them. This group is categorized as being excluded from public and private health services. Those who self-medicated are also considered as excluded of health services<sup>99</sup> as well as those who visited a healer<sup>100</sup> or a relative. Those who

<sup>98</sup> Data come from the 2010 EPH. It is not clear, however, if parents consider their children too young at age 5 to attend preschool or if the children were not old enough to enter preschool.

<sup>99</sup> We also run the analysis assuming that self-medication is considered as not seeking health services. Results are presented in Appendix 6.

suffered an illness or accident in the last 90 days, considered it sufficiently important to seek attention and were not subject to restrictions of supply, costs, and quality<sup>101</sup> are categorized as enjoying the opportunity of timely and affordable access to health care services.<sup>102</sup> Public provision of health care refers to services provided by the Ministry of Health and Social Welfare (*Ministerio de Salud Publica y Bienestar Social*) and the Institute of Social Security (*Instituto de Prevision Social*).<sup>103</sup> Public care services are further divided into those provided in a health center and those provided in hospitals. No further disaggregation is possible given the available administrative and household survey data.<sup>104</sup> Private health care corresponds to services provided by pharmacies and private professionals and medical institutions. Finally, the analysis also considers a set of indicators of housing services or amenities that capture the opportunity to grow up in a household with conditions sufficient to provide a safe, stable, and a stimulating childhood. These indicators include access to infrastructure facilities such as drinking water, safe sanitation facilities, and electricity in the household.<sup>105</sup>

### Circumstances considered

**The analysis of opportunities in Paraguay considers nine circumstances: gender of the child; gender of the household head; education of the household head;<sup>106</sup> household's per capita income; presence of the household head's spouse/partner in the household; number of siblings; urban versus rural area of residence; regional residence (grouped in seven large regions); and primary language or languages spoken in the household.**

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<sup>100</sup> It is possible that the family preferred the attention of a healer instead of that of standard health services, even if the latter were available and affordable. In this case we would be overestimating exclusion to health care. However, the percentage of the ill who visited a healer or a relative was 1.49 percent in 2010

<sup>101</sup> In the survey these represent those who reportedly visited a health professional or a pharmacist.

<sup>102</sup> No matter how much care is taken in terms of differentiating needs, demands and access to health services, the discussion of access to medical care requires further caution. This is because the opportunity is defined on the subset of children requiring medical care as opposed to the entire population, and this induces biases related to the selectivity of the sample. However, for the form of bias that would be most worrisome, one can argue that the inequality estimated in the selected sample would be an underestimate of the actual inequality. The reasoning is as follows: even if the likelihood of getting ill or requiring some form of medical attention were to be distributed randomly among the population, it is likely that those with circumstances that make them more likely to be able to secure the necessary care would be precisely the ones more likely to be reporting to have needed it in the first place.

<sup>104</sup> Under health centers we consider primary and secondary health services provided by *postas de salud* and *clnicas de salud*. Secondary and tertiary health services provided by regional and central hospitals and by MSPyBS and IPS hospitals are grouped under hospital services.

<sup>105</sup> Water and sanitation are primary drivers of public health and improvements in these services have been shown to reduce the incidence of diarrhea and its serious long-term consequences such as malnutrition, pneumonia, and physical and mental stunting. In that sense, these opportunities could have just as well have been categorized under the health opportunities.

<sup>106</sup> While education and gender of household head need not necessarily be the same as that of the parents of a child living in the household, there is a large overlap between household heads and parents. Using the information of household heads allows for easier analysis, given the way the data are reported in the surveys. Replacing the household head characteristics with those of actual parents leads to similar results in the HOI estimation, but with a smaller sample size, since parental information is available for a smaller set of children.

This set maintains the “core” circumstances analyzed in previous studies in Paraguay (World Bank 2010; Molinas et al. 2010) and adds three variables to that core: regional location, urban or rural location, and language of the household head. By maintaining core circumstances, the analysis controls for all socioeconomic aspects, demographic and family structure circumstances, spatial disparities and some degree of discrimination (or gender preference), all present in the previous studies in Paraguay. By adding regional variables, the analysis may be controlling for additional sociodemographic issues that go beyond urban and rural location. It is believed that language is a practical proxy for ethnicity in a country whose population by and large self-identifies with a Guarani origin. Specifically, the analysis controls for the language the household head speaks at home most of the time, whether it is only Spanish, Spanish and Guarani (mixed), or only Guarani. Other circumstances that would merit further considerations such as intrahousehold bargaining or migration conditions are not directly captured. However, the presence of the household head spouse is expected to partially control for decision-making issues because it captures a key feature of the family structure that provides clues on how and who makes decisions (that is, collectively or, rather, unilaterally by the household head). Table 6.2 presents the key summary statistics for each of these circumstances over the period of analysis, 2003–10.

**Table 6.2: Summary Statistics of Circumstances Used in Analysis**

Circumstance		2003	2004	2005	2006	2007	2008	2009	2010
Child's sex: male		50.3	51.7	51.1	50.7	51.5	51.0	52.0	51.8
Household head's sex: male		75.9	76.0	74.5	74.9	73.4	73.1	69.0	73.7
Household head's education	None	42.2	41.3	39.0	37.7	38.0	38.1	34.6	35.0
	6th grade	25.1	26.8	24.8	27.7	27.3	24.6	26.4	26.0
	7th to 9th	13.1	12.9	13.1	12.5	12.3	13.3	13.3	13.9
	More 9th	19.6	19.0	23.1	22.0	22.4	24.0	25.7	25.1
Household head living with couple		80.3	77.5	76.9	77.6	76.4	77.7	76.5	78.7
Household head's main language : Guarani only		53.7	55.1	54.4	49.1	47.2	49.0	49.7	51.2
Household income per capita (Guarani-thousands in 2005 values)		404	389	420	360	411	426	450	463
Region of Residence: Urban		51.9	52.8	53.9	54.5	53.4	54.3	54.0	54.2
Number of other children aged 17 or less		2.7	2.7	2.5	2.6	2.5	2.4	2.3	2.2
Department of Residence	Asunción	7.7	6.9	6.5	6.8	6.4	6.1	6.3	6.3
	San Pedro	7.6	6.9	6.7	6.5	6.7	6.6	6.5	6.4
	Caaguazú	9.0	9.2	8.8	8.7	8.8	8.2	8.9	8.5
	Caazapá	10.5	9.3	9.2	9.6	9.2	9.2	9.5	8.7
	Alto Paraná	11.5	11.3	11.9	12.6	12.8	11.6	12.3	12.1
	Central	23.9	27.3	28.6	28.7	28.5	31.0	29.7	30.8
	Others	29.8	29.0	28.3	27.1	27.5	27.3	26.8	27.3

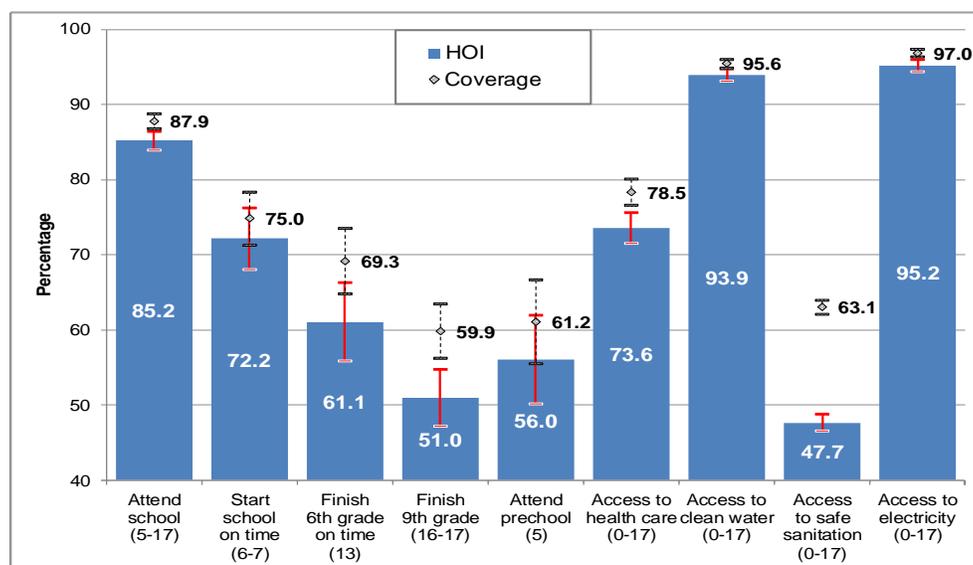
Source: Authors' estimates from EPHs 2003–10.

### 3. Description of Results

**Figure 6.2 presents a snapshot of the most recent status of educational, health, and housing opportunities in Paraguay.** For every opportunity, the plotted dots denote the overall coverage rate, while the corresponding bars denote the HOI. Recall that the HOI is the inequality adjusted coverage rate, which means that the gap between the coverage and the HOI can be interpreted as a measure of the “penalty” due to inequitable access along the dimensions of the circumstances used in the analysis. The relatively high penalty or “D-Index” suggests that these opportunities—or their lack thereof—are distributed fairly unevenly across circumstance groups. By definition, these inequalities are unfair because society considers that they should be universally distributed.

**Results of this analysis confirm that children in 2010 in Paraguay still faced substantive differences in terms of equal access to a number of opportunities, such as completing ninth grade, accessing health care and accessing safe sanitation.** Their gaps between coverage rate and HOI are statistically significant, as shown in Figure 6.2. This is, however, not the case for other opportunities that display an almost universal access or are close to being universally distributed. Thus, **the playing field is more leveled in the case of attending school and accessing water and electricity** (and, to a lesser extent, starting school on time). As it would be expected, inequities in those opportunities that are close to be universal are very limited. In contrast, completing ninth grade and access to sanitation services have large differentials in access associated with circumstances. These are precisely those opportunities that have lower coverage rates to start with and therefore are far from being universally distributed: they have large penalties for unequal distribution across circumstances that range between 8 and 15 percentage points. The largest breach between coverage and the HOI is observed for access to sanitation, followed by finishing ninth grade and finishing sixth grade on time (figure 6.2).

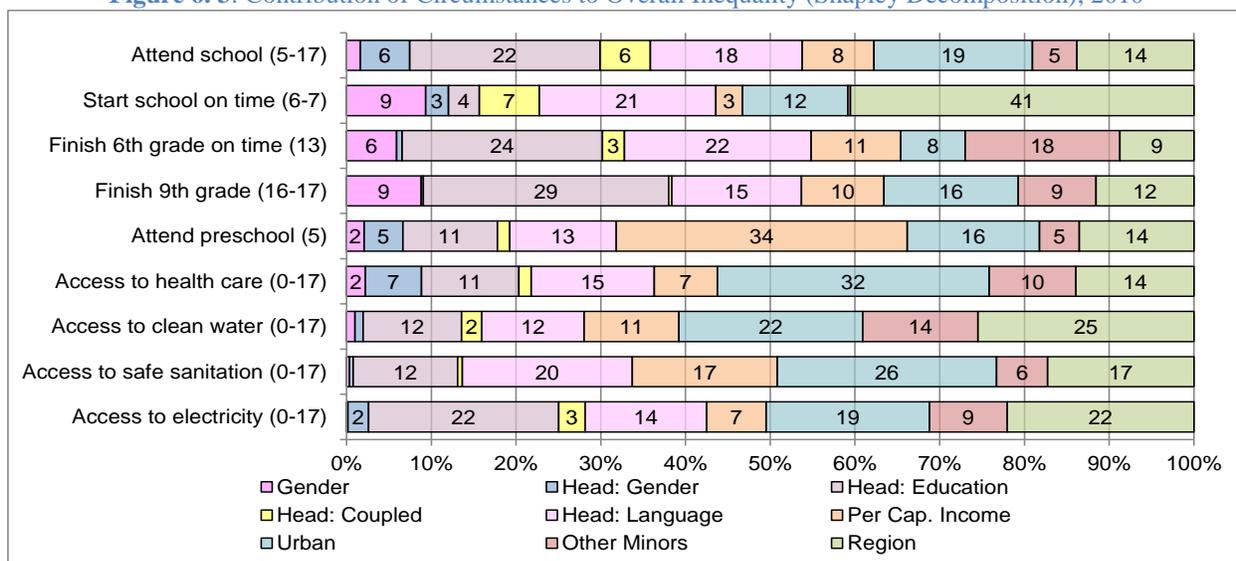
Figure 6. 2: Coverage and HOI in Paraguay, 2010



Source: Authors’ estimates from EPH 2010.

**What are the main drivers behind the observed access differentials and how they change across opportunities?** One way to answer this question is to estimate the individual contribution attributable to each specific circumstance included in the analysis in the access of the opportunity. As described in appendix 1, the contribution of specific circumstances to the D-index can be estimated using a technique called Shapley decomposition. Figure 6.3 presents the results of this decomposition for 2010. The contribution of each circumstance across opportunities is presented as shares in the colored bars. Appendix 2 compares the decomposition for 2003 and 2010.

**Figure 6.3: Contribution of Circumstances to Overall Inequality (Shapley Decomposition), 2010**



Source: Authors' estimates from EPH 2010.

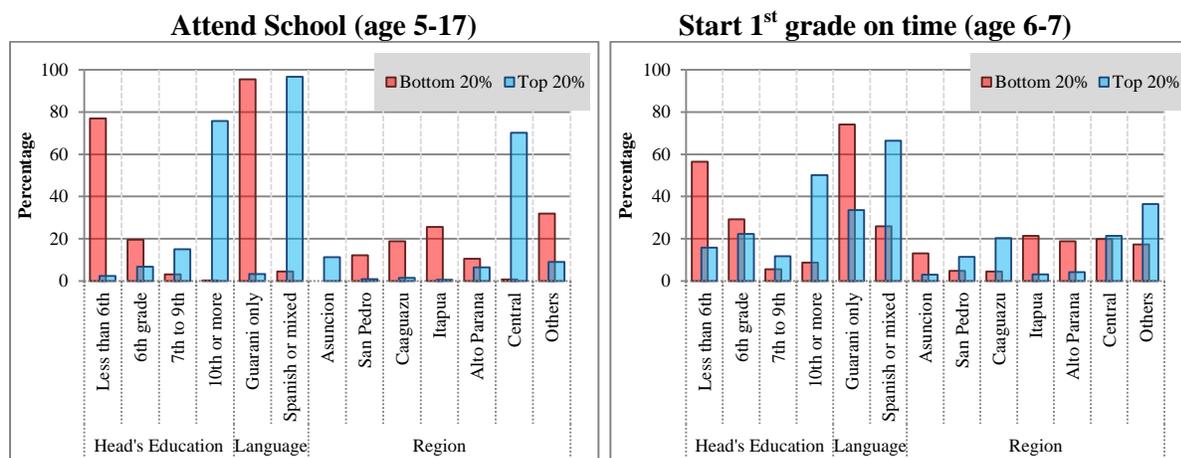
**In 2010, different circumstances turn out to be the largest contributors across educational opportunities. To be sure, there does not seem to be a dominant circumstance that drives unequal access for each educational opportunity considered here.** Household head's education is the largest contributor to school attendance for children aged 5 to 17, finish 6<sup>th</sup> grade on time and finish 9<sup>th</sup> grade. Household's per capita income is the single most important contributor to inequalities in preschool attendance, suggesting the importance of demand and preferences in education decisions. Instead, regional location is the main contributor to differentials in starting school on time. Language spoken by the household head, urban-rural location of the household and –to a lesser extent– number of minors in the household are all relevant factors explaining disparities, but their contributions are smaller than those of the circumstances aforementioned. In contrast, the gender of the household head and that of the child do not appear to matter much in explaining differentials in educational opportunities, and the presence of the household head's spouse does not appear to matter for most of the education opportunities.<sup>107</sup>

<sup>107</sup> World Bank (2010) also reports similar results for a relatively low weight of child's gender and household head's gender across educational and housing opportunities in Paraguay.

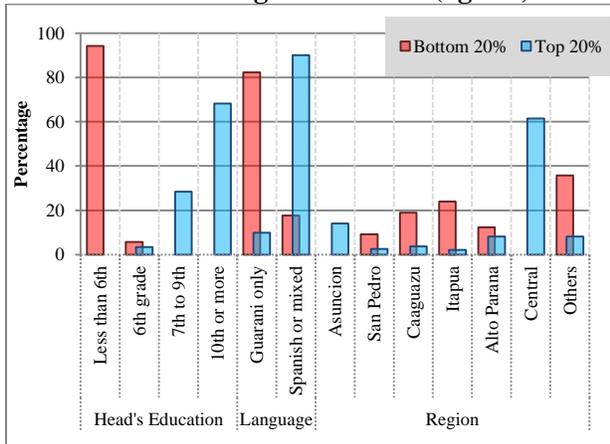
The contributors for the health and housing opportunities tend to be more concentrated on urban/rural and regional residence, which jointly explain between 40 percent and 50 percent of the total disparities observed across those opportunities. This result underlines the importance of supply factors in explaining differentials in these opportunities. Socioeconomic variables—such as household heads’ education, language, and households’ per capita incomes—also appear as systematically relevant contributors. This implies that it is both supply and demand factors that explain disparities behind health and housing opportunities in Paraguay.

An alternative way to look at the importance of circumstances consists of constructing “vulnerability profiles” of children across opportunities. These profiles allow identification of the underserved, their characteristics, and how their profiles compare with those who have better than average access. Figure 6.4 presents a snapshot of the vulnerability profiles in 2010 for all opportunities. For each opportunity, the dominant circumstances for children in the lowest quintile of the predicted probabilities of access are compared with the circumstances of children in the highest quintile of the distribution of predicted probabilities of access. For example, consider the opportunity of being enrolled in school for children aged 5–17. Of all the children aged 5–17 who have the lowest probability of attending school, 80 percent of them belong to households whose head has a level of education lower than sixth grade. Instead, 80 percent of those children in the top quintile of that opportunity—that is, those children who have the set of circumstances that make them more likely to enjoy the opportunity—have household heads with an educational attainment of 10<sup>th</sup> grade or higher. For the sake of presentational ease, this analysis focuses only on three main circumstances: household’s head education, language spoken at home by the household head and region of residence.

