Governance and Rural Public Expenditures in Latin America
The Impact on Rural Development

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ESA Working Paper No. 07-01

June 2006

Agricultural Development Economics Division

The Food and Agriculture Organization
of the United Nations

www.fao.org/es/esa

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Abstract

In this paper we examine the effects of the composition (between private and public goods) of government expenditures in the rural world, and the effect that corruption has in the political game that determines these allocation decisions. In the first section of this paper we develop a political economy model where corruption and trade openness counteract to determine, within a political equilibrium, the amount of public funds to be devoted to the rural world, and their composition between public and private goods. In the second section we contrast the implications of the political economy model with recently released data on rural public expenditures in Latin America. We find that corruption reduces the amount of public funds that reach the rural world, but not its composition. We also find that after accounting for the endogeneity of public expenditure decisions, the composition of these expenditures significantly determines rural development (as proxied by agricultural GDP).

Key Words: Corruption, trade openness, public spending, rural development, public goods.

JEL: H2, H50, H41, O13, Q10.

I am very thankful for the useful comments from Fabrizio Bresciani, Benjamin Davis, Alberto Zezza, and the participants of the working seminar at FAO – ESA. Views and opinions presented here do not represent FAO's institutional views.

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I.- Introduction

The composition of public spending matters from the perspective of development. Tax holidays and other types of industry location luring that ends as wealth transfers to the private sector, usually sold to the public as "job creation" measures, are not likely to have the same long term growth enhancing effect as public goods spending. This is particularly true in developing countries where their under-provision causes public goods investment to have very high rates of returns. Public goods investment is highly complementary with private investment, i.e. the public road that made a private operation at a given location profitable. Furthermore, by definition the benefits of public goods are broadly spread while most of the benefits of transfers to privates tend to be captured by few. On the other hand, the purpose of government existence is to intervene in missing markets, or those suffering from market failures. Non-excludable public goods like roads and other public infrastructure, social spending in education and health: investments with high positive externalities and which suffer from under-provision due to capital markets/information failures are the types of interventions most likely to fit the state intervention rule.

In this paper we examine the effects of government expenditure composition in the rural world, and the effect corruption has in the political game that determines these allocation decisions. First we determine the political economy behind the decision of how much funds to assign to the rural world; and then, given those rural funds, how they are allocated between private goods and public goods. Next we examine if the composition of that rural spending matters for rural development, proxied in our empirical examination by agricultural growth.

Expenditure in private goods, not only are less productive than public goods, from a social point of view, but they incur in the additional damage of crowding out other public and private investments. López (2004) identifies 3 different ways in which investment in private goods crowds out other forms of private and public investments. (i) First there is the obvious type of crowding out, the use of public financial, human and institutional resources in private goods spending directly removes them from investments in public goods. (ii) By providing subsidies to investments that are otherwise profitable, this type of private goods spending may delay or even revoke private investments. For example, if a rationed amount of subsidies are offered for a particular investment which is profitable even without the subsidy, a risk neutral investor that does not get the subsidy may rationally decide to delay the investment until he/she gets the subsidy and improve his/her returns. (iii) In the medium term the lack of public investment (due to the complementarity of public and private investments) reduces the productivity of investments and therefore reduces the amount of private investments. For these reasons, the positive correlation between the share of public good spending and output performance, in the rural world, discovered by the same author should not come as a surprise.

In this study, we advance the discussion one step further by delving into the effects of the political economy of the determination of these spending allocations and its final implications for development. Corruption, understood as the use/abuse of public power for private gain, implies that optimal policies can be skewed for the benefit of interested lobby groups. It is useful to understand that corruption not only involves money transfers in a faraway park in the dead of the night, but can occur in broad day light as campaign contributions or party support. The characteristics of a successful lobby group have been previously identified in the literature (see Olson 1965), they are small groups (which minimizes costs of organization) with clear and defined interests, and have the money/power to influence policy[1]. In the case of the allocation of rural funds between public goods (roads, electricity, water, sewage, schools, health: all of which are in evident undersupply in rural Latin America) and private goods (classically export or marketing promotion subsidies), it is evident where the lobby power lies. Poor rural inhabitants hardly meet the conditions for a

[1] In the case of Latin America, the focus of our study, social power as defined by family/class prestige can partially substitute economic power.

successful lobby, so if there is corruption, spending will be skewed towards more private goods spending than optimal. Now, if this corruption has measurable effects in rural development is one of the questions we empirically try to answer here.

The next section presents a political economy model to explain how rural expenditures are determined. Section V, presents the data used in our empirical model, followed by a section on the empirical results. We then analyze the development costs of corruption in section VII, and finally we test the robustness of our results with a sensitivity analysis.

II.- Structure of the Game

With the exception of extreme autocracies, the process of changing tax rates and codes is a cumbersome political enterprise that requires a change in the law, and therefore some sort of political consensus in the legislative bodies. The allocation of those tax revenues, however, the government expenditure, requires no such political agreement and can, within a broad range, be freely allocated by the government. In the same manner, changes in trade policy, increases or reductions in subsidies or tariffs, not only usually require legislative accords, but are usually achieved through trade agreements on which small countries do not have a high degree of bargaining power.

These political characteristics are captured in the political economy model that we present below. The objective is to understand how governments decide how to allocate public funds in rural areas between public goods investment and private goods spending (transfers to privates). We assume that governments make these decisions in two *separable* steps. First, the government decides how to allocate total revenues between urban and rural expenditures (taking the allocation of rural funds among private subsidies and public investments as given). At this stage the government is open to accept contributions from organized urban lobby groups to increase urban spending. In the second step, the government decides how to allocate the remaining funds in the rural world. Again, at this stage, the government is open to accept contributions from organized rural lobby groups to increase the amount of private transfers, and reduce the investment in public goods[2].

We propose that the only source of government funding is a tax t on the output of the non-agricultural sector z, we will call it the urban sector. We assume that the tax rate t is given and requires, as in any democracy or apparent democracy, congress agreement to change, as opposed to expenditure decisions which are freely chosen by the government. We propose that total government revenues are:

$$R = tz - sp^{*}\chi - \beta T - (1-\beta)T \qquad (1)$$

Here, a share β of total available funds T is allocated to the rural world, while the rest $(1-\beta)T$ is allocated to the urban sector. χ represents the exports of the agricultural good x, which receives a subsidy at a per-unit rate of s over the international price p^{*}. For simplicity we will assume that agricultural export subsidies are either a negligible amount of total expenditures or paid with a deficit. In this case we have that: $tz = T$.

