PUBLIC FINANCIAL MANAGEMENT AND MACROECONOMICS: THE CASES OF EXTRABUDGETARY EXPENDITURES AND EARMARKED REVENUES

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JEL Classification: H61, H81

Abstract

This paper has two sections. In the first section we analyze some macroeconomic effects of extra-budgetary expenditures. We show that these expenditures as opposed to budgetary outlays introduce a source of uncertainty in terms of the future tax path and, consequently, are able to influence saving and investment decisions. We present a model where the uncertainty in tax payments leads to a lower capital accumulation than in the case of certainty.

The second section analyses the case of earmarked revenues by presenting a simple growth model where earmarking implies both a suboptimal balanced growth rate and a suboptimal transitional path. In addition, a preliminary empirical analysis shows two important aspects related to earmarking. First, growth enhancing government expenditures, such as the share of education and health in government outlays, have a positive association with per capita income. Second, the share of these expenditures in the government’s budgets is associated with the institutional development of the countries. These two aspects raise doubts on the policy pursued by many developing countries consisting of fixing these expenditures in terms of GDP. Such fixing, which implies a corresponding earmarking of revenues, could determine a government expenditure policy inconsistent with the countries’ institutional framework. In this regard, we test the institutional and geographic determinants of the intensity of education and health outlays in government expenditures.

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THE CASE OF EXTRABUDGETARY EXPENDITURES

1.1 Introduction

This section is devoted to extra-budgetary expenditures (EBE) and macroeconomics. In general, the term “extra-budgetary funds” (EBF) refers to a wide variety of alternatives. One of the main aspects of the EBF is that they are government’s transactions not shown in the budgets neither of the state (federal) government nor of the subnational government (Allen and Radev, 2010). International evidence reveals that the Social Security Funds outlays (SS) are by far the most relevant EBF in quantitative terms. The case of the SS is interesting and particularly relevant because although they are usually not included in the state budget laws and accounts, they are commonly presented in the accounts of the general government. Therefore, the information set available for economic agents generally includes the income and expenditures of SS. Consequently decisions about consumption, saving and investment take into account this information set, notwithstanding its extra-budgetary nature.

In this paper we concentrate on extra-budgetary expenditures (EBE) instead to EBF with the aim of addressing a particular subset of the EBF reality. By EBE we refer to expenditures made by line government entities with the critical quality of being not included in the expenditure side of any fiscal data recorded and published in the year the expenditures were committed. One typical case of EBE is the inclusion in period t debt statistics of some fiscal liabilities originated in unpaid expenditures made (but not shown in the accrual accounts) in the period \( t - 1 \). Far for being isolated events of anecdotal interest, there is evidence that these episodes are relatively common practices of many countries either developed or underdeveloped\(^2\). As the recent Spanish experience with regional governments shows, a change of government is an event that can trigger the unveiling of significant unpaid and unreported bills (Financial Times, 2011).

This view of the EBE is consistent with the fact that some of the problems attributed to the EBF (in terms of soundness of fiscal policy, fiscal discipline and transparency) may be the result of poorly designed financial management and governance procedures (Allen and Radev, 2010). As there authors said, “(EBF) can significantly distort the assessment of

\(^2\) The IMF has traditionally been skeptical about the EBF for reasons covering the soundness of fiscal policy, transparency, control and fiscal discipline. Note that one of the main recommendations included in Allen and Radev (2010) refers to the core motivation of our analysis: “The data on EBFs should be consolidated with the budget figures for the purposes of fiscal analyses and the presentation of information in fiscal reports”
the overall macroeconomic and fiscal position, including with respect to critical dimensions such as: the size of the general government; its contribution to aggregate demand, investment and saving; the tax burden; and the social safety net”. From a macroeconomic perspective, what the EBE affect are two central constraints of the economy. First, the government´s budget constraint, equating the debt to the excess of taxes over outlays in present value terms. Second, the consumers´ constraint, equating their net assets to the present value of consumption net of disposable income. Note that although any government expenditure affects both constraints, EBE as opposed to budgetary outlays introduce a source of uncertainty in terms of the future tax path. This uncertainty is greater the greater the expected EBE. Economic agents, therefore, have to assess the likelihood of future increases in taxes stemming from the EBE.

The case of Greece 2000-2003

On September 2004, Eurostat (Eurostat, 2004) revised the Greek fiscal numbers it has published in a March 2004 Eurostat’s report. The data revision covered Greece´s deficit and debt for the period 2000-2003. The difference between the original numbers reported and the revised figures made was impressive. In the period 2000-2003 the Government deficit in terms of GDP was 9.6 % higher than originally reported. In addition, the total debt was underestimated in more than 7 points of GDP each year.

The Eurostat report attributed the divergence to a “more faithful application of the ESA 95 and the availability of new data”. In fact, the main elements explaining the divergence concerning the fiscal deficit were under-reported military expenditures (5.5 % of GDP), over-estimated surplus of the social security (2 % of GDP) and higher than realized V.A.T tax collections (0.9 % of GDP). For the case of the total debt, capitalization of interest and consolidation of Social Security´s assets were the source of the difference.

In addition to the years 2000-2003, Eurostat and the Greek government agreed that the 1997-1999 deficit was also under-reported by 6 % of GDP. On December 2004 the Greek’s Finance Minister said that the previous government provided wrong fiscal numbers to the EU. At the same time, the EU's finance ministers discussed the findings of

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3 ESA 95 is the accounting framework upon which EU member States notify deficit and debt figures.
the bloc’s Executive Commission that blamed the Greek government for systematically underreporting the fiscal deficit in 1997-2003.