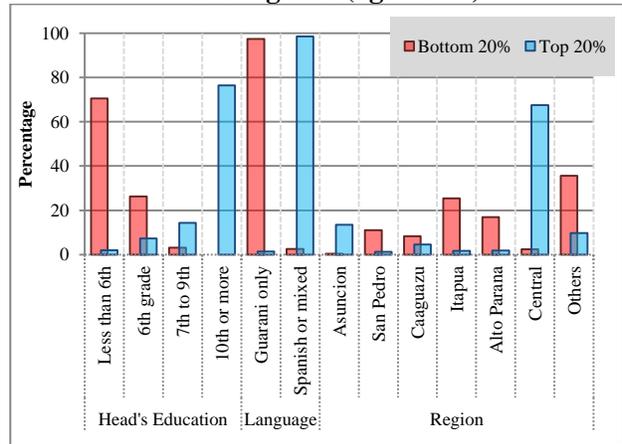
Figure 6. 4: Vulnerability Profile for Educational Opportunities, 2010



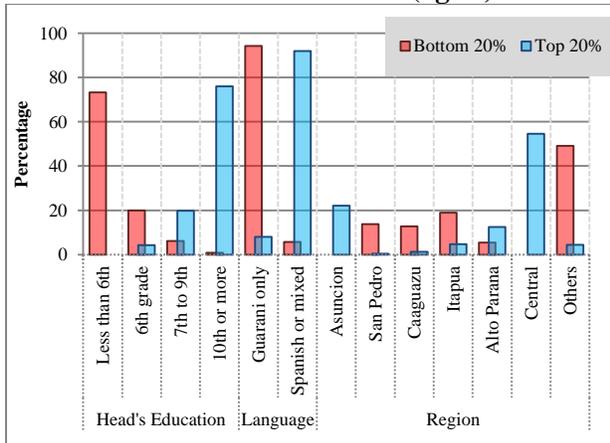
**Finish 6<sup>th</sup> grade on time (age 13)**



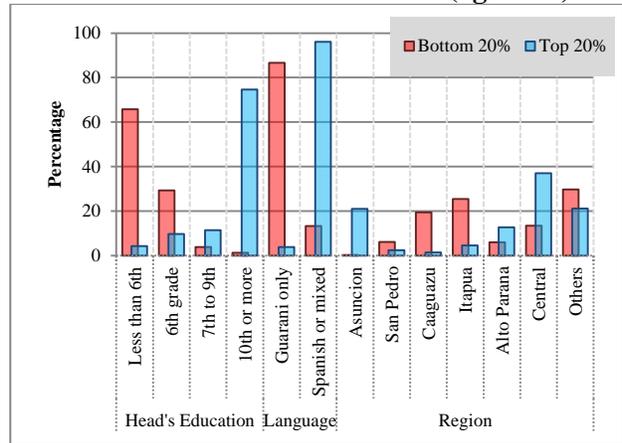
**Finish 9<sup>th</sup> grade (age 16-17)**



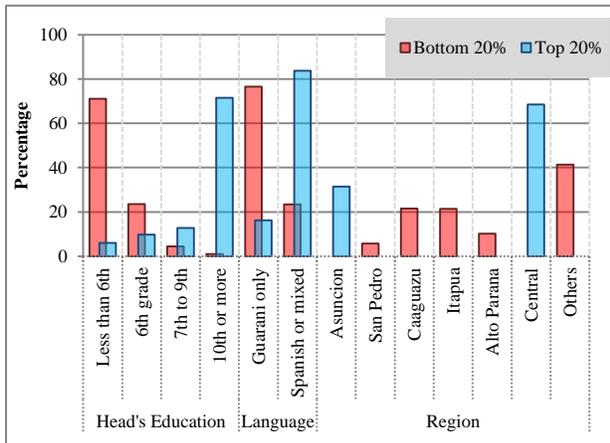
**Attend Preschool (age 5)**



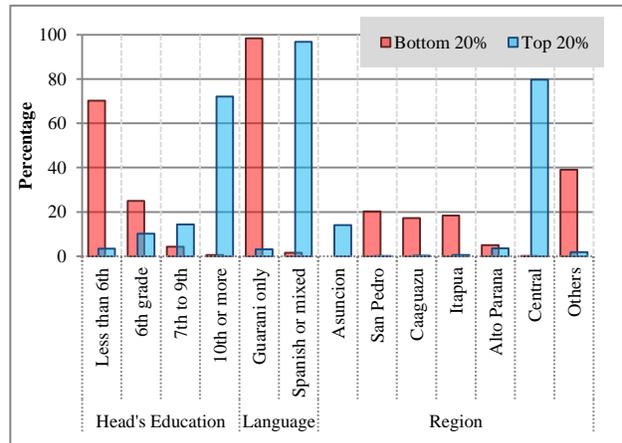
**Access to health care services (age 0-17)**



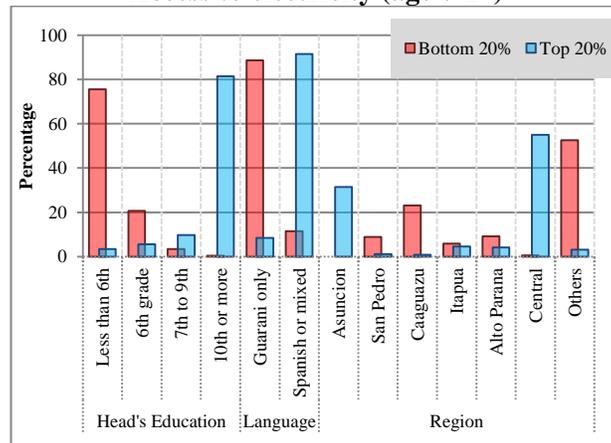
**Access to drinkable water (0-17)**



**Access to safe sanitation (age 0-17)**



**Access to electricity (age 0-17)**



Source: Authors' estimates from EPH 2010

**The strong association between household head’s educational attainment and vulnerability profiles is observed across most of the educational opportunities.** This is indeed the case for attending preschool, completing sixth grade on time, completing ninth grade, and starting primary education on time.

**The vulnerability analysis shows that the household head’s achievement lower than sixth grade is also associated with vulnerabilities in all of the four opportunities considered for health care and housing opportunities.** Instead, educational attainment of at least 10<sup>th</sup> grade or more is associated with being in the top quintile of access probabilities for all those opportunities.

**A strong story also emerges for the two other circumstances reported in the vulnerability map in figure 6.4. Households whose heads speak mainly Guarani are systematically more likely to belong to the most vulnerable group in terms of all the educational, health and housing opportunities.** In contrast, speaking both languages and mainly speaking Spanish is strongly associated with a higher access probability across all opportunities considered.<sup>108</sup>

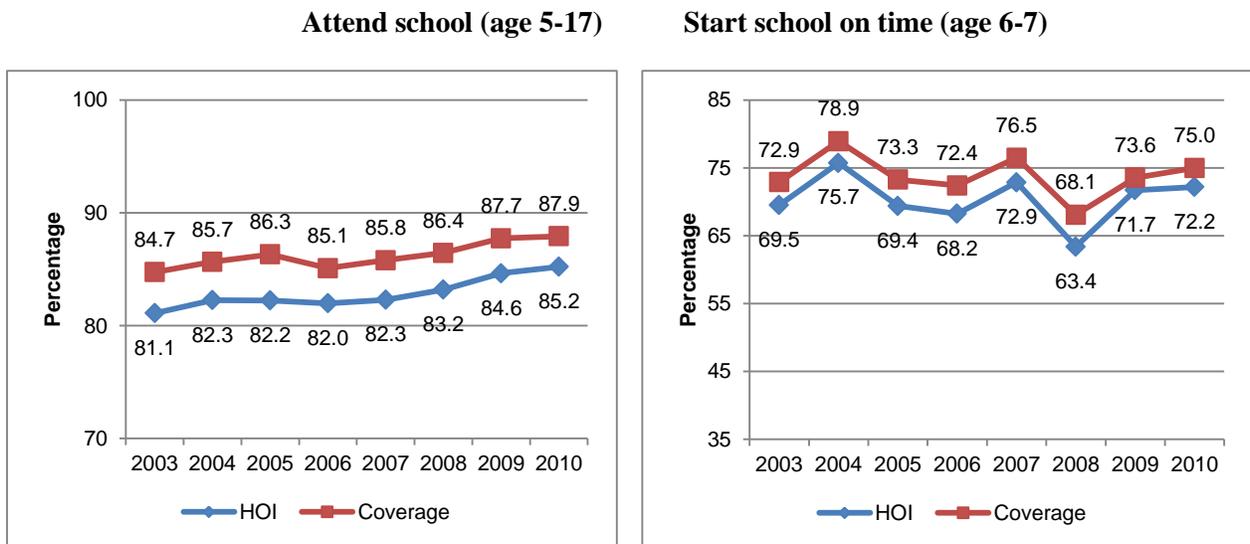
**Finally, the vulnerability profile associated with regions also displays clear relationships between specific regions and vulnerability. Households residing in the “other” regional group are consistently more likely to be in the bottom quintile of the distribution of all opportunities.** This is especially the case across housing and health care opportunities. It is also the case for education opportunities, but here, departments like Itapúa, Caaguazú, and Alto Paraná have a bearing on belonging to the most vulnerable group. In contrast, Central and—to a lesser extent—Asunción and Alto Paraná are associated with households in the least vulnerable

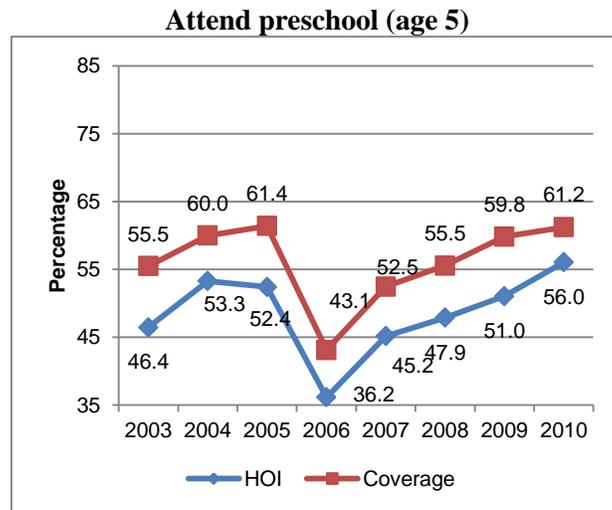
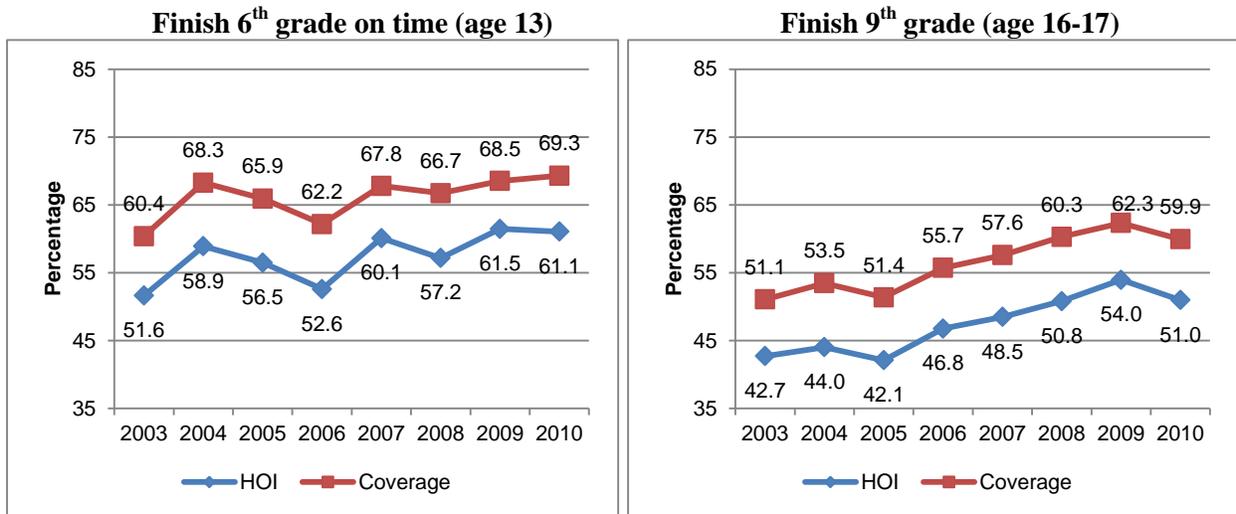
<sup>108</sup> It is only in the case of access to timely medical services that there is a clear association between household heads speaking only Spanish and pertaining to the top quintile of the distribution of opportunity access. And speaking both and only Guarani do not have much of an impact on that probability.

group across most opportunities. The strongest associations, seen between regional residence and vulnerability, are found across housing opportunities.

**In addition to the static analysis for 2010, trends between 2003 and 2010 are also presented for all opportunities in figures 6.5 and 6.6. Figure 6.5 presents the respective annual coverage and the HOI for all educational opportunities.** Three findings stand out. First, both the coverage and the HOI increase for preschool attendance, on time completion of sixth grade and completion of ninth grade while they stagnate or grow more slowly for timely start of school and school attendance. Second, some opportunities exhibit marked annual fluctuations such as attending preschool, start first grade on time, and finish sixth grade on time. In other words, annual changes are not steady. Third, finishing ninth grade, one of the most lagging opportunities in terms of low coverage and low HOI, has grown the most steadily across opportunities, but still remains well behind other educational opportunities. Attending preschool –an opportunity whose initial access rates were similar to finishing ninth grade in 2003– has been subject to a deep fluctuation. Thus, there does not appear to be a clear relationship between initial opportunity gaps and subsequent trends.

Figure 6. 5: Change in the HOI across Educational Opportunities, 2003–10





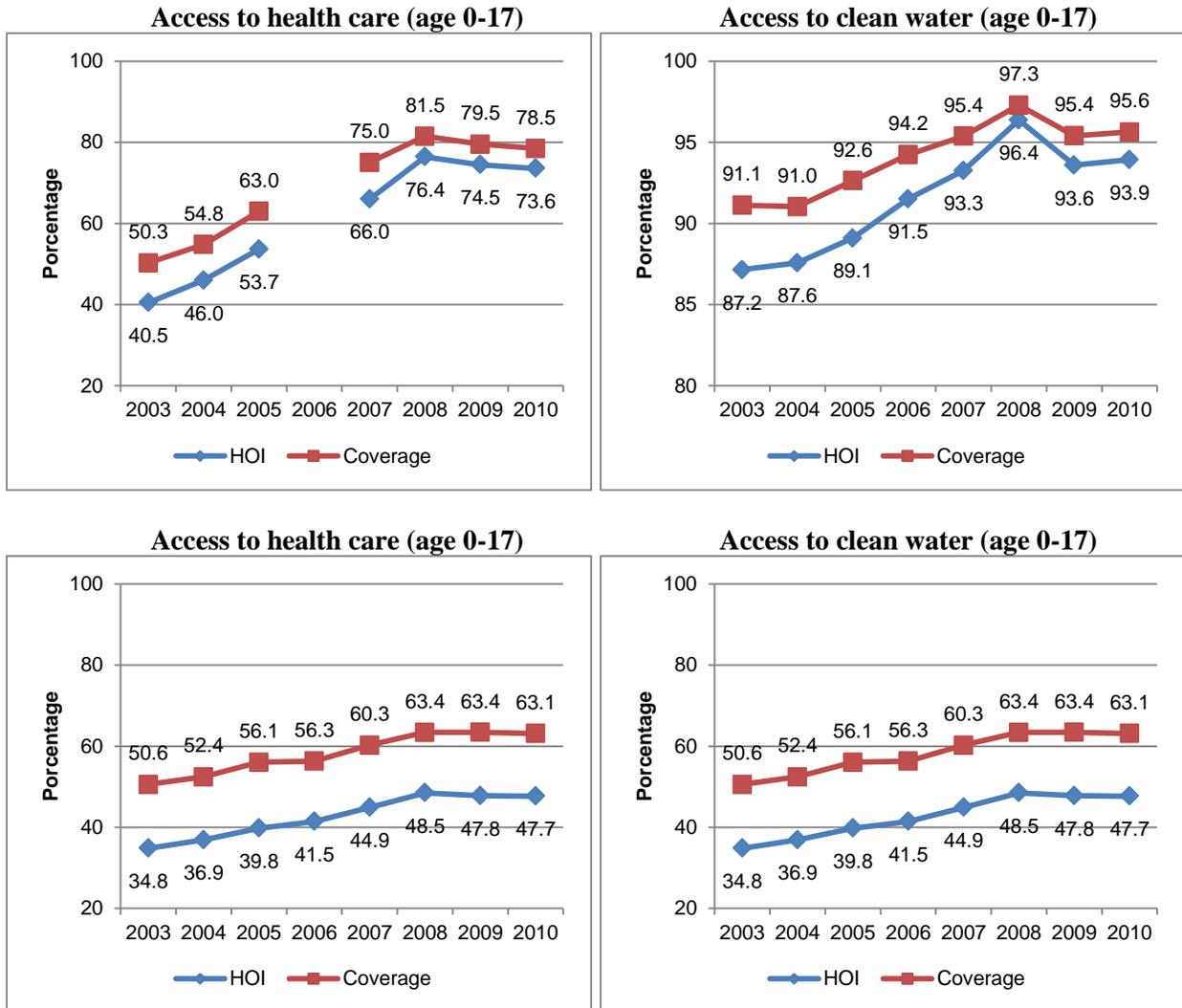
Source: Authors' estimates from EPH 2003–10.

**Figure 6.6 compares the temporal evolution of coverage and the HOI for health care and housing opportunities.** Interestingly, the gap between health service coverage and its HOI has shrunk (by half) over time, as is the case for water and electricity access. In contrast, sanitation access has not changed over time. Compared to education, all housing and health care opportunities have improved over time and have shown a steadier trend than education opportunities.

**Changes in HOI between 2003 and 2010 are decomposed into three effects: composition—changes in the distribution of circumstances in the population; (ii) scale—changes in coverage; and (iii) equalization—changes in the distribution of disparities across groups.** The decomposition analysis (not shown here) confirms two important results with regard to access inequalities. First, the equalization effect is typically a positive contributor to increasing the HOI across opportunities. This implies that there has been an overall reduction in access

disparities across circumstance groups for most opportunities. Exemptions to this positive contribution—that is, the opposite effect of increasing disparities—is found for finishing ninth grade. The magnitude of these negative contributions is very small—however, less than 10 percent of the total change between the two years. Second, the contribution of equalization effects is much smaller than scale and composition effects. Equalization explains only between 1 and 25 percent of the HOI inter temporal changes. This implies that there is still a lot of room for equalizing policies to effectively reduce disparities across groups for most opportunities analyzed in Paraguay.

**Figure 6. 6: Change in the Coverage and the HOI Gap over Time, 2003–10**



Source: Authors' estimates from EPH 2003–10.

a. Health information not available for 2006 EPH.

#### 4. Benefit Incidence Analysis of Opportunities

**This section links traditional fiscal incidence analysis with the new developments of measurement of equality of opportunities. The exercise consists of expanding traditional and commonly used distributive analytical methods for fiscal policy incidence, benefit incidence analysis (BIA), and relate it to the concept of equality of opportunities.** The resulting opportunity BIA, or Opp-BIA, presents an incidence analysis of public education and public health care—medical attention—along the distribution of opportunities and compares it with the traditional BIA across income or consumption distributions. The distribution of opportunities is obtained by estimating the probability of each child to access a given opportunity—say, attending school—given his or her set of circumstances. Circumstances in this exercise are the same ones used in the definition of the HOI for Paraguay, that is: child’s gender, household head’s education level and gender; household per capita income; presence of household head’s spouse; number of other children; urban/rural and regional residence; and main language of household head. After estimating these probabilities for each child, children are then assigned to quintiles according to these probabilities by opportunity—in the same way that they are assigned to quintiles of income or consumption. The Opp-BIA has two main advantages over the traditional BIA. First, it allows analysis of the allocation of public resources to education and health against a direct concept of vulnerability in the access to education and health, rather than an indirect concept of vulnerability associated with incomes or consumption. In other words, it allows a sharper picture of the distribution of resources and specific vulnerabilities. Second, it provides insights on how multiple factors (all of those considered relevant circumstances) affect the distribution of education and health care resources. This is not to say that the analysis determines causality between circumstances and educational benefits (in the same way that a traditional BIA does not establish causality between household incomes and education spending), but it certainly complements the insights provided by the traditional BIA based on household per capita income or consumption.<sup>109</sup>

#### 5. Education

**The gross unitary benefit—average public spending per student—for children enrolled in public schools and/or publically subsidized private schools in 2009 was estimated as G1,153,447 (US\$232) for elementary students and G2,636,277 (US\$531) for students in secondary and technical education.**<sup>110</sup> Average household contributions—that is, private out-of-pocket expenses of families—toward the education of their children averaged G 541,157 (US\$109) per student in elementary and G1,007,842 (US\$203) in secondary. These averages

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<sup>109</sup> To identify beneficiaries used in this exercise, the analysis used the 2004 and 2009 EPHs. Numbers for unitary transfers in primary education are obtained from preliminary results of BOOST in Paraguay and the number of beneficiaries provided by the Ministries of Education (2010), Health (2011) and Finance (2013)). Transfers were attributed only to children who reported attending public schools. All values in the following analysis are expressed in Guaranis and US dollars of 2009.