To describe the full process of public funds allocation, we proceed by backwards induction, and thus start with the allocation of rural funds.

III.- The Allocation of Agricultural Expenditures Game

The conflict of interests between small and large farms arises from the fact that investment in public goods raises the productivity of labor, and in doing so, it indirectly increases costs of hired labor which reduces the rents of large farmers. Large farmers, obviously, prefer hand-outs from the government than investment in public goods.

The economy produces two goods, the numeraire z and the agricultural good x. We assume a separable and additive utility function:

[2] The assumption that the decision on how rural funds are spent is independent from the assignment of rural/urban funds is a simplifying assumption; however, it is likely to reflect the way government spending really works. First, governments procure a budget. After that, governments allocate funds to ministries and regions. Then, rural expenditure decisions are the carried out, usually in the Ministry of Agriculture.

$$U(x,z) = z + u(x)\,, \tag{2}$$

where the sub-utility function $u(x)$ is strictly concave. Demand for x is thus, $d(p) = [u'(p)]^{-1}$. Given that z appears linearly in the utility function, consumer surplus is only accrued from the agricultural good, and is equal to:

$$S(p) = u(d(p)) - p \cdot d(p) \tag{3}$$

The agricultural good is produced by small and large farmers, $x = x_L + x_S$, and there is no unemployment, so total rural labor is distributed among small and large farm production: $L^R = L_S + L_L$. We assume that small farm production is the fall back possibility for rural workers. Small farm output is given by,

$$x_S = A(\mu E) \cdot L_S\,. \tag{4}$$

A is the productivity of labor which depends positively ($A' > 0,\ A'' < 0,\ A(0) > 0$) in the rural expenditures in public goods (μE); where E is total rural expenditure and $\mu \in [0,1]$ is the share of total rural expenditures invested in public goods[3]. By public goods we think of the different types of investments with positive externalities not accounted for by the markets, like investments in human capital (health and education services), some forms of non-excludable physical capital like roads, electricity, and communications infrastructure; and environmental goods and services like water and soil quality improvement. Note that if no investments in public goods are made, labor is still productive in the small farmers' sector. As long as the small sector remains productive, wages in the economy are determined by A.

We assume that agriculture is a protected sector, and that it also exports[4]; thus, it is the beneficiary of an export subsidy. The relevant price for large farm producers (we assume, for

[3] Note that , $E = \beta T = \beta tz$. However at this stage, both β and T have been predetermined, so to reduce notation at this stage we use E.

[4] The protected sector assumption is corroborated by our sample data, see details below.

exposition purposes, it does not affect the results presented, that only large farmers are the beneficiaries of these subsidies):

$$p^x(s) \equiv (1+s)p^*, \tag{5}$$

where s is the per-unit subsidy and p^* is the international price. We assume that the country is bound by international trade agreements, and may not freely change s; so for purposes of the government s is given.

Large farm owners earn rents from a fixed factor, which can be thought of as large land properties. They maximize their rents:

$$\pi\left(p^x, A(\mu E)\right) = \underset{x_L, L_L}{\text{Max}}\left\{p^x \cdot x_L - A(\mu E)\cdot L_L\right\}; \tag{6}$$

where $\pi(\cdot)$ is a profit function, non-decreasing in p^x, non-increasing in A, convex over $\left(p^x, A(\mu E)\right)$, and assumed to be twice differentiable. From the definition of the profit function we obtain that: $\pi_1(p^x, A) \equiv \partial\pi(p^x, A)/\partial p^x = x_L(p^x, A)$, and $\pi_2 = -L_L(p^x, A)$, where we use number subscript to refer to partial derivatives with respect to argument number. Large farmers' welfare is:

$$V(s,\mu) = \pi\left(p^x(s), A(\mu E)\right) + (1-\mu)E\,. \tag{7}$$

That is, large farmers in addition to their rents, receive hand-outs which amount to a share $(1-\mu)$ of total rural expenditures E. Alternatives to specification (7) may be given. For example, it may be thought that private goods $(1-\mu)E$ increase total factor productivity of x_L; or that this private good is transferred to large farm owners in the form of a per-unit rebate (in addition to the subsidy). However, we prefer (7), because of its algebraic simplicity, and because it more transparently transmits the fact that expenditure in private goods only benefits the large farms. Also in (7), we do not include consumer surplus as we assume that large farmers are few and consumer's surplus represents a negligible part of their welfare.

The government revenues in this case are negative due to its subsidizing of agricultural exports:

$$r(s,\mu) \equiv -sp^{*}\chi(s,\mu), \tag{8}$$

where $\chi(s,\mu)$ represent exports:

$$\chi(s,\mu) = \pi_1(p^x(s), A(\mu E)) + A(\mu E)[L^R + \pi_2(p^x(s), A(\mu E))] - Nd(p^*), \tag{9}$$

and *N* represents the total population. We assume, non critically and just for realism, that an increase in μ, reduces the total output *x*, because an increase in μ reallocates labor into the small farm sector, and this sector is less productive, per unit of labor, than the large farming sector (for all relevant μE). This assumption, determines that $\partial r(s,\mu)/\partial\mu = -sp^{*}\cdot\partial\chi(s,\mu)/\partial\mu > 0$. Additionally, we propose that government revenues are concave over μ; $\partial^2 r(s,\mu)/\partial\mu^2 < 0$. It can be shown that if third derivatives of $\pi(\cdot)$ are zero, or sufficiently small this is guaranteed by the convexity of $\pi(\cdot)$, which is what we assume.

Total rural welfare is thus equal to small farmers' welfare, plus large farmers' welfare, plus the government's welfare:

$$W(s,\mu) = \pi(p^x, A(\mu E)) + (1-\mu)E + A(\mu E)L^R + L^R S(p^*) + r(s,\mu) \tag{10}$$

In the absence of corruption, taking international prices p^* and total rural expenditure E as given, the government would choose a second best μ^*, that maximizes welfare, following the rule:

$$\frac{\partial W(s,\mu)}{\partial\mu} = -E + EA'(L^R + \pi_2(\cdot)) + \frac{\partial r(s,\mu)}{\partial\mu} \leq 0 \tag{11}$$

Note that in (10), both *A* and *r* are concave over μ; thus, unless $\pi(\cdot)$ is extremely convex over μ (i.e. labor demand elasticity of the large farm sector is extremely high), *W* is concave and can be maximized; we assume that the concavity requirement is met[5]. It is perfectly possible to have a corner solution at $\mu^* = 1$, in which case (11) would be an inequality. The other corner, $\mu^* = 0$ is unlikely if $A'(0)$ is very high, which we should assume.