The revised numbers, however, turned out to be a first step toward unveiling Greece’s true fiscal data in the period. In early 2010 it was revealed that during 2000 and 2001 investment banks arranged currency swaps for Greece that reduced its national debt by 3.2 billion U$S. After joining the euro, Greece tried to cut its borrowing in other currencies in order to insulate itself from a dollar or yen appreciation. For this reason, it hedged bonds issued in yens in 2000. The investment banks arranged new cross-currency swaps and restructured other swaps with Greece at a historical exchange rate in December 2000 and June 2001. Eurostat officials said they only became aware of the contracts in February 2010 (Bloomberg, 2010). At the same time, a top investment bank executive and former Governor of the New York Federal Reserve said to the U.K. Parliament’s Treasury Committee that “(the swaps) did produce a rather small, but nevertheless not insignificant reduction, in Greece’s debt-to-GDP ratio”. In addition, he said that “Governments on a fairly generalized basis do go to some lengths to try to “manage” their budgetary deficit positions and manage their public debt positions”.

What the operations involved was an under reporting of Greece’s debt through off-balance sheet transactions (Johnson, 2010). From the point of view of fiscal transparency the episodes show two lessons. First, even developed countries supervised under the Maastricht criteria can recur to extra-budgetary expenditures imposing unexpected increases in future tax payments. Second, these attitudes far from being marginal and isolated events are attributed to be a common practice of governments to “manage” their fiscal numbers.

The case of Paraguay 2010-2011

During 2004-2009 Paraguay fiscal numbers reported an accumulated overall surplus of 7.3 % of GDP having a surplus every year. However, in the first quarter of 2010 the Congress enacted a law authorizing the Ministry of Finance to issue bonds for the equivalent of 6.5 % of GDP. The law established that the Ministry of Finance would swap these bonds for Central Bank’s assets. Interestingly, the law included a comprehensive list of the Central
Bank’s assets to be exchanged. The list included debts of the former Paraguayan airline, commercial banks’ debts, municipalities’ debts\(^4\), and debts of autonomous public entities.

### 1.2 The Model

Our model follows closely Romer’s version of the two-period Diamond Model (Romer, 1996). Each individual lives for two periods. In the first period, each member of the young generation supplies one unit of labor, receives wages and decides how much of his income to consume and, therefore, how much to save. In the second year of living, each member of the old generation consumes the amount he/she saved when young plus the interest earned on his savings. Population grow at a rate \(n\).

\(C_{1t}\) is the consumption of the young generation at time \(t\) and \(C_{2t}\) is the consumption of the old generation at time \(t\). The utility of a person born at time \(t\) is:

\[
U_t = \frac{c_{1t}^{1-\theta}}{1-\theta} + \frac{1}{1+\rho} \frac{c_{2t}^{1-\theta}}{1-\theta} \quad (1)
\]

The coefficient \(\rho\) is the rate of time preference. There is a constant returns to scale production function:

\[Y_t = F(K_t, A_t L_t)\]

\(A_t L_t\) are the effective units of labor of the economy. It is assumed that markets are competitive and, therefore, factors earn their marginal product:

\[
r_t = f'(k_t)
\]

\[
w_t = f(k_t) - k_t f'(k_t)
\]

Where \(r_t\) is the rate of interest (there is no depreciation), \(w_t\) is the real wage, and \(k_t\) is the capital stock per unit of effective labor. In the special case of Cobb-Douglas technology, namely, \(Y_t = K_t^\alpha (A_t L_t)^{1-\alpha}\), worker’s labor income equals \(A_t w_t\).

There is a lump-sum tax \(\tau\) on the younger generation. The budget constraint of individuals is given by:

\[^4\text{Municipalities in Paraguay are extra-budgetary entities and their fiscal data are not included in the consolidated government statistics.}\]
\[ C_{1t} + \frac{C_{2t+1}}{1+r_{t+1}} = w_tA_t - \tau_t \quad (2) \]

The maximization of 1 observing the constraint 2 allows us to solve for the consumption of the young generation during its first period of life:

\[ C_{1t} = \left[ \frac{(1+\rho)^{\frac{1}{\theta}}}{(1+r_{t+1})^{\frac{1-\theta}{\theta}}} \right] (w_tA_t - \tau_t) \quad (3) \]

The term in parenthesis is the marginal propensity to consume out of disposable income. In the special case of \( \theta = 1 \) equation 3 in simplified and the marginal propensity to save is:

\[ s = \frac{1}{2+p} \quad (4) \]

There is a balanced budget of the government and in each period the government’s expenditure income flows are given by

\[ G_t = \tau_t L_t \quad (5) \]

The dynamics of the capital stock is shown in equation 6. The capital stock in the period \( t + 1 \) equals the savings of the generation that was young at period \( t \).

\[ K_{t+1} = s L_t (w_tA_t - \tau_t) \quad (6) \]

Dividing both members of this equation by the effective units of labor \( A_{t+1}L_{t+1} \) we get:

\[ k_{t+1} = \frac{s}{(1+n)(1+\theta)} (w_t - \phi_t) \quad (7) \]

Where \( \phi_t \) is the government expenditure per effective units of labor\(^5\). The Cobb Douglas technology implies:

\[ y_t = f(k_t) = k^\alpha_t \quad (8) \]

\[ w_t = f(k_t) - k_t f'(k_t) \quad (9) \]

\(^5\) Note that the Cobb Douglas production function implies that the total remuneration of labor is \( w_tA_tL_t \) and, therefore, \( w_t \) is the remuneration of labor per effective unit of labor.
Using 4, 8 and 9 we have:

\[ k_{t+1} = \frac{1}{(1+n)(1+r)} \left[ \frac{1}{(2+p)} [(1-\alpha)k_t^a - \varphi_t] \right] \] (10)

Equation 2.10 shows the dynamics of the capital stock in the case of consumers behaving under certainty about the future. In terms of our model, the young generation makes consumption and saving decisions at time \( t \) knowing with certainty the level of the government expenditures \( G_t \) and, consequently, the lump sum tax each member will have to pay. We assume that the aggregate level of government expenditures of period \( t \) is informed to the population through the period \( t \) Government Budget which is enacted at the beginning of the period. However, the budget is assumed to be executed at the end of period \( t \). This last assumption is irrelevant for the individual's decisions since there is certainty about the course of the future. Nevertheless, the assumption will be important in what follows.