<sup>110</sup> In 2004, those averages were G573,665 (US\$96) and G1,590,574 (US\$266) per elementary and secondary/technical student, respectively. They represent G820,528 (US\$165) and 2,275,036 (US\$458) in 2009 values, respectively.

typically conceal significant differences by location and levels of education, and Paraguay is no exemption. In effect, administrative information on public education spending in Paraguay allows disaggregating that spending by two levels of education: primary (*elemental*) and secondary-technical (*media-técnica*). *Elemental* education includes preschool (*inicial*) and the first, second and third cycles of primary education, *básica*. It also includes special education for preschool and primary education (*educación especial inicial y básica*) and special permanent primary education (*educación permanente básica bilingüe*). Secondary-technical includes high school education (*media*), permanent professional secondary education (*educación permanente formación profesional*), alternative secondary education (*educación media alternativa*), and secondary distance education (*educación media a distancia*). Educational budgets disaggregate spending for each of those categories across departments. There is still another spending category, *alcance nacional*, which budgets do not disaggregate regionally.<sup>111</sup> This category typically includes salaries, educational material, and supplemental food. There are different ways to allocate this spending across regions: one consists of allocating those expenses according to the distribution of reported region-specific spending; another would allocate resources following the distribution of region-specific student enrollments. This analysis opts for allocating *alcance nacional* resources by geographical enrollment. The reason is that a substantive part of this spending category refers to educative material and food rations, which ultimately depend on numbers of enrolled students. Appendix 3 provides the specific estimates of education unitary benefits per department that result from this rule.

**Figure 6.7 presents the distribution of the estimated public education benefits per child aged 5–17 across quintiles of per capita household consumption and probability of attending school—that is, the results from the BIA and Opp-BIA, respectively.** Each bar represents the proportion of beneficiaries from each quintile (20 percent of the distribution) and the proportion of benefits that the beneficiaries of each quintile capture. Figure 6.7a presents the shares of education benefits and beneficiaries across quintiles of incomes, while 5.7b presents the shares across quintiles of probabilities. Thus, for example, the 20 percent of children with the lowest income per capita benefit some 22 percent of public expenditure in elemental and secondary education in Figure 6.7a. Instead, the 20 percent of children with the lowest probability of attending school (explained by their set of circumstances), benefit some 21 percent of public expenditure in elemental and secondary education (Figure 6.7b).

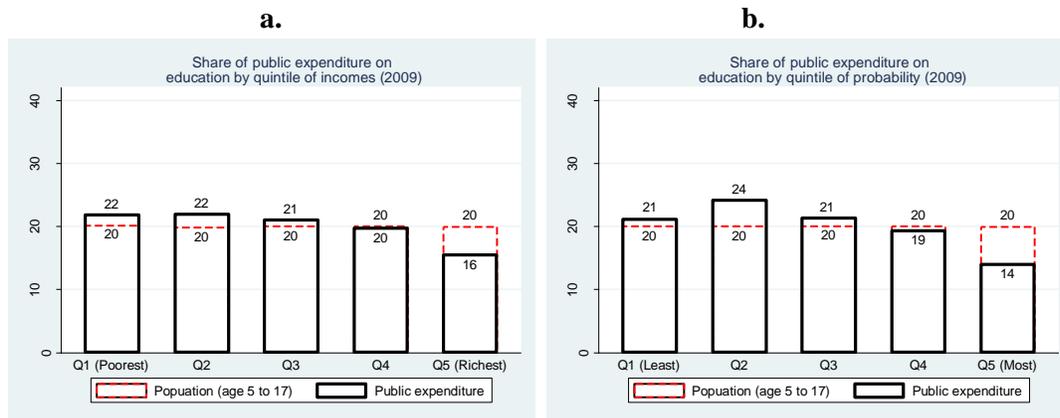
**In 2009, the shares of public spending on education in Paraguay followed a near uniform distribution, with each quintile almost capturing a fifth of public benefits except for the last quintile.** In this respect, spending on public education in Paraguay is not pro-poor or pro-rich, because it does not appear to favor disproportionately the poorest or the richest, respectively. However, this near uniform distribution is not the result of a neutral distribution of resources across levels of education but, rather, the result of a pro-poor spending on elemental education combined with a pro-rich spending on secondary education. In effect, figure 6.8a confirms that shares of public spending benefits decrease as the consumption of household increases for

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<sup>111</sup> A final budget item is “education and culture without discrimination,” which includes training for police and armed forces and physical investments associated with cultural assets. These items were not included in the analysis because they would typically not benefit children directly.

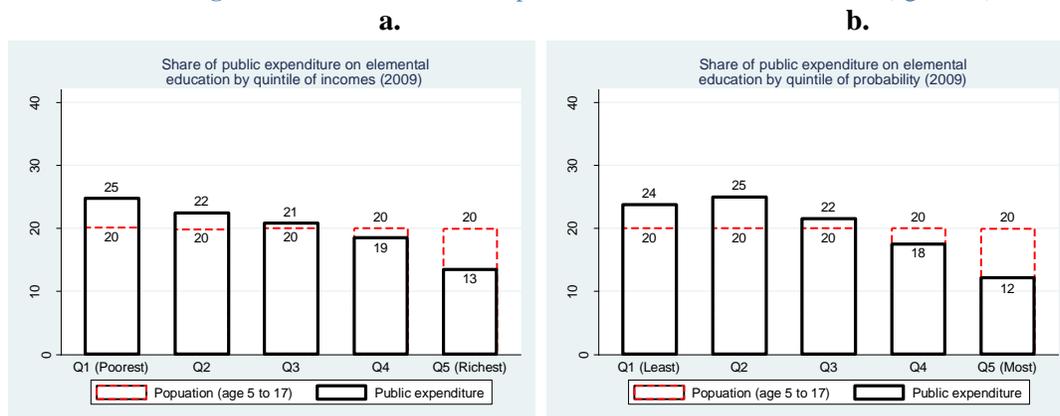
elemental education, while figure 6.9a shows the opposite occurs on secondary education. The bottom 40 percent of the distribution of beneficiaries of elemental education capture 47 percent of total public resources on elemental education (figure 6.8a) the same percentage of secondary education public spending goes to the top 40 percent of the income distribution (figure 6.9a). The Opp-BIA confirms the distinct distributional incidence patterns for aggregated, elemental, and secondary education spending (figures 6.7b, 6.8b, and 6.9b respectively). To be sure, for the combined public spending on elementary and secondary education, having a set of circumstances less favorable to attend school does not make a large difference in the public benefits that child will receive. Only children with the most favorable set of circumstances receive less public benefits than their share in the population would suggest. The main reason is that these children opt for private education. Results highlight, once again, an elemental education that is close to universal and equitable access and a slightly pro-rich distribution of public spending on secondary education. These key results are also confirmed for 2004, as shown in appendix 4.

**Figure 6.7: Share of Aggregate Public Expenditure on Education (age 5-17), 2009**



Source: Authors' estimates from EPH 2009, Ministerio de Educación (2009)

**Figure 6.1: Share of Public Expenditure on Elemental Education (age 5-14), 2009**

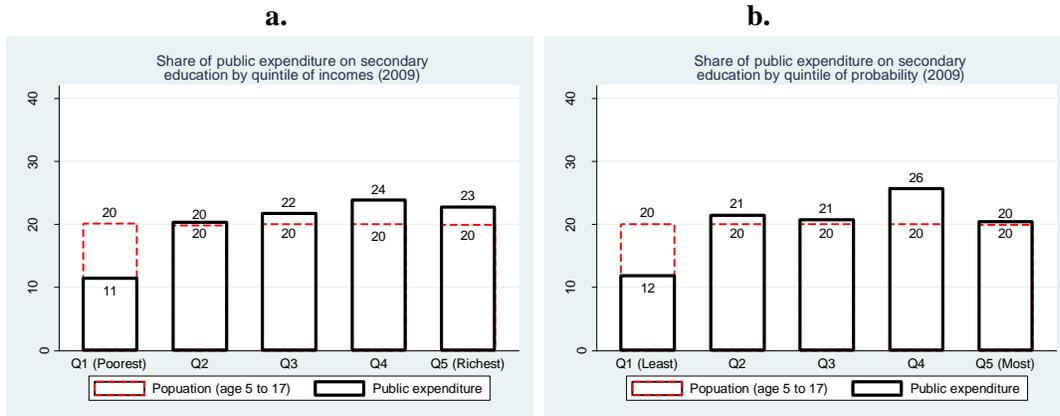


Source: Authors' estimates from EPH 2009, Ministerio de Educación (2009)

**The distribution of spending share per group allows determination of the pro-poor nature of spending. In contrast, net unitary benefits—that is, the average benefit per student *net* of**

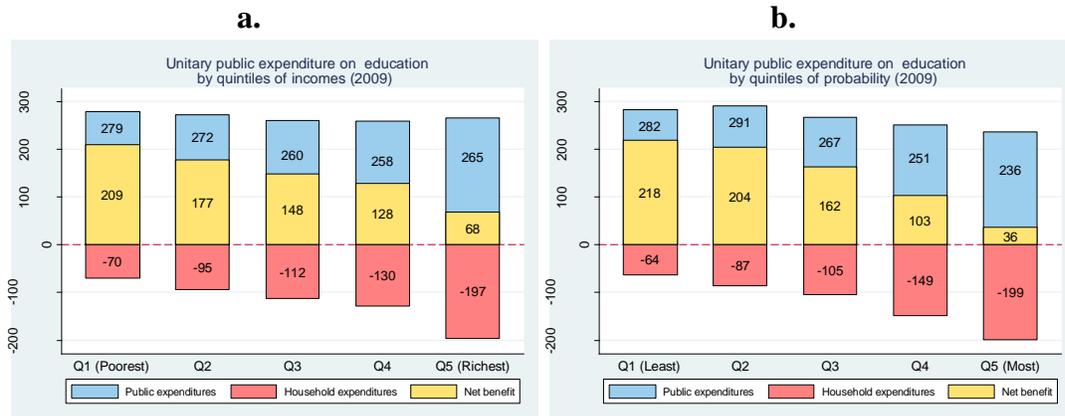
the family’s private out-of-pocket spending toward his or her education—depict the **progressivity of public spending**. Progressivity in spending is understood as children in poorer household’s receiving increasingly larger net benefits from access to public education. The following figures report the distributions of net unitary spending for aggregate, elementary, and secondary education. As for the shares of spending reported before, both the incidence across quintiles of incomes and quintiles of opportunities are presented.

**Figure 6. 8:** Share of Public Expenditure on Secondary Education (age 16-17), 2009



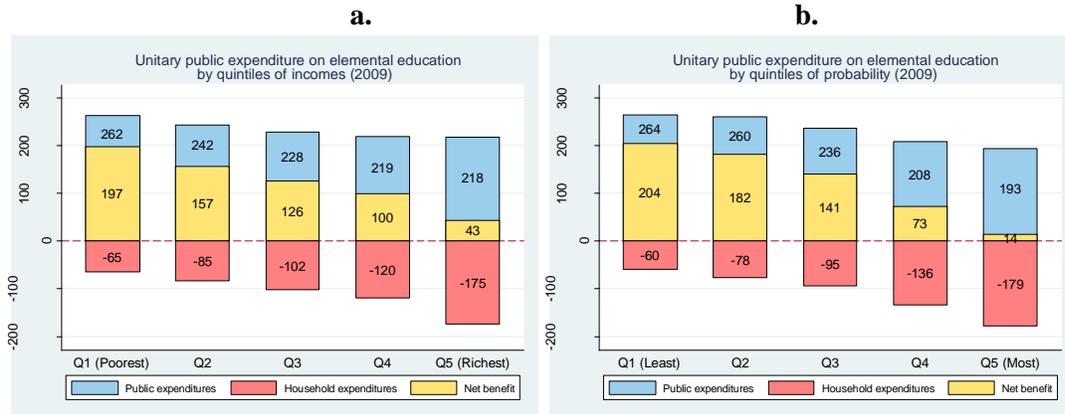
Source: Authors’ estimates from EPH 2009, Ministerio de Educación (2009)

**Figure 6. 9:** Distribution of Unitary Public Expenditures on Education Net of Private Household Contributions (age 5-17), 2009



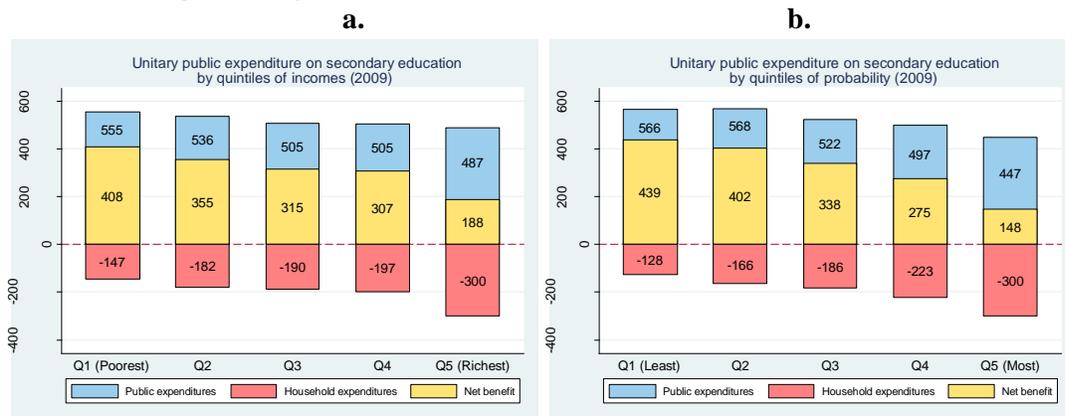
Source: Authors’ estimates from EPH 2009, Ministerio de Educación (2009)

**Figure 6. 10:** Distribution of Unitary Public Expenditures on Elemental Education Net of Private Household Contributions (age 5-17), 2009



Source: Authors' estimates from EPH 2009, Ministerio de Educación (2009)

**Figure 6. 11:** Distribution of Unitary Public Expenditures on Secondary Education Net of Private Household Contributions (age 5-17), by Quintiles of Households, 2009



Source: Authors' estimates from EPH 2009, Ministerio de Educación (2009)

**Results confirm the unambiguous progressivity of public spending on education in Paraguay, after including households' private contributions. Such contributions increase alongside the level of consumption of the household.** Simply put, richer households incur higher out-of-pocket expenses on education than poorer households do. This is true for *elemental* grades as well as for secondary education. Interestingly, gross unitary benefits per student slightly decrease as household consumption increases. This implies that the public education system is progressive because children in poorer household appear to receive slightly larger benefits from attending school while their families incur in lower out-of-pocket expenses towards their education.

**In the context of this static incidence analysis, larger transfers mean larger costs of education because provision costs are equated one-on-one with education benefits.**<sup>112</sup> So, more beneficiaries from poor households attend public schools in departments with higher provision costs. These higher costs typically reflect higher salaries of teachers in rural and isolated schools and the allocation of centralized administrative expenses of the educational system (*alcance nacional*) across fewer students in smaller departments. Also, these results reflect that richer families opt out of the public system in favor of enrolling their children in private schools. Finally, richer families spend more on fees, texts, school materials, and other costs than poorer families.<sup>113</sup>

## 6. Health care

**The distributional incidence of public health care spending in Paraguay shows that it is neither pro-poor nor progressive.** In fact, the share of spending benefiting middle-income groups—that is, children in households of the third quintile of the distribution—is larger than the share of low- and high-income group quintiles. **Beneficiaries in the third quintile capture 31 percent of benefits of public health care (figure 6.13a). The remaining groups, the bottom 40 percent and the top 40 percent, capture 31 percent and 38 percent, respectively, that is, slightly below their proportional population shares.** The disaggregation by types of attention, health centers, and hospitals confirms that the middle income quintile captures a larger share of benefits than other quintiles. It also shows that there are different distributional profiles for health care in centers and hospitals: while the bottom quintile of the distribution of incomes disproportionately benefits from health center services (figure 6.14a), it is also disproportionately not benefiting from hospital care related public spending (figure 6.15a). The opposite is observed for the top quintile: it does not benefit much from public spending on health care centers (figure 6.14a), while benefits from hospital care benefits more than its share of beneficiaries (figure 6.15a)

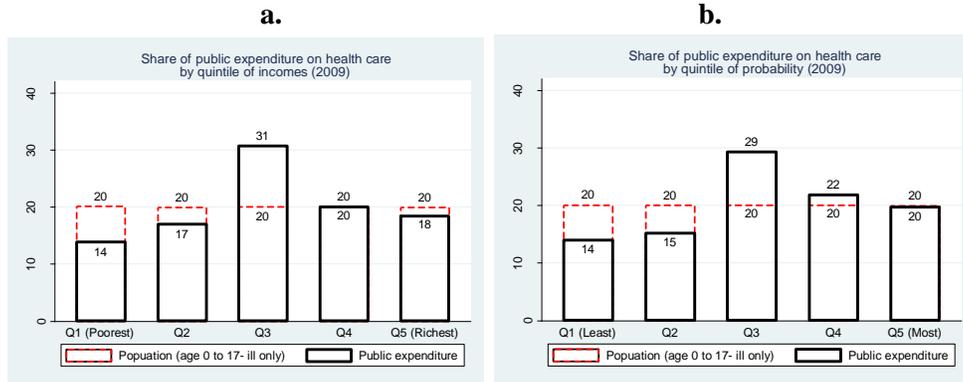
**Incidence results across the distribution of probability confirm by and large that the middle quintile benefit the most from public health care spending.** Figure 6.13b also shows that public health care spending is not pro-poor when analyzed by quintiles of opportunities. The children with the set of circumstances most favorable –bottom two quintiles– only capture 29 percent of benefits (figure 6.13b). The disaggregation by nature of the attention, health center, or hospital related indicates that there are marked distributional differences as well. Medical attention in health centers is pro-poor when analyzed by quintiles of opportunities: the bottom 40 percent captures some 54 percent of such benefits (figure 6.14b). However, hospital care spending is pro-rich along the distribution of probabilities. The bottom 40 percent of the distribution captures 19 percent percent of all benefits associated with hospital care (figure 6.15b). Thus, the incidence of public health care spending by quintiles of opportunities reveals that health centers tend provide a pro-poor service, while hospitals provide a pro-rich service.

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<sup>112</sup> Because the analysis is static, it does not include future rates of return to education, that is, their true investment side.

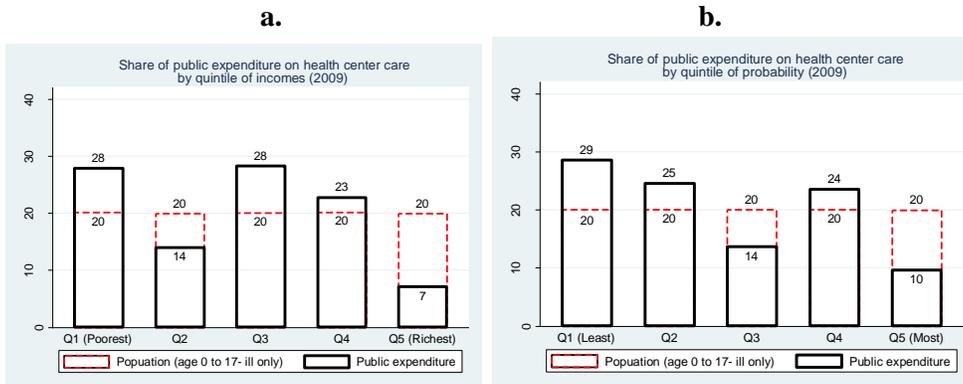
<sup>113</sup> Some 39 percent of children in the top quintile of the distribution of beneficiaries attend private schools; only 3 percent of children in each of the two bottom quintiles do. Those children from the top quintile who go to public or publically subsidized schools spend on average three times more than children from the bottom two quintiles.