Unfortunately, the government is open to accept bribes to change the second-best policy. Large farmers, which are fewer, and hence with lower organizational costs, and higher income levels, organize to lobby for a lower μ. For each marginal reduction that large farmers can obtain in μ, their welfare increases not only from increased hand-outs, but from increased rents derived from cheaper labor costs. Thus, large farmers have evident incentives to spend lobby dollars to achieve a lower μ. They offer the government a bribe schedule $B(\mu)$, contingent on all possible $\mu \in [0,1]$. It is assumed that $B(\mu)$ is feasible, i.e. non-negative and smaller than the lobby group's aggregate income. The government which is open to these "under the table" transactions maximizes its objective function, after the bribe schedule has been offered:

$$G(s,\mu) = B(\mu) + \alpha W(s,\mu) \tag{12}$$

with $\alpha \geq 0$ [6].

Bernheim and Winston (1986) in their work on menu auctions showed that the μ that maximizes (12) satisfies:

$$\tilde{\mu} = \arg\max \left\{ B(\mu) + \alpha W(s,\mu) \right\} \text{; and} \tag{13}$$

$$\tilde{\mu} = \arg\max \left\{ \left[V(s,\mu) - B(\mu) \right] + \left[B(\mu) + \alpha W(s,\mu) \right] \right\} \tag{14}$$

[5] It can be shown, that rural welfare will be concave if and only if:

$$\frac{-A''\mu}{A'} > \varepsilon_{L_S,\mu} \equiv \frac{\partial L_S}{\partial \mu}\frac{\mu}{L_S}.$$

That is, the degree of concavity of the productivity of labor in the small sector is higher than the derived small farm labor demand elasticity.

[6] Which is also assumed to be concave over the relevant range of $\alpha \in [0, \infty]$.

These conditions show that the bribery political equilibrium maximizes the government objective function (13), and at the same time maximizes the joint government and lobby group's welfare (14)[7]. The first order conditions for (13) and (14) require that:

$$\frac{\partial B(\mu)}{\partial \mu} + \alpha \frac{\partial W(s,\mu)}{\partial \mu} = 0 \text{ ; and} \tag{15}$$

$$\frac{\partial V(s,\mu)}{\partial \mu} + \alpha \frac{\partial W(s,\mu)}{\partial \mu} = 0 \, . \tag{16}$$

From (15) and (16) it is easy to see that the sub-game perfect Nash equilibrium for this bribery game requires that $\frac{\partial V(s,\mu)}{\partial \mu} = \frac{\partial B(\mu)}{\partial \mu}$. For this reason, Bernheim and Whinston refer to this as a *locally truthful* equilibrium, because around the neighborhood of $\tilde{\mu}$, the marginal bribe is equal to the private marginal benefit obtained from a reduction in μ. Another way to view this result, however, is that, since the government plays last and has the information of the bribers' behavior, it will extract the last cent out of the lobbyists (until the benefits equal the costs for the lobbyists).

Using the property of local truthfulness, we can obtain the political equilibrium $\tilde{\mu}$ from:

$$\frac{\partial G(s,\mu)}{\partial \mu} = EA'\pi_2(\cdot) - E + \alpha \left[-E + EA'(L^R + \pi_2(\cdot)) + \frac{\partial r(s,\mu)}{\partial \mu} \right] = 0 \, . \tag{17}$$

The first term in (17) ($EA'\pi_2(\cdot) - E$) is unambiguously negative. The second term inside the squared brackets, which is equal to $\partial W(s,\mu)/\partial \mu$, must therefore be positive. Since, at μ^*

[7] Condition (14), implies that the lobbyists' welfare level is valued at $(1+\alpha)$, while the non represented group's welfare is valued at only α. This means that the implicit weight on the lobby group is $(1+\alpha)/(1+2\alpha)$, while the weight on the unrepresented is $\alpha/(1+2\alpha)$. This means that as $\alpha \to \infty$, which is the least possible corruption, the highest possible share for the unrepresented is only ½. This, in our view, is a drawback of specification (12), but we will not change it, because we want to be comparable to the ample literature that has spawned from Grosmman and Helpmann (1994), who originally proposed (12).

$\partial W(s,\mu)/\partial\mu$ equals zero; and since $W(s,\mu)$ is concave over μ, it follows that the bribery $\tilde{\mu}$ must be smaller than the second-best optimal μ^*.

Prediction 1. As corruption increase (i.e. α decreases) the political equilibrium $\tilde{\mu}$ falls[8].

Totally differentiating (17) we get:

$$\frac{d\mu}{d\alpha} = \frac{\left[-E + EA'(L^R + \pi_2(\cdot)) + \partial r(s,\mu)/\partial\mu\right]}{-\partial^2 G(s,\mu)\big/\partial\mu^2} > 0 .$$

The denominator is positive, given the concavity of the government's objective function, while the numerator, is positive, because it is equal to $\partial W(s,\mu)/\partial\mu$ which has to be positive in the political equilibrium. Thus, an increase in corruption, which here amounts to a reduction in α (the valuation of total social welfare), causes a further reduction in $\tilde{\mu}$.

Prediction 2. The larger the large farmers' sector, the lower the political equilibrium $\tilde{\mu}$ will be.

Prediction 3. The larger the larger the rural labor force, the larger the share of investment in public goods, $\tilde{\mu}$ will be.

The intuition for the Prediction 2 is very straight forward: the larger the big farm sector is, relative to small farming, the greater is their weight in social welfare and the greater is their economic / political power. With more power, large farmers' can bargain for further deviations from the second-best allocation of rural public expenditure. This result can be appreciated algebraically from (11) and (17). First note from (11) that an increase in π increases labor demand in the large farm sector, which causes the optimal μ^* to be reduced. Furthermore, from (17) we can see that an increase in the big farm sector increases labor demand, which makes the first part of (17) more negative, which has to be counterbalanced by

[8] We agree with Fredriksson and Svensson (2002) that α is a measure of corruption, because it measures how far the government is willing to deviate from optimal policy to benefit itself. The lower the α, the lower the weight of society's welfare with respect to its own contributions/bribes collection, and thus signal a higher degree of corruption.

an increasingly positive $\partial W(s,\mu)/\partial\mu$, which means a further deviation (reduction) of μ from the new lower optimal.

Prediction 3 is also intuitive. The only reason for public good investment here is to fund the externality in the small farm production: $A'(L^R+\pi_2(\cdot))$; as the rural labor force increases, so does the optimal μ^*. Of course, corruption reduces this marginal effect, and the effect of an increase in L^R on the political equilibrium $\tilde{\mu}$ is positive, but of a lesser magnitude.