The case of uncertainty in government expenditures and taxes.

Let's analyze now the case where the young generation has uncertainty within period \( t \). The source of the uncertainty is that although at the beginning of the period the Congress enacts the government budget, the execution of the budget is concentrated at the end of the period and at that moment the execution can be different than the approved budget. The executed government expenditures are \( G_t \) whereas the outlays approved by the Congress are \( \tau_t L_t \). Since there is a balanced budget rule, any discrepancy between the budget authorized by Congress and the level of government expenditures are cancelled by an additional tax \( \varepsilon L_t \). Both components of the tax system are collected at the end of the period. The rationale for this discrepancy between enacted and executed budget is the presence of extra-budgetary expenditures and receipts.

There are two states of the world. The budget constraint is either \( G_t(1) = (\tau_t - \varepsilon)L_t \) with probability \( \pi_1 \), or \( G_t(2) = (\tau_t + \varepsilon)L_t \) with probability \( \pi_2 \). In order to make this model comparable with the previous one we impose the additional restriction that \( \pi_1 = \pi_2 \).

At time \( t \) the young generation maximizes the expected utility function 2.11:

\[ E_t = \pi_1 \left[ \frac{c_{1-\theta}^{1-\delta}}{1-\theta} + \frac{c_{1-\theta}^{1-\delta}}{1+\rho} \right] + \pi_2 \left[ \frac{c_{1-\theta}^{1-\delta}}{1-\theta} + \frac{\varepsilon c_{1-\theta}^{1-\delta}}{1+\rho} \right] \] (11)
The budget constraint determines that the present value of consumption must equal \( w_t A_t - \tau_t - \varepsilon \) with probability \( \pi_2 \), and \( w_t A_t - \tau_t + \varepsilon \) with probability \( \pi_1 \). Maximization of 11 gives the period 1 consumption of the young generation al time \( t \):

\[
C_{1t} = \left[ \frac{(1 + \rho)^{1 - \theta}}{(1 + \rho)^{1 + (1 + \pi_1) \frac{1}{\pi_1}} \left( \frac{1}{\pi_1} \right)^{\frac{1}{\pi_1}} \left( \frac{1}{\pi_2} \right)^{\frac{1}{\pi_2}}} \right] (w_t A_t - \tau_t) + \left[ \frac{1}{\pi_1} \left( \frac{1}{\pi_2} \right)^{1 - \theta} \right] \left[ \frac{1}{\pi_1} \left( \frac{1}{\pi_2} \right)^{1 - \theta} \right] \left( \frac{1 + (1 + \pi_2) \frac{1}{\pi_2}}{(1 + \rho)^{1 + (1 + \pi_2) \frac{1}{\pi_2}}} \right) \varepsilon \tag{12}
\]

Note that the marginal propensity to consume is greater in 12 than in the case of certainty 3. Correspondingly, the propensity to save is greater under certainty than under uncertainty on government expenditures. This is a critical result that will imply a lower capital accumulation under uncertainty. In addition, and although we assumed \( \pi_1 = \pi_2 \), let’s consider the case of \( \pi_1 > \pi_2 \), that is to say, a case in which the population perceive a greater chance of paying additional taxes than receiving a tax subsidy. In this alternative, the second term in 12 becomes positive and the savings are even lower than under certainty.

Assuming, as we did before, \( \theta = 1 \) and remembering that \( \pi_1 = \pi_2 \), 12 becomes:

\[
C_{1t} = \left( \frac{1 + \rho}{1 + \rho + \pi_1 \pi_2} \right) (w_t A_t - \tau_t) \tag{13}
\]

In addition, the propensity to save is:

\[
s = \frac{1}{1 + \frac{1 + \rho}{\pi_1 \pi_2}} \tag{14}
\]

The capital accumulation is given by:\(^6\)

\[
K_{t+1} = sL_t (w_t A_t - \tau_t) \tag{15}
\]

\[
k_{t+1} = \frac{1}{(1 + n)(1 + \rho)} \left( \frac{1 + \rho}{\pi_1 \pi_2} \right) [(1 - \alpha)k_t^p - \varphi_t] \tag{16}
\]

\(^6\) The saving rate should be: \( sL_t (w_t A_t - \tau_t + \varepsilon) \). However, the expected value of \( \varepsilon \) is cero and, consequently, to focus the long run steady state we can ignore \( \varepsilon \) in equation 15.
Equation 16 is shows the dynamics of the capital in the case of uncertainty as equation 10 gave the same dynamics for the case of certainty. Both equations and the Graph 1 imply a lower level of capital per effective labor in an uncertain environment about fiscal policy. One main implication is that living standards measured by per capita income are lower under uncertainty in the level of taxation than in a scenario of a certain tax path having the same expected value. That is to say, two government expenditures policies having the same expected value of taxation differ in terms of the steady state level of income. The source of this is the lack of certainty of the Government Budget in signaling the tax payments the private sector must face.

Graph 1

1.3 Some preliminary empirical evidence

Table I presents our main estimations. Whereas regressions 1 and 2 have the log of per GDP per capita as dependent variable, regressions 3 and 4 have the log of GDP per worker as explained variable. To capture the uncertainty in future tax payments, we use
the variable logsdr9702 computed as the log of the standard deviation of the revenue-GDP ratio for the period 1997-2002. Both physical capital and human capital are included: logki is the log of the investment-GDP ratio and logaveduc is the log of the average years of total schooling. Finally, logn is the log of the population growth rate.