**Figure 6. 12: Share of Public Expenditures on Health Care (age 0-17), 2009**



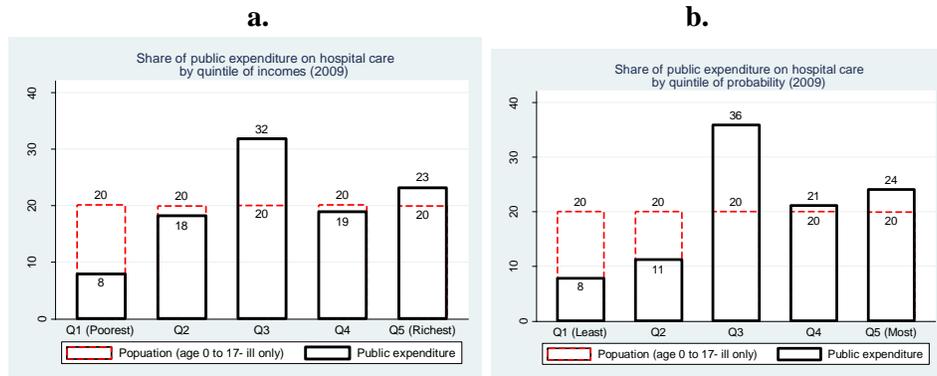
Source: Authors' estimates from EPH 2009, MSPyBS (2010), IPS (2011)

**Figure 6. 13: Share of Public Expenditures on Health Center Care (age 0-17), 2009**



Source: Authors' estimates from EPH 2009, MSPyBS (2010), IPS (2011)

**Figure 6. 14: Share of Public Spending on Hospital Care (0-17), 2009**



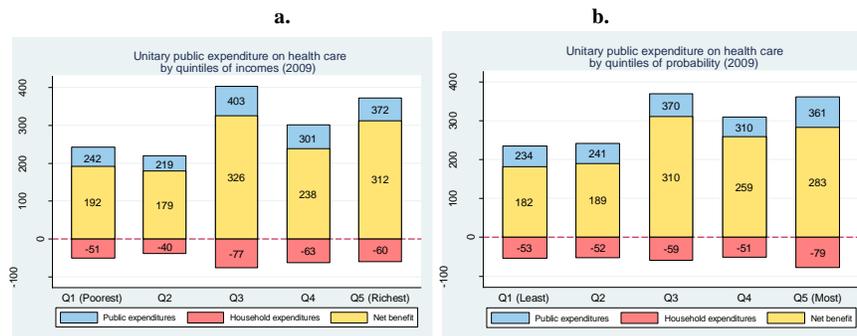
Source: Authors' estimates from EPH 2009, MSPyBS (2010), IPS (2011)

**The distribution of net unitary benefits per health care is neither progressive nor regressive in Paraguay.** The average benefit from health care—without any disaggregation—neither systematically increases nor decreases along with income levels (figure 6.16a). Household out-of-pocket contributions do not seem to follow a monotone trend either although beneficiaries at

the bottom 40 percent incur less out-of-pocket contributions in absolute terms. The result is a net benefit for the top quintile of incomes that exceeds that of the poorest quintile, reaching the largest net benefit among those beneficiaries from the middle income group. This regressivity conceals, once again, distinct patterns for health centers and hospital-related spending profiles. Figure 6.17a and 6.18a depict nonlinear patterns along with consumption levels. They are neither progressive nor regressive. In the case of the distributive incidences depicted by the quintiles of probability, net benefits from public spending on health centers first decrease to then increase (figure 6.17b), while they remain mostly uniform across quintiles of probability for hospital care except, again, for the mid-income group (figure 6.18b).

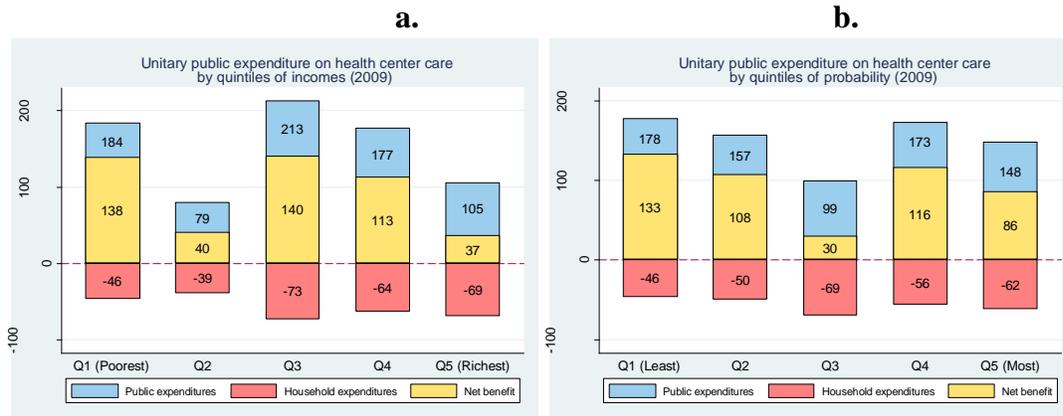
**There are several possible explanations for these patterns.** One option is that richer households, and/or those with circumstances making them more likely to access public health, do not so clearly opt out of the public system. In addition, and contrary to education, different medical conditions and accidents require different types of health care. The complexity and severity of required attention should not be expected to follow clear socioeconomic nor geographical lines. Outliers do not drive these results either. In fact, results do not change when two scarcely populated departments—Canindeyú and Ñeembucú—with extremely high average public transfers on public health are removed (appendix 5). Another potential source of bias in these estimates, self-medication, does not fabricate the reported trends. Appendix 6 show results after considering that all self-medicated individuals are in fact included in the definition of health care opportunity. Finally, it is also worth noting that these distributive incidences are not the result of the poor demanding less—or reporting less—health services because this analysis considers only those who demanded attention to a condition considered serious enough to demand some medical attention in the first place.

**Figure 6. 15:** Distribution of Unitary Public Expenditures on Health Care Net of Private Household Contributions (age 0-17), 2009



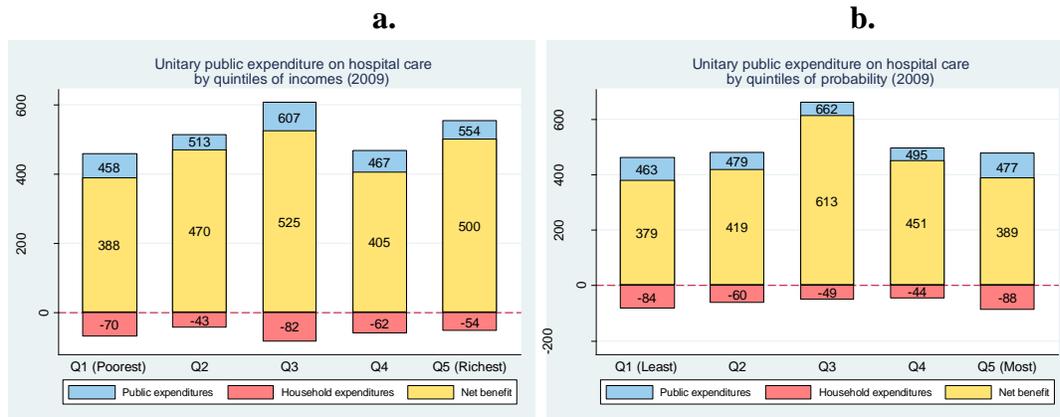
Source: Authors' estimates from EPH 2009, MSPyBS (2010), IPS (2011)

**Figure 6. 16: Distribution of Unitary Public Expenditures on Health Center Care Net of Private Household Contributions (0-17), 2009**



Source: Authors' estimates from EPH 2009, MSPyBS (2010), IPS (2011)

**Figure 6. 17: Distribution of Unitary Public Spending on Hospital Care Net of Private Household Contributions (age 0-17), 2009**



Source: Authors' estimates from EPH 2009, MSPyBS (2010), IPS (2011)

## 7. Policy implications: targeting additional spending

**The expanded incidence analysis provides an alternative strategy targeting public spending that complements the traditional focus on those with lowest access.** This strategy consists of integrating both outcomes and opportunities in targeting decisions. This can be done by targeting additional spending to population groups with larger gaps between their share of public benefits and their share of population *and* with sets of circumstances that make them less likely to gain access to an opportunity by themselves.

**The number of groups that result from considering all nine circumstances at once exceeds 1,300 in Paraguay.** For the purpose of illustration, this analysis considers simply the education level of the household head (less than sixth grade, sixth grade completed, seventh to ninth grade completed, or higher than ninth grade); language of household head (only Guarani, only Spanish/mixed); and residence (urban, rural). The combination of these three categories, –found

to be most critical in explaining educational and health HOIs in section 4–, defines 16 circumstance groups, as reported in table 6.3. This example focuses on two opportunities, attending secondary school and accessing public hospital health care, which are particularly notorious in distributive terms (see appendix 7 for a similar analysis on other opportunities). Table 6.3 reports the probabilities of accessing both opportunities across the 16 circumstance groups.

**Table 6.3: Circumstance Groups and Their Probabilities to Attend School and Access to Health Care Services (when sick)**

Code	Household head: Education (grade completed)	Household head: main language spoken at home	Region of residence	Average probability of attending school (age 5-17)	Average probability of accessing health services when required (age 0-17)
1	5th or less	Guarani only	Rural	77 percent	64 percent
2	6th			88 percent	75 percent
3	7th to 9th			85 percent	76 percent
4	10th or more			91 percent	84 percent
5	5th or less	Spanish only or Mixed		82 percent	71 percent
6	6th			90 percent	81 percent
7	7th to 9th			88 percent	78 percent
8	10th or more			93 percent	86 percent
9	5th or less	Guarani only	Urban	84 percent	77 percent
10	6th			91 percent	85 percent
11	7th to 9th			89 percent	80 percent
12	10th or more			94 percent	88 percent
13	5th or less	Spanish only or Mixed		89 percent	83 percent
14	6th			94 percent	87 percent
15	7th to 9th			91 percent	85 percent
16	10th or more			96 percent	90 percent

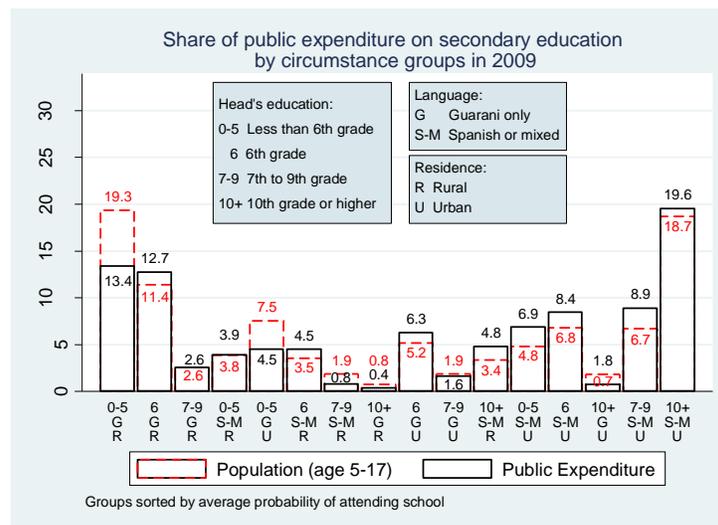
Source: Authors' estimates from EPH 2009.

**After sorting these 16 circumstance groups by their probability of access to secondary school (from least to most likely) and their probability of access to public hospital care, respectively, figure 6.19 and figure 6.20 report the gap between each group's share of population and share of benefits.** For access to secondary education, groups that have a lower than average probability to access and receive a share of public resources lower than their population shares are children in households whose heads speak only Guarani or, if speak Spanish or both, live in rural areas. These groups are those coded as 13, 11, 3, 2 and 1 in figure 6.19. Interestingly, groups with household heads that speak only Guarani, reside in urban areas (and well educated)– that is, groups 10 and 14– opt out of the public education system to a considerable extent: between 20 percent and 36 percent of children in those circumstance groups are enrolled in private education (vis-à-vis between 1 percent and 5 percent of children in the

other mentioned groups). This would lead only five very specific circumstance groups to which target additional resources following the integrated outcome and opportunity criteria.

Similarly, children with the least probability of accessing public health care in hospitals and having the largest gap—in relative terms—between their population and benefit shares live in rural households whose heads speak only Guarani and have low levels of education (sixth grade or less) as seen in groups 1 and 5. Also in this category –of groups receiving proportionally less benefits than their population shares– are children in households whose heads speak Spanish or both languages, reside in rural areas and typically have heads with low education. Those groups are coded 14, 13, 10, 11, 7 and 3 in figure 6.20. Admittedly, these groups represent a small fraction of the population –20 percent of the population for the eight groups identified– but their gaps in terms of population-benefit shares is very large in proportional terms. These groups –most of which do not appear to opt out of the public health system in favor of private attention<sup>114</sup>– would constitute obvious candidates for targeted interventions. It is also worth noting that these groups are not exactly the same ones by opportunity (although rural households with less educated heads speaking Guarani only are the least advantaged in both cases), which underscores the potential need for different target groups across equalizing interventions.

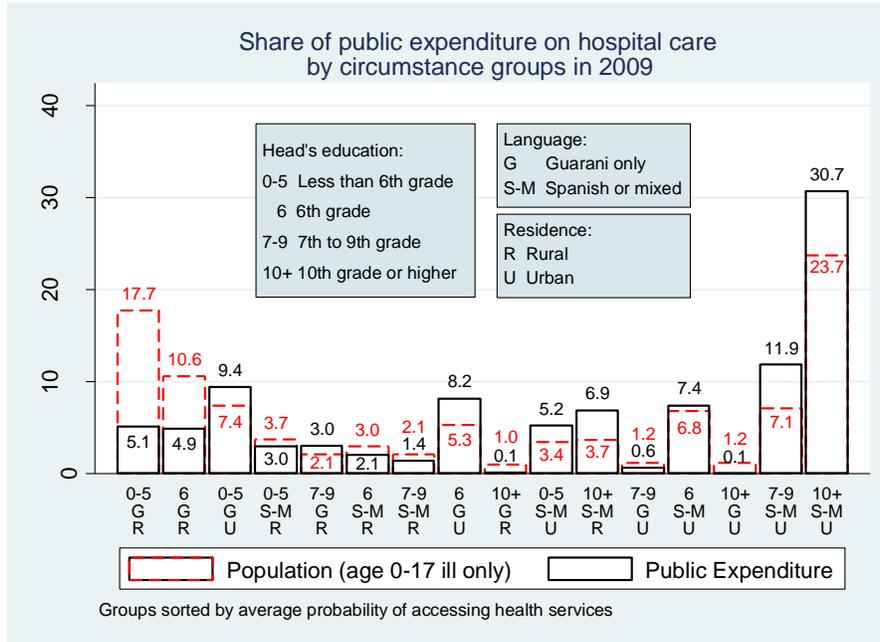
Figure 6. 18: Share of Public Spending on Secondary Education by Circumstance Group (age 15-17), 2009



Source: Authors' estimates from EPH 2009, Ministerio de Educación (2009)

<sup>114</sup> Only groups 10 and 14 appear to substantially seek private health providers when demanding medical attention. In effect, these groups attend to private providers in one out of three cases of sickness and/or accidents, according to EPH 2009.

Figure 6. 19: Share of Public Expenditure on Hospital Health Care by Circumstance Group



Source: Authors' estimates from EPH 2009, MSPyBS (2010), IPS (2011)

### 8. Summary and Conclusion

**This study analyzes the state of human opportunity among children in Paraguay and the role that public spending has played in the distribution of such opportunities.** The analysis focuses on educational, health care and housing opportunities, and considers socioeconomic, demographic, geographic, and ethnic-related variables as relevant circumstances.

**Some opportunities are close to universal distribution in Paraguay, such as access to electricity, access to water, and school attendance for children age 5 to 17.** Also, Paraguay has also made significant progress toward more equitable access to basic public services since 2003. These improvements have taken place across most, although some like school attendance and timely start of school, progress has not been significant or steady. Finishing sixth grade on time and attending preschool have been also subject to large annual fluctuations, but improvements in coverage and HOI have been significant. Furthermore, improvements in the HOI have accrued from increases in coverage across the board rather than from equalizing changes, that is, changes in access disproportionately benefiting the most vulnerable. Ultimately, circumstances such as household heads' education, household incomes and location still matter for education, health care, and housing opportunities in Paraguay; they continue to determine how vulnerable children are in terms of their access to basic services. Importantly, there is not a single dominant circumstance that matters the most across all opportunities. This underscores that one-size-fits-all interventions aiming to address disparities for all Paraguayan citizens are unlikely to be effective across different opportunities.

**Public spending on education was found to be neither pro-poor nor pro-rich.** This is not the result of universal access to education, but of a combination of a pro-poor *elemental* education spending and a pro-rich secondary education spending. Interestingly, public spending on (both elemental and secondary) education is progressive, because it benefits increasingly more of the poorer households and because richer households contribute increasingly more out of their pockets when attending public education centers. The patterns of public spending on health care appear less conclusive, with benefits concentrating in the middle group of the income distribution. Also, distributional patterns for care in health centers and hospital differ. These results may reflect some opting out of the public system by richer households as well as some specific patterns of illness and accidents that fail to follow simple socioeconomic patterns. These results, however, already control for socioeconomic differences in the demand of health services.

**Looking ahead, the analysis has identified a simple mechanism to channel public resources more equitably.** Additional public spending may be better targeted to those population groups that (i) experience a large degree of vulnerability in their access to a given opportunity (that is, have a set of circumstances that make them unlikely to access the opportunity) *and* (ii) average large gaps between their share of total population and their share of public benefits associated with that opportunity. In Paraguay, this prioritization exercise identified children in households whose heads speak Guaraní and have low educational attainments—both in urban and rural settings—as the groups that would benefit the most in terms of reducing inequitable differentials in access to secondary education and access to public hospital care, respectively.

## 9. References

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## 10. Appendix 1: Computing the Human Opportunity Index from Household Survey Data

To construct the HOI, one must obtain the conditional probabilities of access to opportunities for each child based on their circumstances. The analysis therefore estimated a logistic model, linear in the parameters  $\beta$ , where the event  $I$  corresponds to accessing the opportunity (for example, access to clean water), and  $x$  the set of circumstances (for example, gender of the child, education and gender of the head of the household, and so forth). The following is the logistic regression using survey data:

(1)

$$\ln\left(\frac{P[I=1|X=(x_1,\dots,x_m)]}{1-P[I=1|X=(x_1,\dots,x_m)]}\right) = \sum_{k=1}^m x_k \beta_k$$

where  $x_k$  denotes the row vector of variables representing the  $k$ -dimension of circumstances, hence,  $x=(x_1,\dots,x_m)$  and  $\beta'=(\beta_1,\dots,\beta_m)$  a corresponding column vector of parameters. From the estimation of this logistic regression, one can obtain estimates of the parameters  $\{\beta_k\}$  to be denoted by  $\{\hat{\beta}_{k,n}\}$  where  $n$  denotes the sample size.

Given the estimated coefficients, one can obtain for each individual in the sample his/her predicted probability of access to the opportunity in consideration:

(2)

$$\hat{p}_{i,n} = \frac{\text{Exp}(x_i \hat{\beta}_n)}{1 + \text{Exp}(x_i \hat{\beta}_n)}.$$

Finally, the analysis computes the overall coverage rate,  $C$ , the D-index, the penalty,  $P$ , and the HOI using the predicted probability  $\hat{p}$  and sampling weights,  $w$ :

(3)

$$C = \sum_{i=1}^n w_i \hat{p}_{i,n} \quad D = \frac{1}{2C} \sum_{i=1}^n w_i |\hat{p}_{i,n} - C|$$

$P = C * D$ ; and  $HOI = C - P$ .

### Shapley Decomposition: Identifying How Each Circumstance “Contributes” to Inequality

Following Barros et al. (2009), inequality of opportunities can be measured by the penalty ( $P$ ) or by the D-index ( $D$ ), as defined in expressions (1) and (3) above. The value of these two

measures—where  $P$  is just a scalar transformation of  $D$ —is dependent on the set of circumstances considered. Moreover, they have the important property that adding more circumstances always increases the value of  $P$  and  $D$ . If there are two sets of circumstances  $A$  and  $B$ , and set  $A$  and  $B$  do not overlap, then  $HOI(A, B) \leq HOI(A)$ , and alternatively  $D(A, B) \geq D(A)$ . The impact of adding a circumstance  $A$  is given by:

$$D_A = \sum_{S \subseteq N \setminus \{A\}} \frac{|S|!(n - |S| - 1)!}{n!} [D(S \cup \{A\}) - D(S)]. \quad (4)$$

Where  $N$  is the set of all circumstances, which includes  $n$  circumstances in total;  $S$  is a subset of  $N$  that does not contain the particular circumstance  $A$ .  $D(S)$  is the D-index estimated with the set of circumstances  $S$ .  $D(S \cup \{A\})$  is the D-index calculated with set of circumstances  $S$  and the circumstance  $A$ .