Prediction 4. For high levels of corruption, trade liberalization increases $\tilde{\mu}$; while for low levels of corruption trade liberalization may decrease $\tilde{\mu}$.

Totally differentiating (17) we find:

$$\frac{d\mu}{ds}=\frac{(1+\alpha)p^*EA'\pi_{12}(\cdot)+\alpha\dfrac{\partial^2 r(s,\mu)}{\partial s\partial\mu}}{-\partial^2 G(s,\mu)\Big/\partial\mu^2}\gtrless 0. \tag{18}$$

The sign of (18) is undefined, for low levels of α, i.e. high corruption, the first term in the numerator, which is negative, will dominate. This means that for sufficiently high corruption levels $d\mu/ds<0$, which indicates that trade liberalization, a reduction in s will increase $\tilde{\mu}$, i.e. reduce the deviation from optimal policy. For sufficiently low levels of corruption, the second term which is positive may dominate, in which case, $d\mu/ds>0$, and trade liberalization would decrease $\tilde{\mu}$.[9]

The first result is very intuitive. Trade liberalization reduces the economic / political power of the protected large farm sector, thus with high corruption, $\tilde{\mu}$ is more sensitive to the power of the lobbying group. Thus, trade liberalization with high levels of corruption reduces the distortion (increases $\tilde{\mu}$). The second result states that when corruption is low, the

[9] The sign of the cross derivative of government revenues follows from assuming that third derivatives of the profit function are zero or sufficiently small.

government revenue effect could dominate. Government marginal revenues from μ decrease with trade liberalization, thus to re-establish the political equilibrium, a reduction in $\tilde{\mu}$ is necessary to counterbalance the increase in revenues. The reduction in $\tilde{\mu}$ augments large farm output and exports, and therefore increases government spending (reduces revenues).

Prediction 5. An increase in total rural expenditure (*E*) reduces the share of investment in public goods, unless corruption levels are very low.

To show this prediction we totally differentiate (17) to obtain:

$$\frac{d\mu}{dE} = \frac{-(1+\alpha) + (A' + \mu E A'')(\alpha L_S - L_L) + \mu E \pi_{22}(\cdot)(\alpha A'^2 + A'') + \alpha \dfrac{\partial^2 r(s,\mu)}{\partial\mu\partial E}}{-\partial^2 G(\cdot) \big/ \partial\mu^2} \gtrless 0 \qquad (19)$$

Ignoring, for now the effect on marginal government revenues, we can sign the rest of the components of (19)[10]. Let us start by assuming full corruption, i.e. $\alpha \to 0$, in this case we can sign (19), because all of the elements in the numerator that are not pre-multiplied by α are negative. This conclusion assumes that $(A' + \mu E A'')$ is positive, which will always be the case for a Cobb-Douglas specification of $A(\cdot)$, and in general will always be the case when we are at low levels of μE, which is the case we are studying; we assume that in Latin America rural public expenditures are at a low level versus the potential expenditure. The sign of (19) may be reverted under low corruption.

The rationale of Prediction 5 is easy to follow. When total rural expenditure increases, it increases the marginal bribe, which makes an even lower μ optimal. Thus with high corruption, higher total rural expenditures will always be associated with a lower share of public good spending. This result may be reverted if total social welfare is highly valued.

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[10] $\partial^2 r(s,\mu)/\partial\mu\partial E$ can not be unambiguously signed. However, given our assumption of $\partial\chi/\partial\mu < 0$; also assuming third derivatives of π to be zero or sufficiently low, and assuming that we are at "low" levels of public investments (i.e. A' "high"), then $\partial^2 r(s,\mu)/\partial\mu\partial E$ can be shown to be positive.

IV.- The Allocation of Total Public Expenditure

The amount allocated to the urban sector is given to the producers of z in the form of a per unit rebate. In this case, the effective price faced by the producers of z is:

$$p^z = (1-t) + (1-\beta)t\ ^{11}. \tag{20}$$

The urban sector generates rents to the owners of a sector specific factor namely physical capital, according to the following profit function:

$$\Phi(1-\beta t, w^u) = \max_{z,L^u} \left\{ (1-\beta t)\cdot z - w^u L^u \right\}. \tag{21}$$

Again we assume that the profit function $\Phi(\cdot)$ is twice differentiable and w^u, is a government determined minimum wage only enforced in the urban areas. Also, without a fallback activity, unemployment in the urban world is possible.

Total urban welfare, thus, includes the rents of the owners of physical capital, labor income, and the consumer surplus in the urban world:

$$V^u(\beta) = \Phi(1-\beta t, w^u) + w^u L^u + L^u S(p^*), \tag{22}$$

where again we make the assumption that the amount of sector specific factor owners are so few that their consumer surplus is insignificant. Total welfare for the country, taking trade policy s, allocation of rural expenditures μ, international price p^*, and tax rate t as given, is:

$$W^T(\beta) = \pi\left(p^x, A(\beta\mu t\Phi_1(\cdot))\right) + \beta(1-\mu)t\Phi_1(\cdot) + A(\beta\mu t\Phi_1(\cdot))L^R + L^R S(p^*) + V^u.^{12} \tag{23}$$

Solving for the first order conditions of (23) we obtain that the second best optimal share of rural expenditures is:

$$\beta^* = \frac{-\Phi_1(\cdot) + \Phi_1(\cdot)A'(L^R + \pi_2(\cdot))}{t\Phi_{11}(\cdot)\left[A'(L^R + \pi_2(\cdot)) + (1-\mu)/\mu\right]}. \tag{24}$$

[11] Recall that the non agricultural good is the numeraire, hence its pre tax nominal value is 1.
[12] We assume welfare is concave over $\beta \in [0,1]$.

We assume $\beta *$ to be positive and within the unit range. Note that the only reason why β should be positive is that it funds a positive externality ($A' \cdot L_S$), as obviously, the hand-outs to the large farming sector are not optimal. As a matter of fact the higher the share of agricultural hand-outs $(1-\mu)/\mu$, the lower the $\beta *$ will be. Also, the optimal $\beta *$ is subject to the standard efficiency considerations: if the price supply elasticity of *z*, i.e. Φ_{11}, (that funds expenditures) is too high, there are higher efficiency losses; and therefore, the implicit taxation (which is what β is) should be lower.[13]

The government is also willing to deviate from the optimal $\beta *$ if it receives the incentives. So just like with μ, the government maximizes the following objective function:

$$G^T(\beta) = B^T(\beta) + \alpha W^T(\beta) \tag{25}$$

where $B^T(\beta)$ represents bribes. We could propose that both large farmers and industry owners propose bribes and compete for a convenient β. This competition would reduce the welfare surplus of the bidders (cf. Grossman and Helpmann (1993)), and the final β would be biased in favor of the larger (wealthier) group, i.e. the non agricultural sector. However, for simplicity we assume that in this game only industry owners offer a bribe schedule contingent on every possible β.