The estimated coefficient of logsdr9702 has the expected negative influence on both GDP per capita and GDP per worker. In addition, the coefficients are highly significant. Column 5 has the rate of per capita GDP growth between 1970 and 2002 as dependent variable. The real GDP per capita of 1970 is included as explanatory variable to capture the convergence term. In this equation, the coefficient of interest has negative sign and is significant at the 10 percent level.

### Table I

<table>
<thead>
<tr>
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<td>logrgdpwok07</td>
<td>grwgdp7007</td>
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<td>logsdr9708</td>
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<td>-0.369 **</td>
<td>-0.342 ***</td>
<td>-0.365 ***</td>
<td>-0.171 *</td>
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<tr>
<td></td>
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<td>logki</td>
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logrgdpch07 is the log of 2007 real GDP per capita, logrgdpwok07 is the log of 2007 real GDP per worker, grwgdp7007 is the rate of growth of real GDP between 1970 and 2007, logsdr9708 is the log of the standard deviation of the average public revenues-GDP coefficient for the 1997-2008 period, logki is the log of the investment-GDP coefficient, logaveduc is the log of the average
education level, logn is the log of the population growth rate, and logrdpch70 is the log of the 1970 real GDP per capita. ***significant at 1 %, ** significant at 5 %, * significant at 10 %.

Our proxy for budgetary uncertainty (the standard deviation of the revenues-GDP ratio averaged over 1997-2002) has a mean value of 2.60. Its range of variation goes from 0.47 (Slovenia) to 10.16 (Cameroon). Our results suggest that a 10 percent decline in budgetary uncertainty is associated with a 3.6 percent increase in per capita income.
2. MACROECONOMIC EFFECTS OF EARMARKING REVENUES

2.1 Introduction

Earmarking is a budgetary practice that assigns the total or a fraction of specific tax revenues to the financing of a particular budget program, activity, trust fund, line ministry or subnational government. As Buchanan explains in a classical paper, “normally earmarking as a term is used with reference to the dedication of a single tax source to a single public service within a multitax, multiservice fiscal unit, but the identical effects are produced by the creation of special-purpose fiscal units” (Buchanan, 1967).

Generally, the receipt of earmarked revenues implies a simultaneous budget appropriation creation for the same amount of money. In addition, earmarked revenues are often transferred to special accounts in an automatic fashion. Examples of earmarked revenues abound both at the national and subnational levels of government, and a notably example is the case of Latin-American countries (Ahmad and Brosio, 2007). At the national level, revenues earmarked to the Social Security Institution or to the Education Ministry are a common practice. At the subnational levels of government, the receipts from motor vehicles sales taxes, lottery proceeds, and cigarette taxes are earmarked in many countries. Sometimes the National Constitutions specify the earmarking of different taxes to different levels of government.

Table 1 presents a summary of a sample of earmarked revenues classified by the level of government responsible for the receipt of earmark resources (columns) and by the administrative, economic and functional expenditures financed. A lesson that can be drawn from the table is that there is such variety of earmarking encompassing different levels of governments and sources of revenues that the analysis of earmarking should clearly favor a case by case approach rather than an overall focus. Perhaps for this reason the empirical evidence of earmarking effects has not been conclusive.\(^7\)

\(^7\) See, for instance, R. Die and T. McGuire (1992).
TABLE 1

<table>
<thead>
<tr>
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<th>FEDERAL GOVERNMENT</th>
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<td>Tax sharing</td>
<td>Tax sharing with earmarking</td>
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<td>Rents from natural resources</td>
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<td>BUDGETARY COVERAGE</td>
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<td>iii) Extra-budgetary and excluded from the public sector definition</td>
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</table>

The cases for and against earmarking

The literature distinguishes between advantages and disadvantages of earmarking.

Buchanan (1967) affirms that earmarked revenues provide a bridge between individuals’ tax payments and expected benefits, facilitating the revelation of taxpayers’ preferences towards the public provision of goods. In this view, the citizen in his role of tax payer, voter and beneficiary of public expenditures is able to participate, on a separable or case by case basis, in the expenditure decisions through earmarking. It is interesting to note that for Buchanan the alternative to earmarking participation is a general-fund budgeting participation where citizens are only able to vote on the aggregate for the predetermined bundles of choices presented by the budget authority. In this regard, it is important to note that the main criticism the author raises against non-earmarking financing, namely the inefficiency produced by the requirement that individuals must purchase goods and

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8 Buchanan’s view seems to be more consistent with concrete public services or with the cases of Parliamentary Governments where the Parliament role in modifying the budget proposal is negligible.
services in bundles of “complex heterogeneous units”, is also applied to a more general definition of earmarking such as entire or partial earmarking of important taxes allocated, for instance, to energy trust funds or to lower levels of governments. In these cases the individuals are not able to decide on the specific units of public goods provided by the trust fiduciary or the local government and, therefore, the tie-in “sale” that in view of the author characterizes general-fund financing applies to earmarking financing as well.

Goetz (1968) affirms that, under certain circumstances, budgetary decisions that generate majority gains can only be reached through a compensating procedure between the members of the majority coalition. In such cases earmarking provides a bridge between tax concessions and expenditure concessions paving the way to obtain a majority gain. In similar lines, Musgrave (1986) stresses the benefits of explicitly connecting tax and public expenditure benefits, helping to develop a concrete trade-off between the income and expenditure sides of the public sector. Marsiliani and Renstrom (2000) present a model of time inconsistency problem in the taxation of energy. Tax earmarking provides a partial solution to the time-inconsistency problem. In addition, the analysis shows that more unequal societies have the incentive to use earmarking as a commitment device.