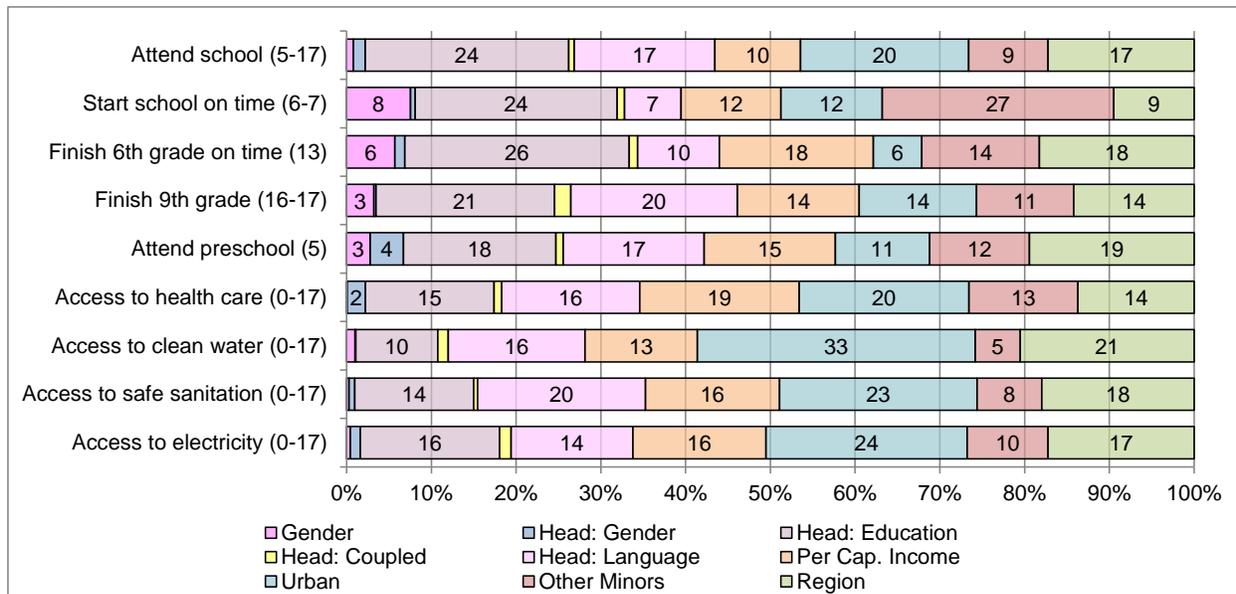
The contribution of circumstance  $A$  to the D-index can be defined as:

$$M_A = \frac{D_A}{D(N)} \quad (5)$$

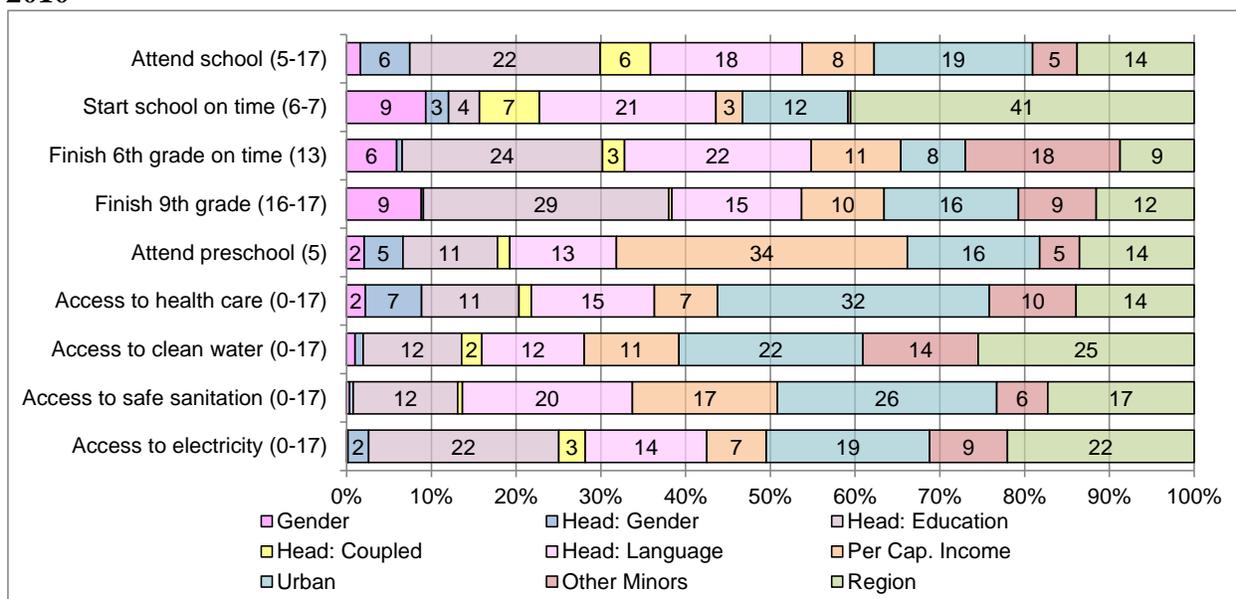
where  $\sum_{i \in N} M_i = 1$ .

## 11. Appendix 2: The Contribution of Circumstances to Overall Inequality (Shapley Decomposition)

**2003**



**2010**



Source: Authors' estimates from EPH 2003–2010.

Note: When marked with (\*), age refers to age on April of the year of the survey—start of school year, otherwise it refers to age at the moment of the survey.

**This analysis for 2003 reveals similar results to those reported for 2010, although with some changes. Thus, the education of the household head has the largest share in all five educational opportunities in 2003. Similar to 2010, however, language of the household head,**

presence of other minors in the household, household's urban/rural location, regional residence, and per capita income of the household also have significant stakes in explaining disparities across the educational opportunities. And as in 2010, neither do they follow a systematic pattern. Urban/rural location seems to matter for school attendance (both for those age 5–17 and preschool), which may indicate supply restrictions, while timely start and—consequently—timely completion of first and sixth grades, respectively, also seem to be associated with other minors in the household, which may suggest some internal competition for resources within the household. As in 2010, child's gender, household head's gender, and presence of household head's spouse/couple are systematically not substantive contributors to inequalities in educational opportunities. In fact, these circumstances do not seem to explain much of the inequalities surrounding health services and housing amenities either. Interestingly, the contribution of all other circumstances to health services also seems to be very similar in 2003. This is not surprising given that this opportunity already shows very small disparities in access. As also expected regarding housing amenities or access to water, sanitation and electricity, location circumstances are the single most important drivers of their inequalities. Urban/rural and regional residences jointly account for 40–50 percent of observed disparities. Language and education of the head of the household, and the households' per capita income explain most of the remaining disparities.

## 12. Appendix 3: Gross Unitary Expenditure on Public Education and Health Care Opportunities, 2004 and 2009

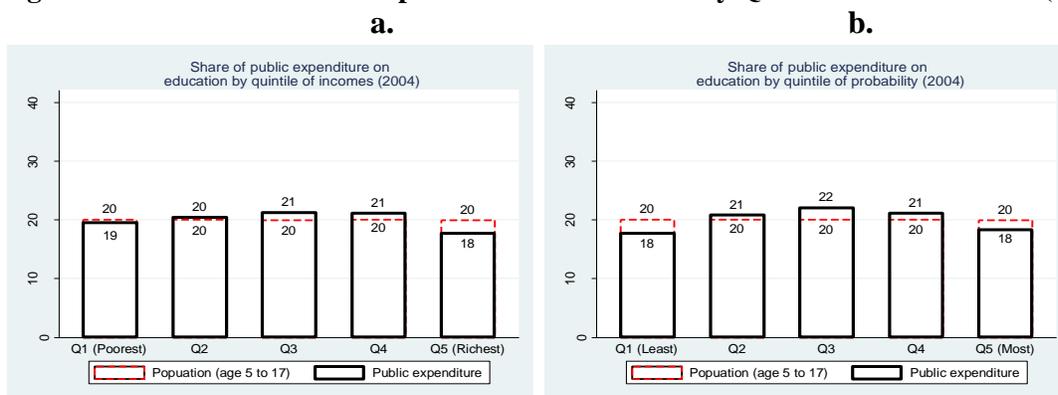
	Education 2009		Public health care 2009		Education 2004	
	Elemental	Secondary	Health center	Hospital	Elemental	Secondary
Asuncion	847,271	2,462,488	171,818	112,686	942,055	1,789,581
Concepción	1,279,107	2,802,588	301,890	338,566	552,994	1,379,013
San Pedro	1,463,325	3,166,206	258,389	790,051	659,951	1,847,873
Cordillera	1,321,578	2,974,520	217,301	5,690,458	603,319	1,783,754
Guairá	1,487,230	3,142,344	210,839	261,535	633,887	1,543,038
Caaguazú	1,345,340	2,736,013	203,564	385,969	592,250	1,542,498
Caazapá	1,461,186	2,943,693	143,242	5,043,878	629,404	1,759,968
Itapúa	1,178,578	2,885,961	365,116	318,681	538,687	1,652,612
Misiones	1,440,166	3,590,737	240,807	437,915	592,290	2,292,872
Paraguarí	1,697,191	3,030,613	227,474	5,006,153	767,251	1,551,409
Alto Paraná	999,489	1,987,678	266,546	288,071	454,108	1,190,507
Central	879,597	2,055,014	264,080	4,225,978	437,471	1,300,564
Ñeembucú	1,505,655	4,478,997	31,836,992	227,091	630,249	2,292,993
Amambay	1,002,305	3,965,219	2,401,953	339,755	500,504	1,615,342
Canindeyú	1,248,840	3,159,369	9,887,237	3,427,084	499,945	1,658,734
Presidente Hayes	1,587,800	3,234,543	616,888	220,496	714,349	2,423,521
Boquerón	503,013	2,658,032	58,188,777	3,184,255	242,609	1,711,564

Alto Paraguay	756,017	4,096,161	1,224,133	4,928,253	458,829	3,696,832
<b>Total</b>	<b>1,153,447</b>	<b>2,636,277</b>	<b>225,900</b>	<b>225,900</b>	<b>573,665</b>	<b>1,590,574</b>

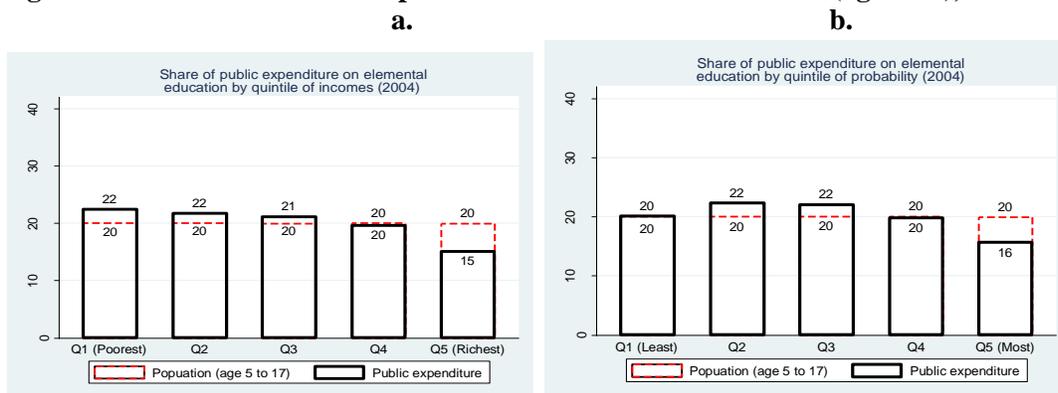
Source: Authors' estimates from EPH 2004, 2009. Benefits measured in  $\text{G}$ .

### 13. Appendix 4: Share of Public Expenditure on Education (age 5-17), 2004

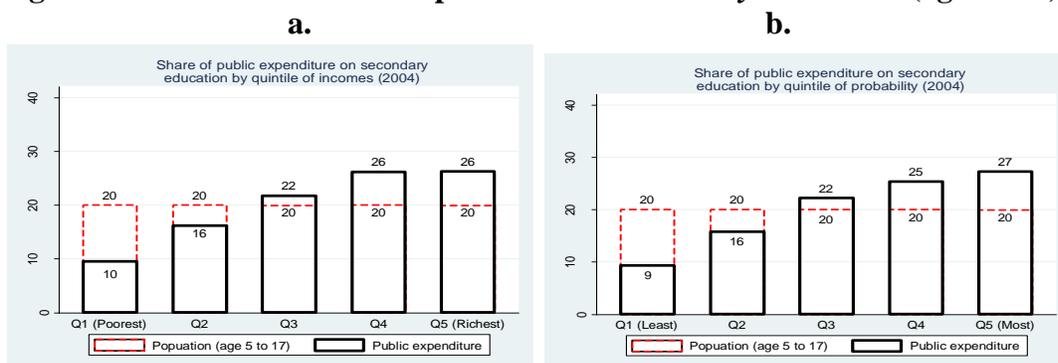
**Figure A4.1: Share of Public Expenditure on Education by Quintiles of Households (age 5-17), 2004**



**Figure A4.2: Share of Public Expenditure on *Elemental* Education (age 5-14), 2004**



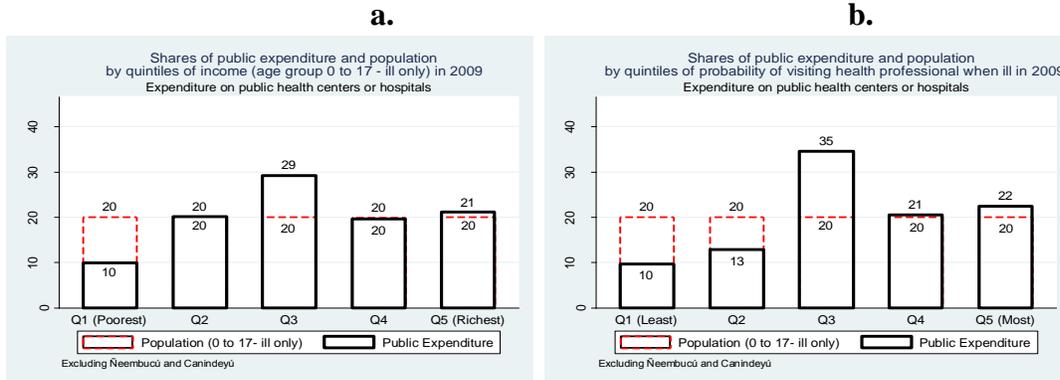
**Figure A4.3: Share of Public Expenditure on *Secondary* Education (age 15-17), 2004**



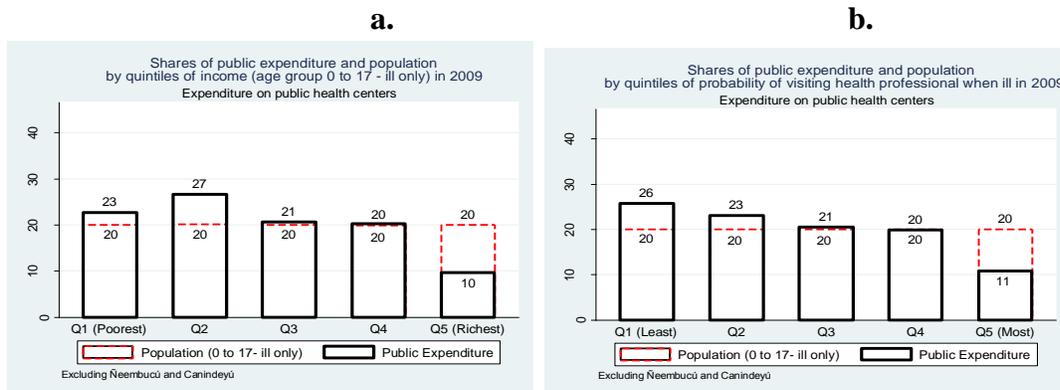
Source: Authors' estimates from EPH 2009, Ministerio de Educación (2004)

## Appendix 5: Share of Public Expenditure on Health Care (age 0-17), 2009

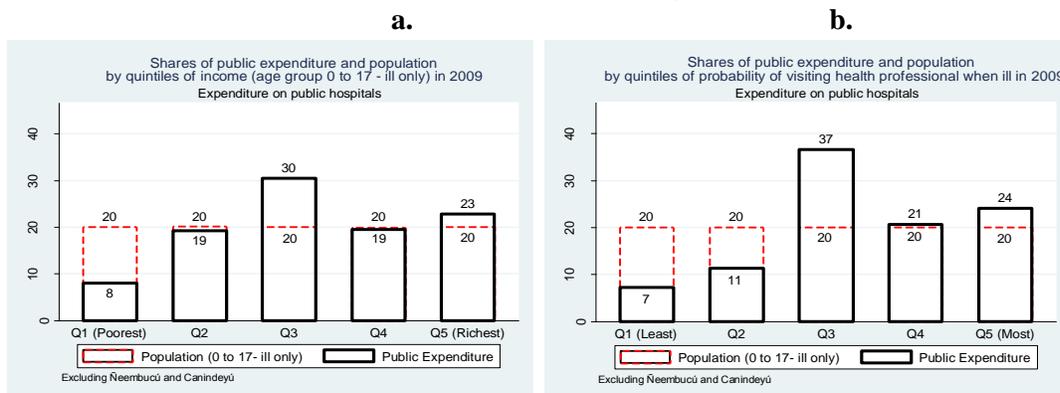
**Figure A5.1: Share of Public Expenditure on Health Care (age 5-17), 2009 (Outlier Departments Excluded)**



**Figure A5.2: Share of Public Expenditure on Health Center Care (age 5-14), 2009 (Outlier Departments Excluded)**



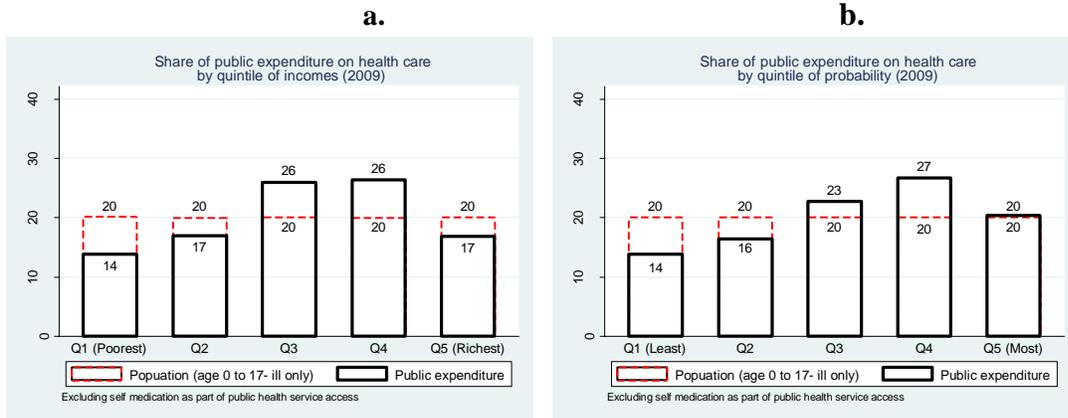
**Figure A5.3: Share of Public Expenditure on Hospital Care (age 15-17), 2009 (Outlier Departments Excluded)**



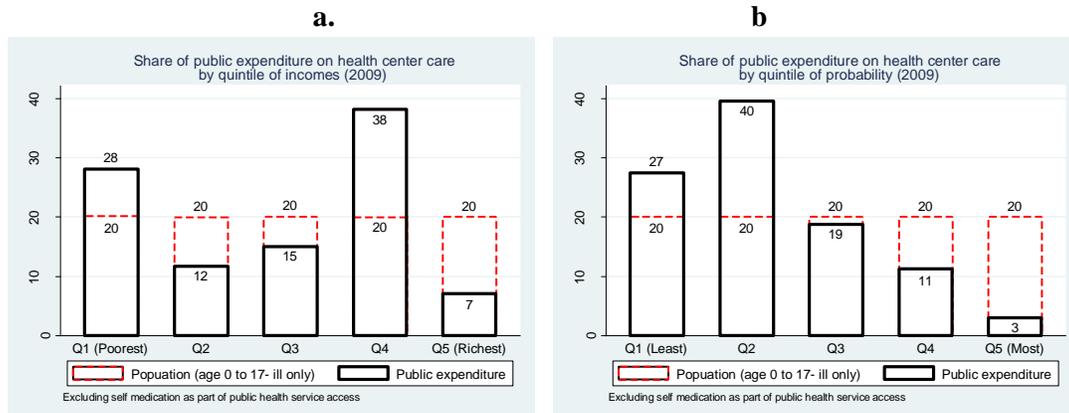
Source: Authors' estimates from EPH 2009, MSPyBS (2010), IPS (2011)