The structure of the game is the same as the bidding for the allocation of rural expenditures. Thus we refer the reader to the previous section, where we show that political equilibrium $\tilde{\beta}$ solves for:

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[13] Some authors argue that there exists a rural/urban continuum rather than a complete separation, and therefore rural wages affect urban wages and *vice versa* (see Fan et al., 2005, for example, and for empirical manifestations of this relationship see López and Anríquez , 2003). We explore the consequences of this assumption by working with urban wages equal to rural wages plus a fixed premium; i.e. $w^u = \gamma A(\cdot)$, with $\gamma > 1$. We do not show the results of working with this assumption to reduce the algebra; nonetheless, two interesting unambiguous results should be mentioned. First, the optimal β is larger, which follows from the fact that now rural spending also affects the welfare of all of the wage earners of the urban world. Also, the result of corruption in the rural spending decisions, μ, spills over to the urban world.

$$\frac{\partial G^T(\beta)}{\partial \beta} = \frac{\partial \Phi(1-\beta t, w^u)}{\partial \beta} + \alpha \frac{\partial W^T(\beta)}{\partial \beta} = 0 . \tag{26}$$

We can use (26) to explicitly solve for the corrupt allocation of public funds:

$$\tilde{\beta} = \frac{-\left(1+1/(\alpha\mu)\right)\Phi_1(\cdot) + \Phi_1(\cdot) A'(L^R + \pi_2(\cdot))}{t\Phi_{11}(\cdot)\left[A'(L^R + \pi_2(\cdot)) + (1-\mu)/\mu\right]} \tag{27}$$

Under corruption the amount of expenditure devoted to the rural sector is lower. This result appears from comparing (25) with (27), where the only difference between the expressions is that the numerator of (27) has an additional subtrahend: $1/(\alpha\mu) \cdot \Phi_1(\cdot)$. Several important predictions can be obtained from (27).

Prediction 6. Higher implicit tax rate *t*, reduces the share of public expenditures in the rural sector.

This result follows straightforwardly from expression (27).

Prediction 7. Higher non-agricultural output (tax base), increases the share of public expenditures in the rural sector.

This result holds if the denominator of (27) is positive (i.e. $\beta > 0$), which we assume. Note that the tax base is obviously the output of *z*, $\Phi_1(\cdot)$.

Prediction 8. Higher levels of corruption reduce the share of public expenditures in the rural sector.

This prediction also follows from (27), noting that an increase in corruption is equivalent to a reduction in α .

Prediction 9. The amount of public expenditures allocated to the rural world will, in general, be higher when the share of those expenditures invested in public goods (μ) is higher, unless the output elasticity of the urban sector is too high, or the labor demand elasticity of the large farm sector is too low.

This prediction can be reasonably made by inspecting the following expression (which is the result of totally differentiating (26):

$$\frac{d\tilde{\beta}}{d\mu} = \frac{\alpha\left\{(L^{R} + \pi_2)[(\Phi_1 - \beta t \Phi_{11})(A' + \mu\beta t \Phi_1 A'')] + (\Phi_1 - \beta t \Phi_{11})(\mu\beta t \Phi_1 A'^{2} \pi_{22} - 1)\right\}}{-\partial^2 G^T / \partial\beta^2} \gtrless 0 \quad (28)$$

In strict mathematical rigor expression (28) can not be signed. Note that the denominator is positive given the assumed concavity of the government's objective function. The numerator, however, can in general terms be signed. Inside the braces, the first element in parenthesis is of course labor in the small sector, which is positive. The next element in parenthesis is of undefined sign, but should be positive, if as we expect the output price elasticity of the urban sector is low. We expect this elasticity to be low, as is the case in general for broad aggregate goods. The third element in parenthesis can be re-written using the notation of the previous section: $(A' + \mu E A'')$, which we continue to assume is positive. Thus the first part of the numerator expresses why the whole expression should be positive, increase rural expenditure in public goods to cover the of rural labor positive externality. However, the second part of the numerator could be negative if the large farm sector labor demand elasticity is too low. If labor demand elasticity in the large farm sector is too low, the losses in large farm welfare, due to an increase in μ would be compounded by an increase in β, and therefore the sign of (28) could be reverted.

Prediction 10. Trade openness, for sufficiently high levels of corruption, reduces the share of total public expenditures in the rural world, β.

Note that trade opening reduces the subsidy in the agricultural sector, and therefore, reduces the price of the agricultural good, while implicitly increasing the relative price of the non agricultural good. The increased relative profitability of the non agricultural sector increase the power of the urban lobby forcing a reduction in the political equilibrium β. On the other hand, there is an indirect countervailing effect: trade liberalization in the agricultural sector reduces large farm labor demand, which in turn increases the public good externality (labor in the small farm sector), motivating an increase in β, as (27) shows. For sufficiently high corruption levels, the first direct effect should dominate.

V.- The Data

The data for public rural expenditures is the product of a FAO project of collecting and making comparable rural public expenditures in Latin America (FAO, 2005b). The project was coordinated by Latin America's regional office, but the local numbers where provided by the respective national ministries of Finance, Economy or Agriculture, depending on the country. The sample covers most of Latin American countries, 20 in total, including the Caribbean big Islands: Dominican Republic, Jamaica and Cuba. The data on rural spending is missing for Cuba, and El Salvador, and thus had to be dropped from the analysis. The case of Colombia is special, because it did not completely itemize its expenditure figures, making it difficult to create comparable division of public goods investment/ transfers to privates from their rural expenditure figures. We thus had to mostly drop Colombia from the analysis.[14]

The expenditure numbers are subdivided into 3 main categories: rural production promotion, rural infrastructure, and social services; and 31 subcategories. The job of identifying public investments from private transfers is mostly clear-cut, as López (2004) suggests, however there are some gray areas. In Table 1, we categorize expenditure items into 6 groups (and present their shares in total rural expenditures). Three of those categories can be assigned directly into subsidies or public investments: public and private, which represent clear-cut cases and the administrative costs, which can be assigned proportionally into each of the two categories once we define the total public goods investments and private transfers. The gray area fortunately represents only 17% of total spending, and among the gray we

[14] The final list of countries (17) included in our statistical analysis is: Argentina, Bolivia, Brazil, Chile, Costa Rica, Dominican Republic, Ecuador, Guatemala, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay, and Venezuela. The data is not complete for the period 1985-2001 for all the countries, so unbalanced panel techniques were used.

identify darker and lighter gray[15]. The 50/50 expenditures item are forestry and irrigation projects. The case of irrigation is contentious; López (2004) argues it should be treated as a transfer to privates, because of the way these investments usually work in Latin America, to the benefit of organized elites which can direct this type of infrastructure projects directly into their own benefit. On the other hand, this type of project has the potential of generating important non-excludable public benefits or even relieve poverty which is definitely a public good. Given this dichotomy, we include it in the 50/50 group, together with forestry projects. Promoting forest generates important environmental public benefits; however, in some cases they also act as transfers to privates. In Chile, for example, the replanting of pine forests owned by cellulose exporting private corporations is subsidized. Of course replanting is socially desirable, but the private operation is already profitable.