Earmarking can result in inefficient resource allocation. Gwilliam and Shalizi (1999) analyze the case of funds earmarked to infrastructure expenditures having lower social benefits than alternative public expenditures. Ahmad and Brossio (2007) focus on the implications of earmarking in fiscal federalist countries. On the one hand, there is an incentive for the Federal Government to concentrate its tax collection efforts in revenues not shared with the sub national governments. On the other, earmarking tend to discourage the tax administration policy of lower levels of governments. In addition, the authors noted that earmarking revenues to subnational governments impose a strong bound to local preferences undermining the efficiency pillars of decentralization. The paper highlights three particularly relevant consequences of earmarking. First, the formation of strong lobbies to interact with the different legislatures involved. Second, earmarking can pave the way to creative accounting procedures at the lower levels of government to avoid the fixed allocation of the earmarked resources. Finally, the misused of the funds involved.

---

9 Goetz (1968) assimilates the general-fund financing to the “tie-in sale view” where sale units consisting of heterogeneous products are used to extract part of the buyer’s consumer surplus by restricting him to an all-or-nothing choice alternative.
The Public Choice view of the budget process emphasizes the need of a comprehensive analysis to assess the trade-offs between different levels of spending and allocation of public funds. According with this view, earmarking should be avoided since it imposes restrictions to the flexibility of funds (A. Fozzard, 2001). Earmarking makes difficult the task of assessing the different spending priorities and discourages the efficient use of resources when the agency expenditures are potentially measurable in terms of cost effectiveness. Note that the Public Choice criticism against earmarking is strongly reinforced as soon as we take into account the growing practice of channeling these receipts into extra-budgetary funds. In this regard, it is common for politicians to hold the view that some “relevant” expenditures should have a guarantee of their financing and, therefore for them, earmarking provides insulation against other competing budgetary line items (Michael, 2008). Moving the agencies financed by earmarking beyond the coverage of the state budget introduce a new set of problems that include not only the measuring of fiscal variables in government statistics but also, and perhaps more important, the lack of the accountability guaranteed by the organic budget laws and financial management legal frameworks.

It is important to note that earmarking of taxes collected by federal levels of government raises diverse political economy implications. As Ahmad and Brossio have shown, there is a growing trend of imposing a double earmarking sequence in Latin America. On the one hand, the revenue sharing system can be seen as a first stage earmarking of federal tax collections. On the other, a second stage earmarking implying a fix appropriation in the provincial or municipalities’ budget. Iaraf (2010) have shown that, contrary to the experience of Canada, Australia and Spain, where there is a frequent evaluation and modification of tax transfers to lower levels of government, the coefficients of revenue sharing to provinces in Argentina and Brazil have not changed in the last 20 years.

Earmarking seems to play also a role in the political economy of enacting tax legislation. Some authors focus earmarking as a political bargain in the process of tax increases or tax creation. Michael (2008) explains that has been the case in Minnesota where earmarking was used to appease the opposition or increase the support for tax increases. In Argentina, the Federal Government negotiated with the Congress an increase in gas taxes

---

10 The authors stress the education and health expenditures of lower levels of governments in the cases of Brazil and Mexico.
11 Michael cites the case of increasing the cigarette sales taxes and earmarking part of the revenues to finance athletic or health clubs outlays.
and a simultaneous earmarking of the revenues to a trust fund that will finance investment in the provinces.

Several empirical studies have shown that earmarking implies a sort of illusion for the states. State legislatures seem to counteract the effects of earmarking by re-assigning general resources that would have otherwise gone to finance the activities favored by earmark financing (Zodrow, 2004).

2.2 A growth model with earmarked revenues

In this section we present a version of the growth model developed by Lucas (1988). The framework consists of a closed economy populated by identical individuals taking decisions under rational expectations. There is a constant returns technology with two inputs: physical capital \((K)\) and human capital expanded labor \((Nh)\). The human capital is the product of the number of individuals \(N\) and the human capital or skill level \(h\). The population grows at a constant rate.

The production possibilities are given by:

\[
Y = A K^\alpha (Nh)^{1-\alpha}
\]  
(1)

The human capital change per unit of time depends on two elements\(^\text{12}\). First, the level of the skills \(h\). Second, the interaction between \(h\) and \(\frac{G_2}{G_1+G_2}\). The parameter \(\delta\) captures the potential efficiency of the economy’s education sector. The \(\frac{G_2}{G_1+G_2}\) ratio reflects the relative importance of education expenditures \(G_2\) in the government budget \((G_1 + G_2)\). Note that it is assumed that the society devotes a fixed fraction of time to accumulating human capital, a control problem located at the heart of Lucas’ model.

\[
\dot{h} = \delta \frac{G_2}{G_1+G_2}
\]  
(2)

There is an exogenous value-added tax rate \(\tau\). The government runs a balanced budget. The expenditures of the public sector are carried out by two agencies: the education ministry and the social security institution. A fraction \(Y\) of the tax revenues is earmarked to the social security institution.

\[
G_1 + G_2 = \tau Y
\]  
(3)

\(^{12}\) We use the following notation for any variable \(X\): \(\frac{\partial X}{\partial t} = \dot{X}\)
Substituting 4 and 5 into 2:

\[ \hat{h} = h \delta \ (1 - \gamma) \]  

(6)

The solution to the differential equation 6 is:

\[ h_t = h_0 e^{\delta (1-\gamma)t} \]  

(7)

The social security institution unique role is to make retirement payments. To simplify the model we assume that the only expenditures of the institute are the payments of pensions in a pay as you go retirement scheme. Under these assumptions, the expenditure composition of national gross domestic product is given by:

\[ Y = c \, N + \dot{K} + G_2 \]  

(8)

Where \( c \) is the consumption per capita level, \( N \) is the population, \( \dot{K} \) is the gross investment, and \( G_2 \) is the government participation on output.