Appendix 6: Share of Public Expenditure on Health Care (age 0-17), 2009  
(considering self-medication as part of health service access)

**Figure A6.1: Share of Public Expenditure on Health Care (age 0-17), 2009**

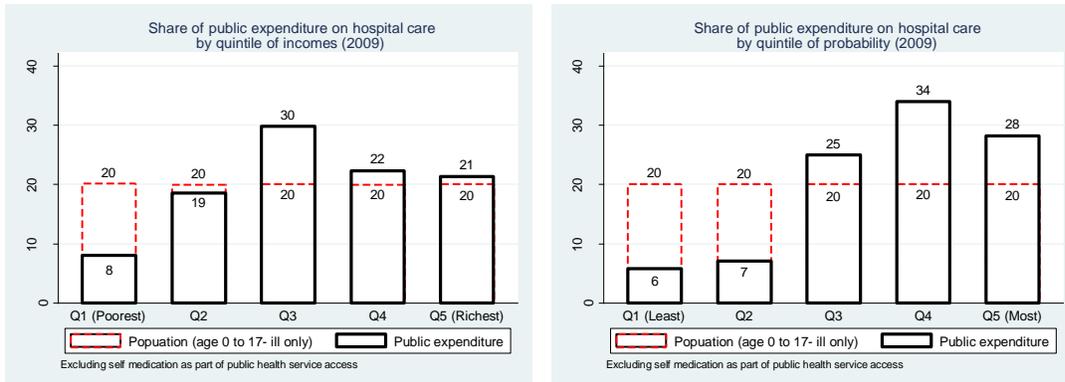


**Figure A6.2: Share of Public Expenditure on Health Center Care (age 0-17), 2009**



**Figure A6.3: Share of Public Expenditure on Hospital Care (age 0-17), 2009**

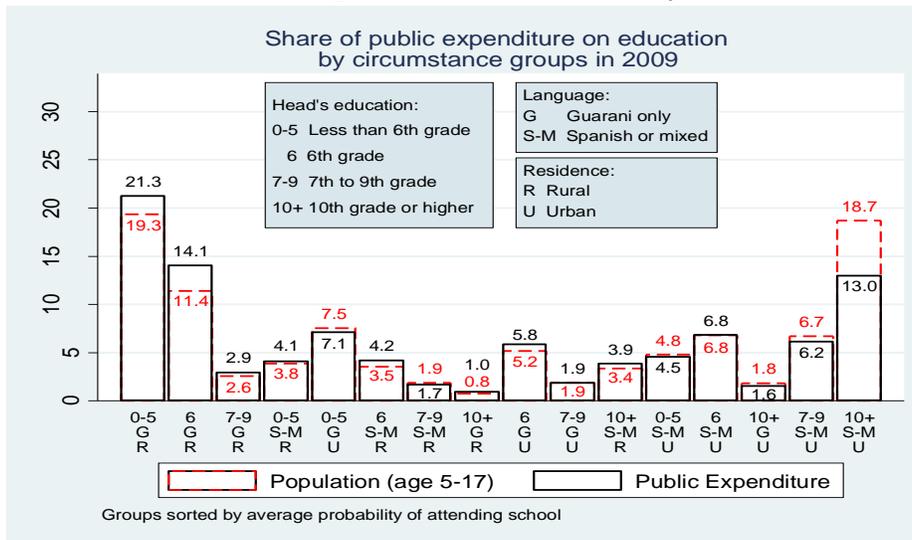
**a.** **b.**



Source: Authors' estimates from EPH 2009, MSPyBS (2010), IPS (2011)

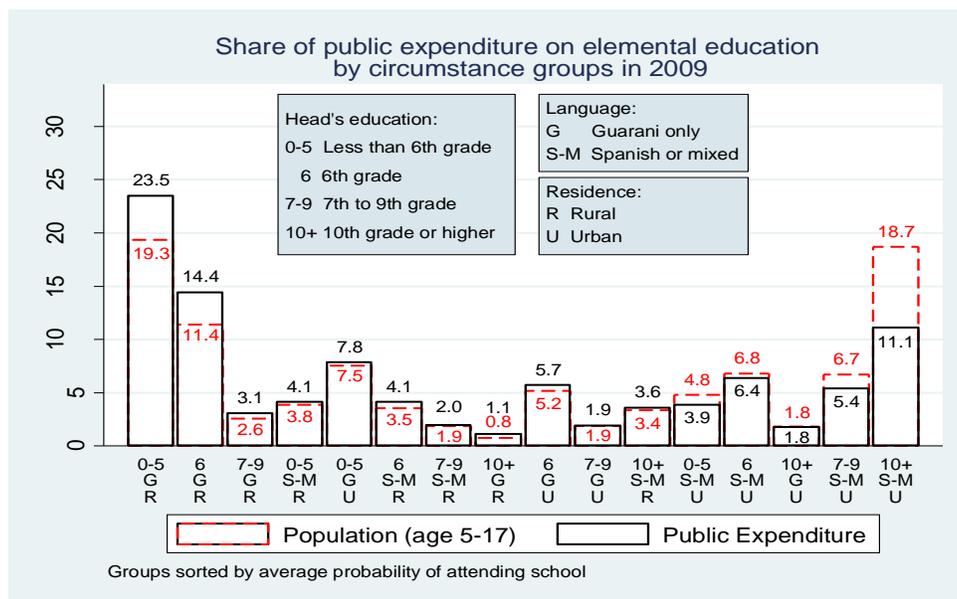
**Appendix 7: Share of Public Expenditure across Selected Opportunities by Circumstance Group, 2009**

**Table A7.1 Share of Public Expenditure on Education by Circumstance Group**



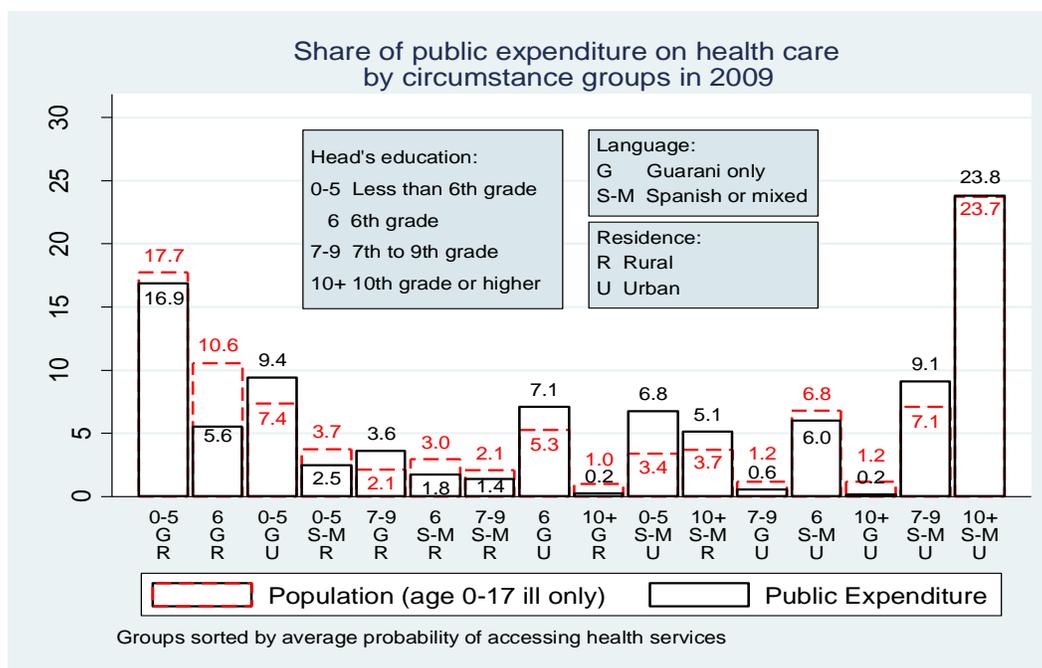
Source: Authors' estimates from EPH 2009, Ministerio de Educación (2009).

**Table A7.2 Share of Public Expenditure on Elemental Education by Circumstance Group**



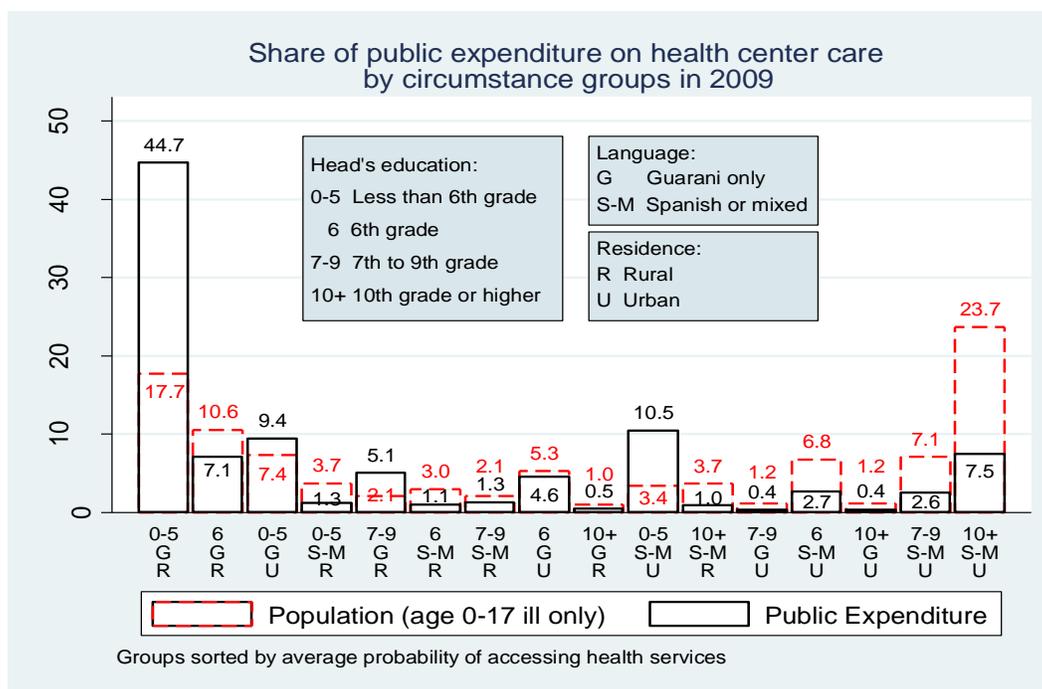
Source: Authors' estimates from EPH 2009, Ministerio de Educación (2009).

**Table A7.3 Share of Public Expenditure on Health Care by Circumstance Group**



Source: Authors' estimates from EPH 2009, MSPyBS (2010), IPS (2011).

**Table A7.4 Share of Public Expenditure on Health Center Care by Circumstance Group**



Source: Authors' estimates from EPH 2009, MSPyBS (2010), IPS (2011).

## Chapter 7. Boost Database for Paraguay, Massimo Mastruzzi, Eduardo Andrés Estrada, Renato Busquets, and Francisco Vazquez Ahued

### Introduction

A core function of any government involves collecting and disbursing public funds and maintaining records of such expenditures. Budget execution reporting systems vary greatly in their organization, accuracy, and level of detail. For researchers, the ability to easily access and analyze public expenditure data is essential to provide thorough and timely advice to policymakers and relevant stakeholders. For government officials, rapid access to budget execution data in an easy-to-use format is essential for better decision making and increasing analytical capacity within government agencies.

The purpose of the BOOST initiative (started at the World Bank in 2009) is to enhance the quality of public expenditure analysis by linking spending to results and improving access to fiscal data. Detailed government expenditure data have been collected and processed in over twenty countries across different regions, creating easy-to-use databases that have been employed by World Bank researchers in a variety of projects. Paraguay is the first country in Latin America and the Caribbean, and the fourth in the world (following Moldova, Kenya, and Togo), to release budget data to the public using BOOST.

The BOOST database for Paraguay has been developed as part of the Paraguay Public Expenditure Review and in close collaboration with the team working on the report and the country management unit. It is available through the website of the Ministry of Finance of Paraguay<sup>115</sup> and provides disaggregated budget data for all levels of government in a user-friendly format. This manual describes the database and provides guidance on its use. For help with issues that are not addressed here, please contact the BOOST team.

This document is organized as follows:

- Section 2 outlines the structure of Paraguay's national budget
- Section 3 presents the data sources.
- Section 4 describes the particularities of the data and the organization of the database.
- Section 5 explains how to use the database.

The development of the database was a joint endeavor of the World Bank and the Ministry of Finance. The BOOST team would like to thank the staff at the Ministry of Finance for its excellent collaboration. We are also grateful for the support of our colleagues at the Poverty Reduction and Economic Management (PREM) Department in the Latin America and the Caribbean Region and the Argentina, Paraguay and Uruguay Country Management Unit of the World Bank. We hope that this tool is helpful in opening new avenues for analysis and providing answers to important questions regarding the efficiency, effectiveness, and equity of

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<sup>115</sup> [http://www.openlooksolutions.com/boost\\_paraguay/](http://www.openlooksolutions.com/boost_paraguay/).

government spending in Paraguay.

The core BOOST team for Paraguay consists of Massimo Mastruzzi (mmastruzzi@worldbank.org), Eduardo Andrés Estrada (eestrada@worldbank.org), Renato Busquets (rbusquets@worldbank.org), and Francisco Vazquez Ahued (fvazquezahued@worldbank.org).

## 1. Structure of Paraguay's National Budget

Paraguay's budget classifier explains in detail the structure of the national budget<sup>116</sup>. The budget classifier is approved annually as an annex to the budget law. According to the 2012 version, the following are the classifications of Paraguay's national budget:

- Classification of the Treasury and by entities \*\*\*
- Classification by purposes and functions \*\*
- Program classification \*\*
- Classification of the expenditure by products \*\*
- Classification by source of funding \*\*\*
- Classification of the revenue of the Treasury \*
- Classification by origin of revenue \*
- Economic classification of the revenue \*
- Classification by object of expenditure \*\*
- Economic classification of the expenditure \*\*
- Classification by origin of funding or funding agency \*\*\*
- Classification by departments and municipalities \*\*

Notes: \* Denotes classification used for the revenue

\*\* Denotes classification used for the expenditure

\*\*\* Denotes classification used for the revenue and expenditure

This designation was done according to the BOOST team's interpretation of Paraguay's budget classifier.

This section will focus on the classifications used for the expenditure, starting with the classification of the Treasury and by entities. A description of the structure of the Treasury is not provided here, as that is related to the revenue side of the budget. To coincide with BOOST terminology, the classification by entities will be referred to as **administrative classification**. As shown in

Figure 7. 1, state entities and agencies are divided in the following: (i) Central Administration; (ii) Decentralized Entities; (iii) Municipalities; and (iv) Mixed Enterprises.

### Figure 7. 1: Structure of the Administrative Classification

<sup>116</sup> Unless otherwise noted, the information about Paraguay's national budget that appears in this section comes from the budget classifier for 2012, annex to Law N° 4581/2011, available at <http://www.hacienda.gov.py/web-presupuesto/index.php?c=192>.

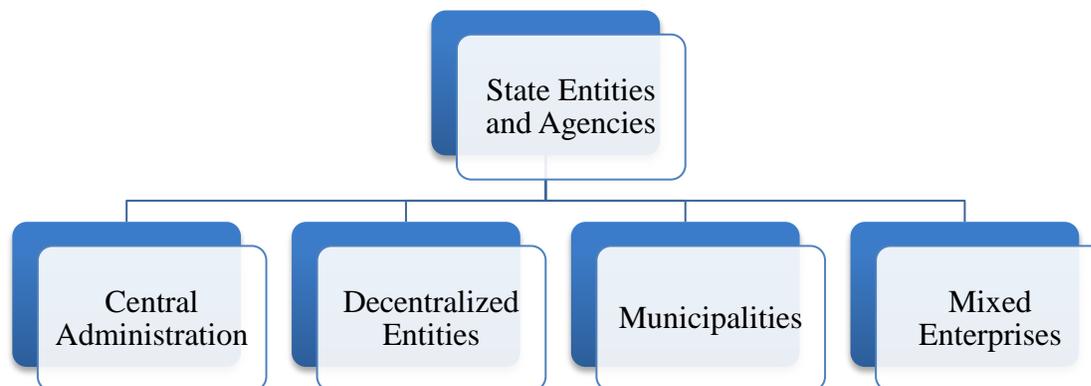
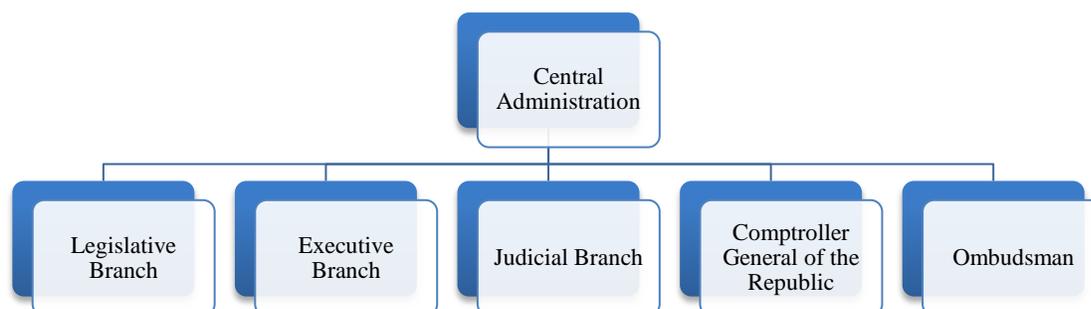


Figure 7. 2 provides the structure of Central Administration<sup>117</sup> and Figure 7. 3 of Decentralized Entities. There are seventeen Departmental Governments, which appear under Decentralized Entities, and 238 Municipalities. The full list of state entities and agencies appears in Paraguay’s budget classifier.

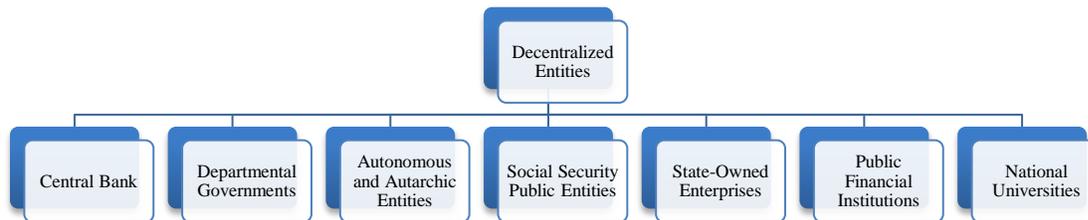
**Figure 7. 2:** Structure of Central Administration



Currently there are nine State-Owned Enterprises in Paraguay. *Administración Nacional de Electricidad* (ANDE), *Administración Nacional de Navegación y Puertos* (ANNP), *Dirección Nacional de Aeronáutica Civil* (DINAC), *Petróleos Paraguayos* (PETROPAR), and *Industria Nacional del Cemento* (INC) are wholly owned by Paraguay. These State-Owned Enterprises appear under Decentralized Entities. In addition, Paraguay has a majority participation in *Compañía Paraguaya de Comunicaciones S.A.* (COPACO), *Empresa de Servicios Sanitarios del Paraguay S.A.* (ESSAP), *Cañas Paraguayas S.A.* (CAPASA), and *Ferrocarriles del Paraguay S.A.* (FEPASA). These appear under Mixed Enterprises.

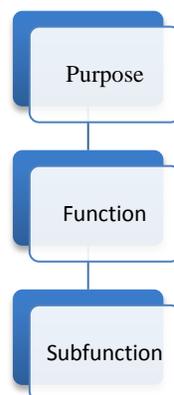
**Figure 7. 3:** Structure of Decentralized Entities

<sup>117</sup> The Treasury appeared in the budget as a separate agency within central administration until 2006, and was then absorbed by the Ministry of Finance.