In the most likely public investments we include, spending items which could be viewed as social spending, or that help in poverty alleviation, but due to their highly targeted nature they can be used as transfers to privates. Finally as most likely private we qualify fishery promotion and integrated rural development projects which usually represent subsidies to given development paths as determined from above.

To make the final classification into private transfers versus public investment we added half of the 50/50 items to each type or rural expenditure, and with the other gray area items we used a 2/3 vs. 1/3 rule, while administrative costs where assigned proportionally. Given that our 50/50 and 2/3 vs. 1/3 rule are completely arbitrary we do provide sensitivity analysis of the results to varying weights of the gray area expenditure items.

The idea of openness is easier to conceptualize than to define or for that purpose to measure. The most popular openness indicator, extensively used in the literature, the ratio of total trade (exports plus imports) over GDP, has been criticized lately, because it tends to over

[15] Although the gray area items represent only 17% of total rural expenditures there is great variability across countries and important variability within time, which is what makes the statistical analysis possible.

emphasize the “openness” of small countries and diminish the “openness” of large countries. Large countries in area and population have more industry and produce more of the goods that smaller countries need to import, and although a large country may have intrinsically open policies and attitude just because of its size it would have less trade over GDP. To correct for this important bias we estimate an openness equation using trade over GDP (both from Word Development Indicators –WDI of the World Bank, and from the Penn World Table –PWT version 6.1) and use the prediction error as the indicator of openness. That is, countries for which the predicted level of trade given their income, size, population, port infrastructure and other observable exogenous characteristics is lower than the observed level of trade are more open than countries in which the opposite happens[16]. We also use an agricultural openness indicator, which is equal to the value of trade in agricultural goods as a proportion of the value of sectoral GDP[17]. In Table 2, we observe the implicit openness ranking for the different variables considered in this study.

The first four columns show the effect of using the constructed index instead of observed trade volumes. In the first two columns we observe that two of the largest Latin American economies, Brazil and Argentina have the lowest trade to GDP ratios. Once we correct for the economy size and other exogenous characteristics (third and fourth column), we find that Brazil is among the most open economies in the region, while Argentina appears as more open, but still among the more closed economies of the region.

The other “openness” measurement candidates are based on observed policies. How much tariffs and exports taxes are collected over the value of exports and imports. Export taxes are not a good candidate, because by the end of the 80’s almost all the countries in the sample had completely moved away from export taxes, leaving us without variability, although we accept that there is variability of the openness of the Latin American countries.

[16] A sample regression is available in Appendix 1.

[17] The source is FAO statistics, FAOSTAT, available at http://faostat.fao.org .

Import tariffs collected over the value of imports (that is observed effective tariff rate) is a very good candidate, but had to be eliminated from the statistical analysis because few countries disaggregate their trade revenues at this level. The third alternative, which we use in this study is trade revenues (taxes and tariffs) over the value of trade, i.e. effective barriers to trade.[18]

In Table 3, we show the correlation between the different openness measures. We would be delighted to see very high and positive correlations between the first 4 measures, and high and negative correlations between the last two measures and the first four. Unfortunately, as you can see this is not the case; which confirms that "openness" is not easy to measure. However, given the information in Table 3, we assign the PWT constructed index and the Agricultural openness index the label of preferred openness measurements because both are highly correlated with the other trade volume indicators and have the correct negative correlation with both of the objective trade barriers indicators.

Corruption is an even harder concept to measure. Although it is easy to identify venal behavior of public officers as corruption, objective measures are unavailable. The only consistent measure of corruption that covers the full geographic and time frames of this study is provided by the private firm Political Risk Services (PRS) Group. This variable that goes from 0 to 6, with 1 being the least corrupt in the region (Costa Rica), and 6 being the highest (Colombia). The variable is constructed using a set of objective questions and subjective country evaluations, and is supposed to measure the likelihood that high country officials demand special payments, and if bribes are expected at lower levels of government. Table 4, which ranks countries by decreasing order of corruption using the available corruption measures, shows that the PRS measure is more or less consistent with the more sophisticated World Bank measure, with the exception of Nicaragua, that appears with low corruption in

[18] The source for these policy based openness indicators are the *Government Finance Statistics Yearbook*(s) of the International Monetary Fund.

the PRS numbers, but with high corruption in the other two indicators. Given that the PRS corruption measure is the only consistent and complete measure, for the time horizon of our study, it is our preferred indicator.

Transparency International has a perceived corruption index based on national surveys, where local experts are asked about how serious is the problem of corruption. Although this is perceived and not effective corruption, it is probably preferred to the PRS numbers, unfortunately these indicators are only available from 1995 onwards; early reports include few countries; and most countries are not surveyed all years.

The World Bank has a new database on governance, which measures among other indicator of good governing practices, “control of corruption”, with a more sophisticated and consistent methodology, unfortunately it only has biennial data starting from 1996[19]. These two latter indicators reflect the growing importance that governance issues have been acquiring among the development community during the last decade. However, for this study that requires historical data, we will have to rely in the PRS measure. In the regression analysis we use the Transparency International and the World Bank figures to make comparisons, however to be able to use them we need to fill the missing data gaps at early stages of our study with country averages. This can *potentially* be done successfully, because the PRS data and history suggest that corruption varies little through time and much more across country, but that smaller time variation could be crucial. In Table 5 we present the correlation among the corruption measures. The high correlation between the World Bank and Transparency international figures is expected, because the World Bank uses Transparency International numbers as one of its key inputs. The table also shows that PRS corruption measure has the right correlation sign with the other indicators, but the correlation coefficient 0.53 is not as high as we would ideally like.

[19] Kaufmann et al., 2003.