From 5, 7 and 8 we have:

\[ \dot{K} = \left[ 1 - (1 - \gamma) \, \tau \right] A \, K^\alpha \left[ N \, h_0 \, e^{\delta (1-\gamma)t} \right]^{1-\alpha} - c \, N \]  

(9)

Preferences are given by:

\[ \int_0^\infty e^{-\rho t} \, \frac{1}{1-\sigma} \left[ c(t)^{1-\sigma} - 1 \right] N(t) \, dt \]  

(10)

Where \( \rho \) is the rate of time preference.

The economic problem is to maximize 10 subject to 9. This is done through the use of the current value Hamiltonian 11:

\[ H_c = \frac{N}{1-\sigma} (c^{1-\sigma}) + \theta_1 \left\{ \left[ 1 - (1 - \gamma) \, \tau \right] A \, K^\alpha \left[ N \, h_0 \, e^{\delta (1-\gamma)t} \right]^{1-\alpha} - c \, N \right\} \]  

(11)

In addition to observing 9, the maximization conditions are:
Along the balanced growth path per capita consumption grows at a constant rate $\kappa$:

$$\kappa = \frac{\dot{c}}{c}$$  \hspace{1cm} (14)$$

From 12:

$$\frac{\dot{c}}{c} = -\sigma \kappa$$  \hspace{1cm} (15)$$

Substituting into 13:

$$\rho + \sigma = [1 - (1 - \gamma)\tau] A \alpha K^{\alpha-1} [N h_0 e^{\delta(1-\gamma)t}]^{1-\alpha}$$  \hspace{1cm} (16)$$

And from 7 and 8:

$$\rho + \sigma = [1 - (1 - \gamma)\tau] A \alpha \left( \frac{cN}{K} + \frac{\dot{K}}{K} + \frac{G_2}{K} \right)$$  \hspace{1cm} (17)$$

Since the left hand side of 17 is constant, the rate of growth of the right hand side must be cero. Consequently$^{13}$:

$$\frac{\dot{c}}{c} + \frac{\dot{N}}{N} = \frac{\dot{K}}{K}$$  \hspace{1cm} (18)$$

From 14:

$$\frac{\dot{K}}{K} = \kappa + \frac{\dot{N}}{N}$$  \hspace{1cm} (19)$$

Using 19, 1 and 7 we get the balanced growth rate $\kappa$:

$$\kappa = \left( \frac{1}{1-\alpha} \right) \frac{\dot{A}}{A} + \delta (1 - \gamma)$$  \hspace{1cm} (20)$$

The balanced rate of growth of per capita income is, using 1 and 7:

$$\frac{\dot{y}}{y} = \left( \frac{1}{1-\alpha} \right) \frac{\dot{A}}{A} + \delta (1 - \gamma)$$  \hspace{1cm} (21)$$

$^{13}$ We assume that along the balanced growth the rate of growth of $G_2$ is equal to the rate of change of $K$.  

\[
\begin{align*}
\theta_1 &= -\theta_1 [(1 - (1 - \gamma)\tau) A \alpha K^{\alpha-1} [N h_0 e^{\delta(1-\gamma)t}]^{1-\alpha} - \rho] \\
\end{align*}
\]
Where \( y = \frac{Y}{N} \)

Equation 21 is our yardstick result: with earmarked revenues the balanced growth rate is proportional to the rate of productivity growth plus a term defined by the product of the potential education efficiency \( \delta \) and the share of revenues earmarked to education.

Introducing government expenditures without earmarked revenues:

Without earmarked revenues, the ratio \( \left(\frac{g_2}{g_1+g_2}\right) \) is no longer a constant. Therefore, the change in human capital is given by equation 2. The maximization problem is now:

\[
H_c = \frac{N}{1-\sigma} \left( c^{1-\sigma} \right) + \theta_1 \left\{ AK^\alpha [Nh]^{1-\alpha} - c N - G_2 \right\} + \theta_2 \left\{ h \delta \frac{g_2}{g_1+g_2} \right\}
\]  

(22)

Note that \( G_2 \) is now a control variable. The conditions for maximization are:\(^{14}\):

\[
c^{-\sigma} = \theta_1 \tag{23}
\]

\[-\theta_1 + \theta_2 h \delta \frac{g_1}{(g_1+g_2)^2} = 0 \tag{24}
\]

\[
\dot{\theta}_1 = -\theta_1 \left\{ AK^\alpha [Nh]^{1-\alpha} - \rho \right\} \tag{25}
\]

\[
\dot{\theta}_2 = -\theta_1 AK^\alpha N^{1-\alpha} h^{-\alpha} (1-\alpha) - \theta_2 \left[ \delta \frac{g_2}{g_1+g_2} - \rho \right] \tag{26}
\]

\[
\dot{K} = AK^\alpha (Nh)^{1-\alpha} - c N - G_2 \tag{27}
\]

Equation 24 implies that on marginal terms, the decline in the value of physical capital caused the decrease in savings associated with an increase in \( G_2 \) must equal the increase in the value of human capital per unit of time.