The classification by purposes and functions (in short, **functional classification**) determines the specific purposes according to the immediate objectives of government activity. The objective of this classification is to identify the final destination of the expenditure regardless of the economic nature of the agency or entity that is responsible for it. This classification shows the nature of the services (provision of services and production of goods) of the sectors that the state provides to the community. The functional classification has three levels of aggregation: *finalidad* (purpose), *función* (function) and *subfunción* (subfunction). Figure 7. 4 displays the hierarchy of the functional classification variables.

**Figure 7. 4:** Hierarchy of the Variables of the Functional Classification



The **program classification** is used to order and provide information within the structure of the national budget of allocations by *tipo de presupuesto* (budget type):

- Type 1: *Programas de administración* (Administration Programs)
- Type 2: *Programas de acción* (Action Programs)
- Type 3: *Programas de inversión* (Investment Programs)
- Type 4: *Programas del servicio de la deuda pública* (Debt Service Programs)

Programs must contain physical and financial measurement units to enable a subsequent evaluation of the process of execution of the national budget. The program classification is the

systematic grouping of programs, subprograms, and projects. The program classification is concurrent and related to the administrative and functional classifications. These classifications can be disaggregated by programs, subprograms, and projects; by groups, subgroups, and object of expenditure; generic or specific sources of funding, funding agencies; departments and combinations. According to the nature of the programs, they can form large groups of current, capital, and financing expenditures.

Programs are assigned to Responsible Units, Administration and Finance Units, Administration and Finance Subunits, or Project Execution Units, which are responsible for managing the administrative, budgetary, and financial process. These units appear in the budget as *unidad responsable* (responsible unit).

The structure of the program classification is given by the following components:

### **Type 1: Budgets of Administration Programs**

- Programs
- Responsible unit
- Product
- Group of object of expenditure
- Subgroup of object of expenditure
- Object of expenditure
- Source of funding
- Origin of funding or funding agency
- Departments
- Municipalities

### **Type 2: Budgets of Action Programs**

- Programs
- Subprograms
- Responsible unit
- Product
- Group of object of expenditure
- Subgroup of object of expenditure
- Object of expenditure
- Source of funding
- Origin of funding or funding agency
- Departments
- Municipalities

### **Type 3: Budgets of Investment Programs**

- Programs
- Subprograms

- Projects
- Responsible unit
- Product
- Group of object of expenditure
- Subgroup of object of expenditure
- Object of expenditure
- Source of funding
- Origin of funding or funding agency
- Departments
- Municipalities

#### **Type 4: Budgets of Debt Service Programs**

- Programs
- Responsible unit
- Product
- Group of object of expenditure
- Subgroup of object of expenditure
- Object of expenditure
- Source of funding
- Origin of funding or funding agency
- Departments
- Municipalities

A quick review of the components of the program classification indicates that only the budgets of action and investment programs have subprograms. In addition, only the budgets of investment programs have projects. The program classification draws on the components from other budget classifications.

The classification of the expenditure by products (in short, **classification by product**<sup>118</sup>) identifies the production of goods and services of the programs, subprograms, or projects of the national budget. The classification by product allows to sort, identify, compare, quantify, assess, and provide other information within the structure of the national budget, in terms of programs, subprograms, or projects, but most importantly, it allows its orientation to results with the budget allocations of the various types of budget: Type 1 – Administration Programs, Type 2 – Action Programs, Type 3 – Investment Programs, and Type 4 – Debt Service Programs.

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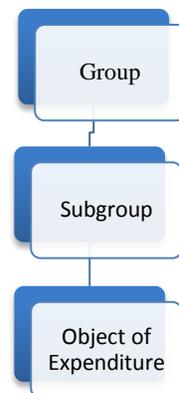
<sup>118</sup> The classification by product is not available in the BOOST database for Paraguay. Paraguay introduced results-based budgeting in 2011. According to the Ministry of Finance, three ministries (Ministry of Health and Social Welfare, the Ministry of Public Works and Communications, and the Ministry of Education and Culture) are applying results-based budgeting in selected programs and subprograms. Its use will extend gradually to other government agencies. More information about the implementation of results-based budgeting in Paraguay is available at <http://www.hacienda.gov.py/web-presupuesto/ppr/index.html>.

The **classification by object of expenditure** determines the nature of the goods and services that the government acquires for its activities. This classification identifies the last three levels of public expenditure and is presented as a systematic and homogeneous arrangement of all the transactions contained in the budget of state agencies and entities such as: personnel services, non-personnel services, consumer goods and supplies, physical and financial investment, transfers and other expenses.

The level of aggregation of the classification by object of expenditure allows the easy registration of all transactions with financial-economic impact made by state agencies and entities. This classification is an information tool to conduct analysis and monitoring of public financial management. As a result, it is considered the main or primary analytical classifier of the budget classification system.

The classification by object of expenditure has three levels of aggregation: *grupo* (group), *subgrupo* (subgroup) and *objeto del gasto* (object of expenditure). Figure 7. 5 displays the hierarchy of the variables of the classification by object of expenditure.

**Figure 7. 5:** Hierarchy of the Variables of the Classification by Object of Expenditure



The economic classification of the expenditure (in short, **economic classification**) identifies the economic nature of public sector transactions, with the purpose of evaluating the impact and repercussions of fiscal actions. The economic expenditure can occur with current or capital purposes or as financial applications. This classification has a strong relationship and integration with the different classifiers that allow the budgeting of the expenditure. The following are the most important ones:

- Relationship economic classification / classification by object of expenditure: the object of expenditure, as the basic classifier, provides the items by object of expenditure that together make up the basic group structure of the economic classification.
- Relationship economic classification / functional and program classification: in the program classification, the identification of the category “Project” (implies investment) allows current expenditures such as remunerations, consumer goods, non-personnel services, to be considered capital expenditures in the economic classifier.

- Relationship economic classification / administrative classification: according to the criteria defined in the System of National Accounts, investments in the function Defense must be considered as current expenditures in the economic classifier.

Expenditures are organized according to their economic nature and use on consumption, transfers, and investments, following the basic structure of the System of National Accounts. The economic classification has three levels of aggregation. Unlike other budget classifications, the budget classifier does not provide a name to each level. The methodology for the preparation of the economic classification of the expenditure is fairly complex, as it draws primarily on the classification by object of expenditure, but also the administrative, functional and program classifications<sup>119</sup>.

The classification by origin of funding of funding agency identifies the primary funding of the different sources that finance the credits established in the national budget and the entities and organizations of the public and private sector that receive transfers from the state.

The origin of funding makes reference to the specific sources that finance the budget credits from Resources from the Public Treasury (Source of Funding 10), Internal and External Public Credit (Source of Funding 20), and Institutional (Source of Funding 30). The primary origin of funding can be national or foreign. The beneficiary entity is related to the state entity or agency that receives the resources that have been financed with the different sources.

The origin of funding is concurrent and related to the classification by source of funding. A specific origin of funding corresponds to each source of funding, as presented below:

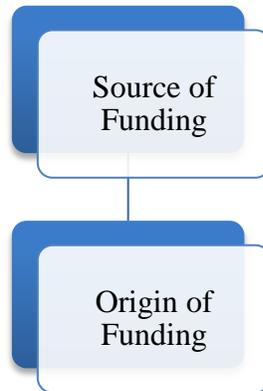
<b>Source of Funding</b>	<b>Origin of Funding</b>
10 – Resources from the Treasury	001 – Genuine
20 – Resources from Public Credit	401 – Inter-American Development Bank (IADB)
30 – Institutional Resources	008 – Property Tax

For simplicity purposes, and considering that the two classifications are related, they are referred to in this document as **classification by source of funding**. This classification has two levels of aggregation: *fuerite de financiamiento* (source of funding) and *origen de financiamiento* (origin of funding). Figure 7. 6 displays the hierarchy of the variables of the classification by source of funding.

**Figure 7. 6: Hierarchy of the Variables of the Classification by Source of Funding**

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<sup>119</sup> A description of the methodology appears in the budget classifier.



The classification by departments and municipalities (in short, **geographic classification**) is used to identify the expenditure by geographic area or department, in order to determine the budgetary programming and records for the various regions and local governments in the country. In terms of departments, there are codes for the city of Asunción, the seventeen departments, and *Alcance Nacional*, that is, expenditure that occurs nationwide or in two or more departments. In terms of municipalities, a code identifies each of the 238 municipalities.

## 2. Data Sources

Budget and expenditure data for Central Administration and Decentralized Entities come from the *Sistema Integrado de Administración Financiera* (SIAF), Paraguay's Financial Management Information System (FMIS). The data were obtained with the assistance of the Vice Ministry of Economy of the Ministry of Finance. Data are available at the most disaggregated level for the period 2003-2012. It includes all the relevant budget classifications used for the expenditure.

Budget and expenditure data for Municipalities are not included in the SIAF. Municipalities are legally mandated to send written reports on municipal finances for every budget cycle to the Ministry of Finance. However, the process of collecting and processing the municipal data is still not automatic. Another issue is the late submission of the information by some municipalities.

Information on municipal finances was collected as part of the World Bank project on Improving the Quality of Public Expenditure at the Municipal Level in Paraguay. The Accounting Directorate and the Departments and Municipalities Unit of the Vice Ministry of Financial Administration of the Ministry of Finance provided assistance for this project. The BOOST database for Paraguay incorporates the budget and expenditure data for Municipalities collected through this project. Data are only available for the period 2006-2010. Unlike the data for Central Administration and Decentralized Entities, the information is not very detailed. The only variables available for the expenditure are the name of the municipality and the top two levels of the classification by object of expenditure: *grupo* (group) and *subgrupo* (subgroup). Since there is no functional, programmatic, and economic classification, the potential for analysis is limited.

In terms of coverage, the BOOST database for Paraguay does not contain information on Mixed Enterprises. As noted in Section 2, there are four Mixed Enterprises in Paraguay: COPACO, ESSAP, CAPASA, and FEPASA. These SOEs are incorporated as *sociedades anónimas*, corporations with limited liability. As such, their budget execution is not captured in the SIAF. Nonetheless, information about their budget and execution can be found in the *Informe Financiero*, the annual financial report of the Ministry of Finance<sup>120</sup>.

### 3. Particularities of the Data and Database Organization

As mentioned in Section 3, the BOOST database for Paraguay contains budget and expenditure data at the most disaggregated level for Central Administration and Decentralized Entities for the period 2003-2012. For the most part, the variables in the database correspond to fields in the SIAF covering the various budget classifications in Paraguay's national budget. Data for Municipalities are available for the period 2006-2010.

The data for Central Administration and Decentralized Entities present the following particularities:

- The administrative classification has four variables: *Nivel* (Level), *Entidad* (Entity), *Entidad Nueva* (Entity New), and *Unidad Responsable* (Responsible Unit). As will be described below, *Entidad Nueva* (Entity New) was created for the BOOST database.
- *Nivel* (Level) identifies the level of government, following the structure of Central Administration (e.g., Legislative Branch, Executive Branch, and Judicial Branch) and Decentralized Entities (e.g., Departmental Governments, SOEs, and National Universities) presented in Section 2. *Entidad* (Entity) identifies the state entities and agencies under each level. *Unidad Responsable* (Responsible Unit) specifies the units responsible for individual programs.
- A variable was created for the BOOST database to reflect changes to the administrative structure of Paraguay during the period 2003-2012. For instance, the Treasury appeared as a separate level and entity at the beginning of the period, but later it was absorbed by the Ministry of Finance. A variable was created, *Entidad Nueva* (Entity New), to reclassify the state entities and agencies into their 2012 equivalent. This is done only for *Entidad* (Entity).
- The functional classification has three variables: *Finalidad* (Purpose), *Función* (Function), and *Sub-función* (Subfunction).
- The variable *Tipo presupuesto* (Budget Type), which is part of the program classification, divides Paraguay's budget into four types of programs: *Administración* (Administration), *Acción* (Action), *Inversión* (Investment), and *Servicio de la deuda pública* (Debt Service).
- The program classification also has variables for *Programa* (Program), *Sub-programa* (Subprogram), *Proyecto* (Project), and *Unidad Responsable* (Responsible Unit). As noted in Section 2, only the budgets of action and investment programs have subprograms. In addition, only the budgets of investment programs have projects.

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<sup>120</sup> The *Informe Financiero* is available at <http://www.hacienda.gov.py/web-contabilidad/index.php?c=306>.

- Programs are assigned to responsible units within state entities and agencies. For the purpose of the BOOST database, *Unidad Responsable* (Responsible Unit) is included as part of the administrative classification, not the program classification. Nonetheless, as explained in Section 2, the program classification draws on the components from other budget classifications.
- The economic classification has three variables: *Econ1*, *Econ2*, and *Econ3*. For the purpose of the BOOST database, the variables of the classification by object of expenditure can also be classified as economic, as they encompass all transactions by state entities and agencies with financial-economic impact. These include *Grupo* (Group), *Sub-grupo* (Subgroup) and *Objeto Gasto* (Object of Expenditure).
- Four transfer variables were created for the BOOST database:
  - A variable to identify intra-governmental transfers (*Transferencia Consolidable*). These are consolidated transfers between state entities and agencies to finance current and capital expenditure. These include funds from revenue sharing agreements and other earmarked special resources.
  - A variable to identify the type of transfer (*Tipo de Transferencia Consolidable*).
  - Variables that identify the parent entity, that is, the entity that submits the transfer (*Entidad Madre*) and the corresponding entity that receives it (*Entidad Hija*).

The inclusion of the transfer variables is important, since some official reports show figures including transfers, while others exclude them.

- The classification by source of funding has two variables: *Fuente de financiamiento* (Source of Funding) and *Origen de Financiamiento* (Origin of Funding).
- There is a geographic variable, *Departamento* (Department), which identifies the department or geographic area where a specific budget item was executed. For expenditure that occurs nationwide or in two or more departments it is classified as *Alcance Nacional*.
- There are four variables for the budget cycle: *Presupuesto inicial* (Initial Budget), *Presupuesto vigente* (Modified Budget), *Obligado* (Committed), and *Pagado* (Paid). Figures are available in guaraníes.
- *Presupuesto inicial* (Initial Budget) contains the nominal amount that was approved by Congress in each year's budget for a specific line item. *Presupuesto vigente* (Modified Budget) is the approved budget plus amends. *Obligado* (Committed) lists the amount that was incurred, while *Pagado* (Paid) contains actual payments associated with that line item. In practice, *Obligado* (Committed) is considered the executed amount.

The data for Municipalities present the following particularities:

- As noted earlier, the only variables available are the name of the municipality and the top two levels of the classification by object of expenditure: *Grupo* (Group) and *Sub-grupo* (Subgroup).
- A variable for *Nivel* (Level) was added to the database to reflect that the data correspond to Municipalities. The name of the municipality was included under *Entidad* (Entity).

- Unlike the data for Central Administration and Decentralized Entities, there are only three variables for the budget cycle: *Presupuesto vigente* (Modified Budget), *Obligado* (Committed), *Pagado* (Paid). Figures are available in millions of guaraníes.

A complete list of variables for Central Administration and Decentralized Entities can be found in Table 7. 1. Each variable is labeled with the original name used by the Government of Paraguay. The English translation is provided in parenthesis. In some cases, a brief explanation of the purpose of the variable is included. The BOOST equivalent is provided for each variable. Standard BOOST labels identify the type of budget classification of the variable and the level that it belongs to (e.g., ECON1 corresponds to the top-level of the country's economic classification).

**Table 7. 1:** List of Variables for Central Administration and Decentralized Entities

<b>BOOST Variable</b>	<b>Original Name</b>
<b>Administrative Classification</b>	
ADMIN1	<i>Nivel</i> (Level)
ADMIN2	<i>Entidad</i> (Entity)
ADMIN2_NEW**	<i>Entidad Nueva</i> (Entity New): Entities described in their 2012 equivalent
ADMIN3***	<i>Unidad Responsable</i> (Responsible Unit)
<b>Program Classification</b>	
BUDGET_TYPE	<i>Tipo presupuesto</i> (Budget Type)
PROGRAM1	<i>Programa</i> (Program)
PROGRAM2	<i>Sub-programa</i> (Subprogram)
PROJECT1	<i>Proyecto</i> (Project)
<b>Transfer Type Variables*</b>	
TRANSFER**	<i>Transferencia Consolidable</i> : 1 if transfer
TRANSFER_TYPE**	<i>Tipo de Transferencia Consolidable</i> : Variable that identifies the type of transfer
TRANSFER_ORIGIN**	<i>Entidad Madre</i> : Variable that identifies the origin of a transfer
TRANSFER_DESTINATION**	<i>Entidad Hija</i> : Variable that identifies the destination of a transfer
<b>Functional Classification</b>	
FUNCTION1	<i>Finalidad</i> (Purpose)
FUNCTION2	<i>Función</i> (Function)
FUNCTION3	<i>Sub-función</i> (Subfunction)
<b>Economic Classification****</b>	
ECON1	Econ1: Top-level economic classification
ECON2	Econ2: Mid-level economic classification
ECON3	Econ3: Bottom-level economic classification
ECON4	<i>Grupo</i> (Group): Top-level classification by object of expenditure
ECON5	<i>Sub-grupo</i> (Subgroup): Mid-level classification by object of expenditure
ECON6	<i>Objeto de gasto</i> (Object of Expenditure): Bottom-level classification by object of expenditure
<b>Classification by source of funding</b>	
FIN_SOURCE1	<i>Fuente de financiamiento</i> (Source of Funding)
FIN_SOURCE2	<i>Origen de financiamiento</i> (Origin of Funding)

<b>BOOST Variable</b>	<b>Original Name</b>
<b>Geographic Classification</b>	
GEO1	<i>Departamento</i> (Department)
YEAR	<i>Año</i> (Year)
<b>Budget cycle variables</b>	
APPROVED	<i>Presupuesto inicial</i> (Initial Budget)
MODIFIED	<i>Presupuesto vigente</i> (Modified Budget)
COMMITTED	<i>Obligado</i> (Committed)
PAID	<i>Pagado</i> (Paid)

Notes: \* Inter-governmental transfers only.

\*\* Variable created by the BOOST Team.

\*\*\* The budget classifier for Paraguay lists this variable as part of the program classification, although it is included here as part of the administrative classification.

\*\*\*\* The budget classifier for Paraguay lists the economic classification and the classification by object of expenditure separately. For the purpose of the BOOST database, the latter is part of the economic classification.

Table 7. 2 provides the list of variables for Municipalities, following the guidelines presented above.

**Table 7. 2:** List of Variables for Municipalities

<b>BOOST Variable</b>	<b>Original Name</b>
<b>Administrative classification</b>	
ADMIN1*	<i>Nivel</i> (Level)
ADMIN2	<i>Entidad</i> (Entity)
<b>Economic classification**</b>	
ECON4	<i>Grupo</i> (Group): Top-level classification by object of expenditure
ECON5	<i>Sub-grupo</i> (Subgroup): Mid-level classification by object of expenditure
<b>Other variables</b>	
YEAR	<i>Año</i> (Year)
<b>Budget cycle variables</b>	
MODIFIED	<i>Presupuesto vigente</i> (Modified Budget)
COMMITTED	<i>Obligado</i> (Committed)
PAID	<i>Pagado</i> (Paid)

Notes: \* Variable created by the BOOST team.

\*\* The budget classifier for Paraguay lists the economic classification and the classification by object of expenditure separately. For the purpose of the BOOST database, the latter is part of the economic classification.

#### 4. How to Use the BOOST Database for Paraguay

As referenced in Section 1, the BOOST database for Paraguay is available through the website of the Ministry of Finance. The database is provided with the functionality of an interactive pivot table. Pivot tables are a powerful, albeit easy to use, tool for data analysis. They allow the end-user to create custom reports, which can then be used to compare categories and identify patterns

and trends in the data<sup>121</sup>. This section provides an overview of the interface and presents a few examples of reports that can be generated with it. As with many things in life, the best way to learn how to use the BOOST database is by using it.

As shown in

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<sup>121</sup> For more information about pivot table reports, consult this helpful overview from Microsoft: <http://office.microsoft.com/en-us/excel-help/overview-of-pivottable-and-pivotchart-reports-HP010177384.aspx>. This applies to PivotTable reports created with Microsoft Excel, but the explanation of the uses of pivot tables is quite informative.