The other variables used, like area, aggregate output measures, population disaggregated in rural/urban, share of labor in agriculture, telephone lines, and road network come from the World Bank's WDI database. The agricultural land inequality indicator was constructed from farm size GINI indicators from different sources: Jazairy et al. (1992), FAO (1997), FAO (2005a), and INE (1998). Finally, the sea/fluvial port availability information was obtained from the World Shipping Register[20].

VI.- Empirical Model and Results

We test the assertions of the theory presented above by fitting with the data from Latin American countries a random effects regression model (Balestra and Nerlove, 1966):

$$\begin{aligned} \mu_{i,t} &= \Gamma_1{}'W_1 + \omega_{1,i,t} \\ \beta_{i,t} &= \Gamma_2{}'W_2 + \omega_{2,i,t} \end{aligned} \qquad (29).$$

Here μ and β, as defined above, represent the share of public rural investment in total rural expenditure, and the share of rural spending in total public expenditure respectively. The subscripts *i, t* represent country and time dimension respectively. Γ_j represents a vector of estimated coefficients, and W_j is a vector of exogenous variables that determines the expenditure shares as identified by our political economy model. The mean zero random disturbances $\omega_{j,i,t}$ are assumed to be orthogonal to the vector of exogenous regressors and to have the following structure: $\omega_{j,i,t} = u_{j,i} + \varepsilon_{j,i,t}$, with $\mathrm{E}[u_{j,i}] = 0$, $\mathrm{E}[\varepsilon_{j,i,t}] = 0$, $\mathrm{E}[u_{j,i}{}^2] = \sigma_{uj}^2$, $\mathrm{E}[\varepsilon_{j,i,t}{}^2] = \sigma_{\varepsilon j}^2$, $\mathrm{E}[u_{j,i}u_{j,k}] = 0$, $\forall\ i \neq k$, $\mathrm{E}[u_{j,i}u_{k,m}] = 0$ $\forall j \neq k, i, m$ $\mathrm{E}[\varepsilon_{j,i,t}\varepsilon_{j,k,s}] = 0$ $\forall i \neq k \wedge t \neq s$. The random effect component $u_{j,i}$ captures country specific differences not included in the control vector of exogenous regressors. Furthermore, to improve the efficiency of the estimators we assume that there is correlation among the errors of both equations, which can also be justified given that both ratios are part of the same process of fund

[20] Information available at http://www.world-register.org/.

allocation; thus as in a Seemingly Unrelated Regression Model (Zellner, 1962), we assume: $E[\varepsilon_{1,i,t}\varepsilon_{2,k,s}] = \sigma_{12} \quad \forall i = k \wedge t = s$.

Theory and Practice of Econometrics

The shares we are estimating enter directly or indirectly as a regressor in each others equation. In the previous section we used the working hypothesis that these shares where chosen separately so they are in a sense exogenous. This is a simplifying assumption, not a theory, so in principle we should have to test if these shares can in fact be used as exogenous variables.

We use a Hausman-Wu test in each equation to test if the share is an exogenous regressor (see Baum et al., 2003). The tests indicate that the share of rural expenditures in total public expenditures (β) is an exogenous regressor in the estimation of the share of public good investments in total public rural expenditures (μ). The opposite is not true, the null hypothesis of exogeneity of the share of public goods investments in the rural world in the determination of total rural expenditures is clearly rejected. Therefore, in the second equation we have to use predicted (with an instrumental equation) share of rural public good expenditures. Hence we end up using a three stage random effects (3SRE) estimation technique. In the first stage we estimate instruments, in the second stage independent equations are estimated to calculate cross equation correlation, and in the third stage this information is used to estimate equations jointly.

One benefit of applying the Hausman-Wu test is that this exogeneity test in the context of instrumental variables is a general test of orthogonality of the error. Thus, the exogeneity test is also a general test of specification and for example can be interpreted as a test of heteroscedasticity that is explained by the regressors of the other equation, which with the instruments used can be safely rejected.

Share of Public Investments (μ)

We proceed to examine each equation separately. We begin with the share of public investment in total rural expenditure (μ). The vector of exogenous variables includes the openness and corruption measures, the focus of our study. We also include the cross-product of openness and corruption measure which is found to be important in the previous section (see Prediction 4). We control for differences in level of development among countries by including an income measure, we use non-agricultural GDP per capita. We recognize that this variable is endogenous, so we use predicted non-agricultural GDP per capita (the regression used for this prediction is presented in Appendix 2). Our model predicts that the size of the large farmers' sector, i.e. the lobby group that bids for private subsidies, determines the ratio of rural public investment. Obviously a direct measure of the relative size of the large farm sector size does not exist, but a measure of inequality of farm size can be used as proxy. We use farm size GINI as an indicator of the relative size of large farms. This is probably a good proxy choice, but its measurement is less than ideal, we can only find one observation per country from different sources and years, and consistent methodology can not be guaranteed. The relative size of labor in small farm production (which suffers from the public good externality) is proxied by the share of labor in agriculture. Finally, we include total rural expenditures *E*, which our model describes as determining the ratio of rural public investment. We acknowledge that this variable could be endogenous, as it is determined by the endogenous β. As explained above, we performed an exogeneity test and did not reject the null hypothesis; thus for purpose of rural expenditure allocation, the total amount of total rural funds available may be taken as exogenous.

The amount of funds allocated to each rural expenditure account can vary considerably from one year to another. For example, one big rural infrastructure project may increase for one year the public investments account and reduce the private subsidies, while in the long run manifest a bias in favor of subsidies. That is why to really disentangle the public policy preferences we need to look at medium term averages and not yearly figures. Five year averages seem a reasonable time horizon; however, to manage the trade off between short term bias, and availability of observations, we choose to use four year averages for all the variables in the estimation (5 year averages are used in the sensitivity analysis).

In Table 6 we present the results of estimating the public investment share equation. The 3 different regressions represent the use of our preferred openness measure with the three different corruption measures; with our preferred corruption measure in the first column.

The income/development control variable is consistently positive and significant across estimations. This means that controlling for the level of corruption, openness of the countries, and the total rural expenditures, richer countries tend to invest a greater share of their rural public expenditures in public goods. This result is a bit discouraging, because it is precisely the poorer countries that need to make heavier investments in public goods, especially public infrastructure that carries a heavy bill.