Along the balanced growth path \( \kappa \) measures the rate of growth of per capita consumption. From 23 and 25 we obtain:

\[
\frac{\dot{K}}{K} = \kappa + \frac{\dot{N}}{N} \tag{28}
\]

Using 23, 25 and 28 we get:

\[
\kappa = \left( \frac{1}{1-\alpha} \right) \frac{A}{A} + \delta \left( \frac{g_2}{g_1+g_2} \right) \tag{29}
\]

\(^{14}\) Equation 2 must also be observed.
Differentiating 1 and using 29:

\[
\frac{y}{y} = \left( \frac{1}{1-\alpha} \right) \frac{A}{A} + \delta \left( \frac{G_2}{G_1+G_2} \right)
\]  

(30)

Contrary to what happened in the earmarked revenues case, the balanced growth rate of the economy depends now on an endogenously determined ratio of education expenditures over total government outlays. Note that at any point in time equation 24 and the government fiscal constraint 31 are two equations determining \( G_1 \) and \( G_2 \).

\[
G_1 + G_2 = \tau AK^\alpha (Nh)^{1-\alpha}
\]  

(31)

Not only equations 30 and 21 differ in this crucial sense but, also, and as equations 24-26 reveal, in the transitional dynamics the ratio \( \frac{G_2}{G_1+G_2} \) is not constant. The reason for this is that the shadow prices of physical and human capital decline through time and, consequently, maximization requires that the mix of government expenditures must also change in order to satisfy equation 24\(^{15}\). Therefore, earmarking revenues implies both a suboptimal long run economic growth rate and a suboptimal transitional path.

### 2.3 Empirical analysis

For the reasons mentioned in the previous section there are many different experiences of earmarked revenues across different levels of governments and covering an ample array of expenditures. Clearly, the political economy of enacting earmarked revenues is a relevant area of research. Adopting a macro strategy of analysis would not be the best option to assess the motivation, incidence, incentives of particular earmarking practices. However, there are two reasons supporting a macro approach. Firstly, the growing trend shown in some countries of demanding the fixing in terms of points of GDP of concrete aggregate government expenditures, especially education. Note that these proposals implicitly imply the earmarking of a constant share of the total governments tax collections. Secondly, the lessons to be drawn from aggregate data could be an important input for assessing the appropriateness of earmarking individual tax revenues not only at the general level of governments but, also, at local levels or decentralized line agencies.

\(^{15}\) We assume \( \delta \frac{G_2}{G_1+G_2} > \rho \).
Our empirical analysis is based on a sample of 103 countries. The data comes from the Government Financial Statistics dataset and includes two government expenditure variables associated with economic growth: the share of education on total expenditure (beduc) and the share of health on the same aggregate (bhealth). By adding up these variables we get the education and health share of total government outlays (beduchealth). There are three subsamples. First, a high quality subsample where the source is General Government data. Second, an intermediate sample originated in the Central Government coverage. Finally, a data based on the Budgetary Accounts definition. Table 2 presents the descriptive statistics. We can see a significant variation of both variables across the overall sample and, also, in the sub-samples. Considering the high quality data, for instance, the range of variation of government provided education as a share of total government expenditures has a minimum of 7 % and a maximum of 21 %. For the share of health expenditures the corresponding limits are 2 % and 20 %.

Table 2: Descriptive Statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Budgetary Accounts</th>
<th>Central Government</th>
<th>General Government</th>
<th>Obs</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>beduc</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>103</td>
<td>0.14</td>
<td>0.044</td>
<td>0.01</td>
<td>0.25</td>
</tr>
<tr>
<td>bhealth</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>103</td>
<td>0.09</td>
<td>0.049</td>
<td>0.01</td>
<td>0.25</td>
</tr>
<tr>
<td>beduc</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>28</td>
<td>0.16</td>
<td>0.048</td>
<td>0.07</td>
<td>0.24</td>
</tr>
<tr>
<td>bhealth</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>28</td>
<td>0.07</td>
<td>0.037</td>
<td>0.01</td>
<td>0.16</td>
</tr>
<tr>
<td>beduc</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>23</td>
<td>0.14</td>
<td>0.059</td>
<td>0.01</td>
<td>0.25</td>
</tr>
<tr>
<td>bhealth</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>23</td>
<td>0.08</td>
<td>0.055</td>
<td>0.01</td>
<td>0.22</td>
</tr>
<tr>
<td>beduc</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>52</td>
<td>0.14</td>
<td>0.033</td>
<td>0.07</td>
<td>0.21</td>
</tr>
<tr>
<td>bhealth</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>52</td>
<td>0.12</td>
<td>0.041</td>
<td>0.02</td>
<td>0.20</td>
</tr>
</tbody>
</table>

Source: Government Financial Statistics Dataset.

Graph 1 plots the education and health shares of government expenditures (beduchealth) against the log of the PPP adjusted level of per capita income. The graph shows a positive association between both variables. In fact, if we ran an OLS regression of beduchealth on the log of 2007 per capita GDP the coefficient of interest is positive and significant at a probability of 1.27 % for the whole sample. If we omit the budgetary accounts subsample, the coefficient is even more significant and the probability is 0.3 %.
Table 3 shows the coefficient of correlation of \textit{beduchealth} with variables representing living standards, institutional development, geographic restrictions to ignite growth, and instruments commonly used in applied research of development and growth. Most of recent empirical research in development economics have used these or closely related variables. The main point we would like to emphasize, though, is the strong correlation between our variable of interest \textit{beduchealth} and each of these variables.