Figure 7. 7, the interface is structured around two tabs, “*Central/Descentralizadas*” for Central Administration and Decentralized Entities, and “*Municipalidades*” for Municipalities. The data are presented in spreadsheet format with values for the variables selected by the end-user. There are several buttons to control the functionality of the interactive pivot table. An Excel file with the description of the variables can be downloaded by clicking on “*Descripción de variables*” under the spreadsheet.

Figure 7. 7: Interface of the BOOST Database for Paraguay

Suma de Pagado	2003	2004	2005	2006
11.001 - CONGRESO NACIONAL	56,972,850,976	11,400,920,342	13,295,363,732	16,343,...
11.002 - CÁMARA DE SENADORES	20,397,242,406	25,380,631,382	28,306,375,414	31,929,...
11.003 - CÁMARA DE DIPUTADOS	32,960,307,810	41,882,497,929	44,733,400,406	51,787,...
12.001 - PRESIDENCIA DE LA REPÚBLICA	89,105,975,144	101,599,561,216	131,348,604,607	189,508,...
12.002 - VICE PRESIDENCIA DE LA REPÚBLICA	2,638,267,949	3,547,570,451	3,599,026,121	4,119,...
12.003 - MINISTERIO DEL INTERIOR	395,636,504,643	442,203,893,703	468,355,190,173	523,766,...
12.004 - MINISTERIO DE RELACIONES EXTERIORES	163,478,360,304	169,949,503,654	188,812,717,073	183,315,...
12.005 - MINISTERIO DE DEFENSA NACIONAL	296,262,701,961	356,330,601,194	338,421,822,033	400,944,...
12.006 - MINISTERIO DE HACIENDA	113,132,631,964	139,384,874,826	145,392,195,831	268,564,...
12.007 - MINISTERIO DE EDUCACIÓN Y CULTURA	1,369,698,653,173	1,497,018,619,079	1,768,261,620,579	2,035,356,...
12.008 - MINISTERIO DE SALUD PÚBLICA Y BIENESTAR SOCIAL	348,377,427,147	447,662,808,342	570,120,414,361	608,760,...
12.009 - MINISTERIO DE JUSTICIA Y TRABAJO	71,704,283,038	94,060,916,568	117,844,051,648	106,621,...
12.010 - MINISTERIO DE AGRICULTURA Y GANADERÍA	179,421,186,947	287,524,705,728	368,338,369,437	334,495,...
12.011 - MINISTERIO DE INDUSTRIA Y COMERCIO	20,297,681,226	24,100,403,654	37,881,178,706	48,068,...
12.013 - MINISTERIO DE OBRAS PÚBLICAS Y COMUNICACIONES	592,508,536,217	743,722,947,776	650,355,938,135	735,951,...
13.001 - CORTE SUPREMA DE JUSTICIA	204,387,911,736	207,982,686,803	245,228,066,219	287,352,...
13.002 - JUSTICIA ELECTORAL	100,277,722,712	91,686,445,080	127,936,954,549	173,646,...
13.003 - MINISTERIO PÚBLICO	93,088,257,305	107,102,514,717	132,100,520,329	147,088,...
13.004 - CONSEJO DE LA MAGISTRATURA	2,647,087,505	2,883,936,918	3,492,952,768	3,484,...
13.005 - JURADO DE ENJUICIAMIENTO DE MAGISTRADOS				
13.006 - DEFENSORIA PUBLICA				
14.001 - CONTRALORÍA GENERAL DE LA REPÚBLICA	23,025,444,040	29,076,024,783	31,380,457,462	32,894,...
14.002 - DEFENSORIA DEL PUEBLO				
15.001 - DEFENSORÍA DEL PUEBLO				
16.001 - TESORO PÚBLICO	2,110,574,758,001	2,754,133,981,129	3,307,085,171,354	3,447,490,...

**Example 1: Create a report for Central Administration and Decentralized Entities:**

Click on “Central/Descentralizadas” and then click on “Seleccionar los campos de datos.” A menu will open (see

Figure 7. 8). Review the available variables under “Variables disponibles.” Select one of the variables. Drag and drop it into the box for “Variables de columna.” This will set the columns

(horizontal axis) of the spreadsheet. The interface only allows one variable in the box, thus it is advisable to select the variable *Año* (Year).

**Figure 7. 8:** Variable Settings for Central Administration and Decentralized Entities

Variables	
Filtros	
<b>Variables disponibles</b>	<b>Variables de columna</b>
Año	Año ✕
Nivel	
Entidad	
Unidad Responsable	
Tipo presupuesto	
Programa	
Sub-programa	
Proyecto	
Transferencia Consolidable	
Tipo de Transferencia Consolidable	
Entidad Madre	
Entidad Hija Receptora	
Finalidad	
Función	
Sub-función	
Grupo	
Sub-grupo	
Objeto Gasto	
Econ1	
Econ2	
Econ3	
Fuente de financiamiento	
Origen de financiamiento	
Departamento	
admin2 Reciente (Entidad)	
<b>Variables del ciclo presupuestario</b>	<b>Variables de fila</b>
Presupuesto inicial	Entidad ✕
Presupuesto vigente	
Obligado	
Pagado	
	<b>Valores seleccionados</b>
	Pagado ✕

**Generar** **Reiniciar** **Cancelar**

To set the rows (vertical axis) of the spreadsheet, select one of the variables under “*Variables disponibles*.” Drag and drop it into the box for “*Variables de fila*.” Multiple variables are

allowed in this box, although they have to be different from the variable selected for “*Variables de columna.*”

Select one of the variables under “*Variables del ciclo presupuestario.*” These are the budget cycle variables. Drag and drop it into the box for “*Valores seleccionados.*” Up to four variables are allowed in this box. Click on “*Generar*” to generate the report, “*Reiniciar*” to return the settings to the default, or “*Cancelar*” to return to the main screen.

Additional options to filter the data appear under the “*Filtros*” tab. At the moment it is possible to filter the data by *Año* (Year), *Nivel* (Level), *Entidad* (Entity), *Grupo* (Group), and *Sub-grupo* (Subgroup). Additional filters will be added in a future update of the BOOST database.

### **Example 2: Create a report for Municipalities**

Click on “*Municipalidades*” and then click on “*Seleccionar los campos de datos.*” A menu will open (see Figure 7. 9). Review the available variables under “*Variables disponibles.*” Select one of the variables. Drag and drop it into the box for “*Variables de columna.*” This will set the columns (horizontal axis) of the spreadsheet. The interface only allows one variable in the box, thus it is advisable to select the variable *Año* (Year).

**Figure 7. 9:** Variable Settings for Central Administration and Decentralized Entities

Variables disponibles	Variables de columna
Año	Año
admin1 (Nivel)	
admin2 (Entidad)	
Grupo	
Sub-grupo	

Variables de fila	Valores seleccionados
admin2 (Entidad)	Pagado (millones de guaraníes)

Generar Reiniciar Cancelar

To set the rows (vertical axis) of the spreadsheet, select one of the variables under “*Variables disponibles.*” Drag and drop it into the box for “*Variables de fila.*” Multiple variables are

allowed in this box, although they have to be different from the variable selected for “*Variables de columna.*”

Select one of the variables under “*Variables del ciclo presupuestario.*” These are the budget cycle variables. Drag and drop it into the box for “*Valores seleccionados.*” Up to three variables are allowed in this box. Click on “*Generar*” to generate the report, “*Reiniciar*” to return the settings to the default, or “*Cancelar*” to return to the main screen.

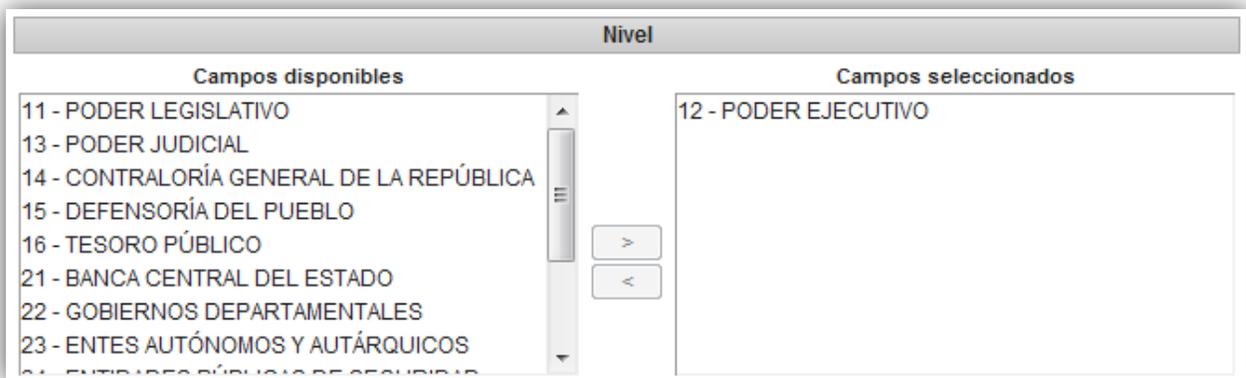
Additional options to filter the data appear under the “*Filtros*” tab. It is possible to filter the data by *Año* (Year), *Nivel* (Level), *Entidad* (Entity), *Grupo* (Group), and *Sub-grupo* (Subgroup).

The BOOST database is extremely useful for time series analysis, as the following example will indicate.

**Example 3: Create a report of initial budget by entities in the Executive Branch (2003-2012)**

Click on “*Central/Descentralizadas*” and then click on “*Seleccionar los campos de datos.*” A menu will open. Leave *Año* (Year) in the box for “*Variables de columna;*” *Entidad* (*Entity*) in the box for “*Variables de fila;*” and *Presupuesto inicial* (Initial Budget) in the box for “*Valores seleccionados.*” Select *Nivel* (Level) under “*Variables disponibles.*” Drag and drop it into the box for “*Variables de fila*” on top of *Entidad* (*Entity*). Click on the “*Filtros*” tab. Under *Nivel* (Level) select “*12 - PODER EJECUTIVO,*” and click on the right arrow sign (see Figure 7. 10). Click on “*Generar*” to generate the report.

**Figure 7. 10:** Example of Filter for Executive Branch by *Nivel* (Level)



The time series for the Executive Branch will appear in the main screen. Click on “*Expandir todo*” to display the time series for the individual entities (see

Figure 7. 11). The report can be downloaded to the end-user’s computer by clicking on “*Descargar archivo CSV.*” The CSV file can be opened for further manipulation in Microsoft Excel or any other spreadsheet software.

Figure 7. 11: Example of Time Series Analysis: Initial Budget by Entities in the Executive Branch (2003-2012)

Suma de Presupuesto inicial	2003	2004	2005	2006
<input checked="" type="checkbox"/> 12 - PODER EJECUTIVO	4,940,445,481,452	4,811,902,994,179	6,126,526,251,744	6,941,067,46
12.001 - PRESIDENCIA DE LA REPÚBLICA	157,213,918,910	165,868,198,926	169,594,825,999	341,598,26
12.002 - VICE PRESIDENCIA DE LA REPÚBLICA	4,343,851,445	4,393,073,317	4,139,936,300	4,813,57
12.003 - MINISTERIO DEL INTERIOR	425,615,166,231	403,966,879,432	495,235,116,761	551,959,04
12.004 - MINISTERIO DE RELACIONES EXTERIORES	191,789,110,396	199,045,998,475	192,582,188,340	200,108,84
12.005 - MINISTERIO DE DEFENSA NACIONAL	294,216,814,987	309,587,711,177	359,851,738,159	431,710,77
12.006 - MINISTERIO DE HACIENDA	144,692,877,029	186,260,909,119	199,087,614,731	227,449,40
12.007 - MINISTERIO DE EDUCACIÓN Y CULTURA	1,389,620,480,804	1,515,621,377,437	1,931,358,566,266	2,207,487,41
12.008 - MINISTERIO DE SALUD PÚBLICA Y BIENESTAR SOCIAL	618,690,090,539	611,929,083,570	800,521,559,300	1,079,139,47
12.009 - MINISTERIO DE JUSTICIA Y TRABAJO	130,987,879,026	118,055,609,847	142,530,455,788	149,498,04
12.010 - MINISTERIO DE AGRICULTURA Y GANADERÍA	325,750,126,532	303,307,862,201	398,484,391,955	373,681,92
12.011 - MINISTERIO DE INDUSTRIA Y COMERCIO	29,961,711,941	46,618,334,339	47,237,784,909	97,989,10
12.013 - MINISTERIO DE OBRAS PÚBLICAS Y COMUNICACIONES	1,227,563,453,612	947,247,956,339	1,385,902,073,236	1,275,631,58

As indicated in Section 3, not all municipalities report budget execution data to the Ministry of Finance every year. The expenditure will appear as 0 for the years in which a municipality did not report the expenditure. That does not mean that the municipality did not execute its budget. It simply means that the execution was not reported.

**Example 4: Create a budget execution report for the Municipality of Asunción (2006-2010)**

Click on “*Municipalidades*” and then click on “*Seleccionar los campos de datos.*” A menu will open. Leave Año (Year) in the box for “*Variables de columna*” and Entidad (Entity) in the box

for “*Variables de fila.*” Select *Grupo* (Group) under “*Variables disponibles.*” Drag and drop it into the box for “*Variables de fila*” below *Entidad* (Entity). Remove *Pagado* (Paid) from the box for “*Valores seleccionados*” and replace it with *Obligado* (Committed). Click on the “*Filtros*” tab. Under *Entidad* (Level) select “*30.001 - ASUNCION,*” and click on the right arrow. Click on “*Generar*” to generate the report. Click on “*Expandir todo*” to display the budget execution report. As Figure 7. 12 indicates, the execution for 2008 was 0. That means that Asunción did not report its execution to the Ministry of Finance that year.

Figure 7. 12: Example of Execution Report for the Municipality of Asunción (2006-2010)

The screenshot shows a web application interface for budget execution reports. At the top, there are logos for 'Viva Paraguay', the 'Ministerio de Hacienda', and the 'Ministerio de Hacienda, Presidencia de la República del Paraguay'. Below the logos are navigation tabs: 'Institucional', 'Consulta Ciudadana', 'Informes', 'Dependencias', and 'Servicios On-line'. The 'Informes' tab is selected. Underneath, there are two main categories: 'Central / Descentralizadas' and 'Municipalidades', with 'Municipalidades' selected. Below these are several buttons: 'Seleccionar los campos de datos', 'Expandir todo', 'Colapsar todo', 'Descargar archivo CSV', and 'Manual de usuario'. The main content is a table with the following data:

Suma de Obligado (millones de guaraníes)	2006	2007	2008	2009	2010
<input checked="" type="checkbox"/> 30.001 - ASUNCION	271,015	276,874	0	436,336	609,211
100 - SERVICIOS PERSONALES	157,189	181,094	0	228,358	262,812
200 - SERVICIOS NO PERSONALES	20,596	33,643	0	48,325	47,083
300 - BIENES DE CONSUMO E INSUMOS	12,416	13,851	0	27,819	34,239
400 - BIENES DE CAMBIO	0	0	0	0	0
500 - INVERSION FÍSICA	18,031	7,658	0	41,329	36,886
600 - INVERSIÓN FINANCIERA	131	175	0	181	179
700 - SERVICIO DE LA DEUDA PÚBLICA	52,282	27,276	0	29,047	54,618
800 - TRANSFERENCIAS	9,065	4,619	0	37,340	38,356
900 - OTROS GASTOS	1,305	8,558	0	23,937	135,038

**Example 5: Create a budget execution report for the Judicial Branch combining various budget classifications (2009-2012)**

In this example we are interested in reviewing the top-level economic classification (Econ1) for the entities in the Judicial Branch for the period 2009-2012. Click on “*Central/Descentralizadas*” and then click on “*Seleccionar los campos de datos.*” A menu will open. Leave *Año* (Year) in the box for “*Variables de columna*” and *Entidad* (Entity) in the box for “*Variables de fila.*” Select *Nivel* (Level) under “*Variables disponibles.*” Drag and drop it into the box for “*Variables de fila*” above *Entidad* (Entity). Select *Econ1* under “*Variables disponibles.*” Drag and drop it into the box for “*Variables de fila*” below *Entidad* (Entity). Remove *Pagado* (Paid) from the box for “*Valores seleccionados*” and replace it with *Obligado* (Committed). Click on the “*Filtros*” tab. Under *Año* (Year) select each year in the period and click on the right arrow sign. Under *Nivel*

(Level) select “13 - PODER JUDICIAL,” and click on the right arrow sign. Click on “Generar” to generate the report. Click on “Expandir todo” to display the budget execution report (see

Figure 7. 13).

**Figure 7. 13:** Example of Execution Report for the Judicial Branch (2009-2012)

Institucional	Consulta Ciudadana	Informes	Dependencias	Servicios On-line
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<input type="checkbox"/> Central / Descentralizadas	<input checked="" type="checkbox"/> Municipalidades
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Seleccionar los campos de datos

Expandir todo

Colapsar todo

Descargar archivo CSV

Manual de usuario

Suma de Obligado	2009	2010	2011	2012
<input checked="" type="checkbox"/> <b>13 - PODER JUDICIAL</b>	995,265,618,924	1,236,159,216,460	1,580,960,431,884	1,970,430,429,180
<input checked="" type="checkbox"/> <b>13.001 - CORTE SUPREMA DE JUSTICIA</b>	483,506,453,048	529,753,144,867	698,942,381,990	830,402,858,072
<b>100 - GASTOS CORRIENTES</b>	419,213,220,773	471,927,545,527	627,931,294,917	726,580,735,399
<b>200 - GASTOS DE CAPITAL</b>	62,582,544,653	52,443,760,716	69,374,566,335	101,960,177,175
<b>300 - GASTOS DE FINANCIAMIENTO</b>	1,710,687,622	5,381,838,624	1,636,520,738	1,861,945,498
<input checked="" type="checkbox"/> <b>13.002 - JUSTICIA ELECTORAL</b>	263,154,836,580	421,783,210,190	539,478,187,712	581,715,357,342
<b>100 - GASTOS CORRIENTES</b>	256,748,593,590	411,583,467,461	525,925,326,156	536,501,670,878
<b>200 - GASTOS DE CAPITAL</b>	6,406,242,990	10,199,742,729	13,552,861,556	45,213,686,464
<input checked="" type="checkbox"/> <b>13.003 - MINISTERIO PÚBLICO</b>	233,618,836,283	266,527,005,922	315,407,525,740	425,209,747,556
<b>100 - GASTOS CORRIENTES</b>	218,091,495,109	250,484,823,820	299,666,526,305	391,812,626,486
<b>200 - GASTOS DE CAPITAL</b>	14,976,419,416	15,509,226,821	15,268,553,472	32,890,770,690
<b>300 - GASTOS DE FINANCIAMIENTO</b>	550,921,758	532,955,281	472,445,963	506,350,380
<input checked="" type="checkbox"/> <b>13.004 - CONSEJO DE LA MAGISTRATURA</b>	8,028,862,180	9,519,960,464	12,095,047,010	16,992,492,484
<b>100 - GASTOS CORRIENTES</b>	7,071,322,580	8,509,941,837	10,891,097,771	13,469,894,667
<b>200 - GASTOS DE CAPITAL</b>	957,539,600	1,010,018,627	1,203,949,239	3,522,597,817
<b>300 - GASTOS DE FINANCIAMIENTO</b>			0	0
<input checked="" type="checkbox"/> <b>13.005 - JURADO DE ENJUICIAMIENTO DE MAGISTRADOS</b>	6,956,630,833	8,575,895,017	15,037,289,432	18,013,999,619
<b>100 - GASTOS CORRIENTES</b>	6,599,570,833	8,372,272,965	11,153,633,632	17,572,652,719
<b>200 - GASTOS DE CAPITAL</b>	357,060,000	203,622,052	3,883,655,800	441,346,900
<input checked="" type="checkbox"/> <b>13.006 - DEFENSORIA PUBLICA</b>				98,095,974,107
<b>100 - GASTOS CORRIENTES</b>				95,392,234,278
<b>200 - GASTOS DE CAPITAL</b>				2,703,739,829