Table 3: Coefficient of Correlation of \textit{beduchealth}

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WELFARE</strong></td>
<td></td>
</tr>
<tr>
<td>Per Capita GDP 07 (1)</td>
<td>0.52</td>
</tr>
<tr>
<td>Average Education (2)</td>
<td>0.62</td>
</tr>
<tr>
<td><strong>INSTITUTIONS</strong></td>
<td></td>
</tr>
<tr>
<td>Avexprisk (3)</td>
<td>0.31</td>
</tr>
<tr>
<td>InstitIndex (4)</td>
<td>0.65</td>
</tr>
<tr>
<td>Rule of law (5)</td>
<td>0.51</td>
</tr>
<tr>
<td><strong>GEOGRAPHY</strong></td>
<td></td>
</tr>
<tr>
<td>Kgptemp (6)</td>
<td>0.23</td>
</tr>
<tr>
<td>Mal94p (7)</td>
<td>-0.57</td>
</tr>
<tr>
<td>Malfal94 (8)</td>
<td>-0.48</td>
</tr>
<tr>
<td><strong>INSTRUMENTS FOR INS AND GEO</strong></td>
<td></td>
</tr>
<tr>
<td>Logmort (9)</td>
<td>-0.33</td>
</tr>
<tr>
<td>Malariaecology (10)</td>
<td>-0.31</td>
</tr>
</tbody>
</table>
Two are the main lessons we draw from this data. First, government aggregate expenditure shares functionally related to enhance economic growth show a positive association with the level of per capita income. Second, it appears that increasing the share allocation of these expenditures in the overall government’s budgets is a process that goes hand by hand with the institutional development of the countries. If this is the case, the proposal of earmarking functional expenses like education should be carefully analyzed. Earmarking these expenses amounts to fixing them in terms of total expenditures of the government sector and countries undertaking this policy would face two risks. On the one hand, as the experience of Argentina and Brazil reveals, the fix coefficients could last more than one generation as the initial fixing can become a trap equilibrium in terms of political games. On the other hand, and perhaps more important, an attempt to fix the earmarking at levels corresponding to the developed countries experience, would end up proposing an expenditure policy inconsistent with the institutional setting of the countries.

Table 4 presents the results of our attempt to test the institutional and geographic determinants of the intensity of education and health in government expenditures. Following standard empirical literature, we included three institutions proxies and two measures of geographic variation. Columns 6 and 7 present our main results whereas columns 8-11 are the results from an instrumental variables estimation addressing the potential problems of lack of independence between our explanatory variables and the error term. The results are robust and constitute an additional argument for considering the expenditure shares as increasing in institutions and decreasing in

---

16 This could prompt a transplantation of institutions problem similar to the analysis of Djancov et al (2003).
17 The I.V. estimations exclude the budgetary accounts sub-sample.
geographic obstacles. The results, however, are of a quite preliminary nature and further research and evidence is needed to go beyond that.

Table 4: Estimations (Dependent variable: beduchealth)

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
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<th>(7)</th>
<th>(8)</th>
<th>(9)</th>
<th>(10)</th>
<th>(11)</th>
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<td>Rule of Law</td>
<td>0.028 (0.007)***</td>
<td>0.023 (0.008)***</td>
<td>0.0031 (0.029)</td>
<td>-0.0442 (0.043)</td>
<td>0.0217 (0.022)</td>
<td>0.007 (0.018)</td>
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<td></td>
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<tr>
<td>Avexprisk</td>
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<td></td>
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</tr>
<tr>
<td>InstitIndex</td>
<td>0.753 (0.016)***</td>
<td></td>
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</tr>
<tr>
<td>Mal94p</td>
<td>-0.721 (0.190)***</td>
<td>-0.044 (0.022)***</td>
<td>-0.243 (0.135)*</td>
<td>-0.290 (0.148)*</td>
<td></td>
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</tr>
<tr>
<td>Malfal94</td>
<td>-0.659 (0.021)***</td>
<td>-0.037 (0.022)*</td>
<td>-0.183 (0.095)*</td>
<td>-0.181 (0.072)**</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
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<th>n</th>
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<tbody>
<tr>
<td>R²</td>
<td>0.14</td>
<td>0.11</td>
<td>0.36</td>
<td>0.14</td>
<td>0.10</td>
<td>0.17</td>
<td>0.19</td>
<td>0.42</td>
<td>----</td>
<td>0.49</td>
<td>0.34</td>
</tr>
</tbody>
</table>

Instruments: OLS OLS OLS OLS OLS OLS OLS Me Me Me Me

Logmort AJR Kgptemp Logmort AJR Kgptemp

***, ***, significant at 1, 5 and 10 % respectively.
**DATA**

**Avexprisk** is the average protection against expropriation risk from Political Risk Services, used by Acemoglu, Johnson and Robinson (2001)

**logrgdpch07** is the log of 2007 real GDP per capita (Penn World Table 6.3)

**logrgdpwok07** is the log of 2007 real GDP per worker (PWT 6.3)

**grwgdp7007** is the rate of growth of real GDP between 1970 and 2007 (PWT 6.3)

**InstitIndex**: Institutions index from Kaufmann, Kraay, and Zoilo Lobatón (2002)

**Rule of law**: Rule of Law index used by Easterly and Levine (2002)

**Kgptemp**: Measures the share of a country’s population living in temperate ecozones, based on the Koeppen-Geiger ecozone classification system as explained by Sachs (2002)

**logsdr9708** is the log of the standard deviation of the average public revenues-GDP coefficient for the 1997-2008 period (International Financial Statistics, International Monetary Fund).

**logki** is the log of the investment-GDP coefficient (PWT 6.3)

**logaveduc** is the log of the average education level (Barro and Lee database, NBER)

**logn** is the log of the population growth rate (World Bank database)

**Logmort**: Log of the stimate of the mortality rates of British soldiers and others populations in the early 19th century, by Acemoglu, Johnson and Robinson (2001)

**logrgdpch70** is the log of the 1970 real GDP per capita (PWT 6.3)

**Mal94p**: Proportion of reach’s country population that lives with risk of malaria transmission, Sachs (2002)

**Malfal94**: Equals Mal94p times the proportion of national malaria cases involving fatal species, Gallup and Sachs (1998)

**Malariaecology**: Instrument for malaria risk, Sachs (2002)
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