Our empirical model predicts (Prediction 2) that the relative size of the large farm negatively affects the share of public investment due to political economy considerations. We find that the land inequality, measured by farm size GINI, has the expected negative sign, but it is not significant (almost significant in column 3). We speculate that this has to do with the fact that this indicator is inconsistently measured, and more importantly, due to data availability is time invariant. We expect little time variation in land distribution through time, but in the course of 16 years these small changes can make the statistical difference. On the other hand, the size of labor in small farm production in our model determines the size of the public externality, and therefore according to Prediction 3, is positively correlated with μ. Our proxy, share of labor in agriculture (which is not the same of share of small farm production in agriculture) has the correct positive sign, but is also not significant.

The effect of corruption on the share of public rural investment is in general not significant, and even with the wrong sign (positive) according to Prediction 1[21]. Before attempting an explanation for this result contrary to the theory let us examine Predictions 4 and 5.

Prediction 4 says that the marginal effect of trade openness on the share of rural public investments will be negative, unless there is high corruption in which case the effect of openness can be positive. Table 6 shows that the estimated marginal effect of trade openness in the share of public rural investments is positive and significant. Prediction 5, says that unless corruption is too high, the effect of total rural expenditures on the share of public investments should be positive. Table 6 shows that the measured effect of total rural expenditure is negative and significant. Altogether, Predictions 4 and 5 point to a "high" level of corruption in the allocation of total rural funds.

We stop to recognize what would be the Predicted effects of openness, if the agricultural was anti-protected, instead of a protected sector as we assume in the model above. In this case the sign of Prediction 4 would be reverted, but not the sign of prediction 5. So even if our modeling was inadequate the signs of "high" corruption would remain. Furthermore, in the next section we show that empirically, trade openness is correlated with lower agricultural output which is consistent with agriculture being a protected sector overall for Latin America in the time frame of our study, i.e. abandonment of the industry protection/import substitution development paradigm after the 1982 crisis. Thus, although the marginal effect of corruption is not negative and significant as predicted by theory; the indirect evidence points to a "high" degree of corruption in the allocation of rural expenditures. Different explanations may be given to this result. On one hand, the level of corruption may be so high that the marginal effect is zero. Another possibility is that the used

[21] Note that corruption appears in more than one coefficient. The marginal effect of both corruption and openness, and its standard error are presented in Table 6 below the coefficients.

corruption indicators do not measure corruption at the rural level. We incline, recognizing our ignorance, to the latter explanation.

Share of Total Rural Expenditures (β)

The vector of exogenous variables used to estimate the equation of the share of rural expenditures in total public expenditures (β) includes the openness and corruption measures. We also include the (predicted) non-agricultural output per capita, identified in our theory as the tax base. We control for the size of the agricultural sector with the (predicted) agricultural income per capita, and the rurality of the country (i.e. share of rural population). To control for the tax rate, identified in the model, we use log of total public expenditures. Finally we include in the exogenous vector the predicted share of rural public investments, after a Hausman-Wu test clearly rejected the null hypothesis of exogeneity of this share.

The results of estimating the share of rural expenditures in total public expenditures equation is presented in Table 7. Prediction 6 forecasts a negative correlation between the implicit tax rate in the economy and the share of rural expenditure. This correlation is statistically corroborated: the sign of the coefficient of total rural expenditure is negative as predicted in all estimations, and significant in the first two columns. Prediction 7, which indicates that the non-agricultural sector as the tax base is positively correlated with the share of rural public expenditures is also supported by the data. The sign on the coefficient is generally positive and significant except for the first column.

As predicted by theory (Prediction 8), corruption reduces the share of rural expenditures. Consistently, the marginal effect of corruption is negative and significant except in the second column where the corruption indicator is transparency international corruption perception measure. We interpret the fact that the marginal effect of corruption is significant in the other estimations as an indication that the time variability (mostly absent in the

Transparency International figures) is essential for the negative statistical correlation between corruption and the amount funds directed to the rural world.

Prediction 9, of our empirical model is not corroborated by the data. The model indicates that, unless secondary effects dominate (determined by a high price elasticity of non agricultural output and/or a low large farm labor demand elasticity) an increase in the share of public good investment (μ) should increase the share of total rural expenditures (β). This prediction is strongly rejected by the data. The rejection is so strong, that it is rather unlikely that the secondary effects of our model actually dominate. More likely, the data reveals a weakness of the proposed model, because it does not consider possible tradeoffs in the final public rural investments bill between μ and β (recall that that rural public expenditures are $\mu\beta tz$). When the share of public expenditures in total rural expenditures goes up, less rural expenditure is "needed" to fund the public good externality; therefore, the share of total rural expenditure can be lower while achieving the same public investment level.

Finally, Prediction 10 which establishes that openness, under corruption, should be correlated with a reduction in the share of rural expenditures is in general in general corroborated by the data. The marginal effect of trade openness is negative and significant in the second and third columns.

VII. The Costs Corruption

It has been previously found by López (2004) that the composition of rural spending matters for agricultural growth and rural development. The author found that for a given amount of rural spending a higher ratio of private goods spending negatively affects agricultural output. In this study, however, we recognize that the allocation of rural spending between private and public goods is the result of a political equation. In the previous section, we showed that as a result of corruption the total amount of funds allocated to the rural world are less than what would be optimal, reducing the funds for both private subsidies and public goods spending in the rural world. We also showed that there is evidence of a “high” level of corruption in the allocation of rural funds. We did not empirically observe corruption reducing the share of public goods. However in this respect the political economy theory is very clear. When there is corruption and public policy may be skewed by lobby groups, policy will skew in favor of private subsidies not public investments. The characteristic of successful lobby groups are met by large private farmers and not by the rural poor who benefit most from public investment[22].

So given that the allocation of rural funds is endogenous, is agricultural output still negatively correlated with private goods spending, or is this a spurious correlation due to endogeneity in the allocation of those funds? We explore this question in Table 8. In the first column, we make an Maximum Likelihood Random Effects estimation of agricultural GDP per capita, explained by total rural public expenditures and (predicted) non agricultural GDP per capita, and controlling for the composition of the rural spending; and also controlling for openness, and rurality. The table shows that the endogeneity of rural expenditures decisions plays a determinant role in the effect on agricultural development of both: total public rural expenditures and the composition of those expenditures.

The results are quite dramatic. In the first column where we use observed data, we find that total rural expenditures have no effect on agricultural development (even the wrong sign); and the composition of public expenditures (more public goods) seems to affect positively agricultural growth, but this effect is not statistically significant. In columns 2 and 3, where we used predicted levels, that control for corruption and other control variables, we see that the composition of public goods does matter for agricultural development a: higher share of investments in public goods (accompanied by a reduction in private subsidies) positively determines agricultural development. Total rural expenditures, as well, are

[22] See Olson (1965). Successful lobby groups are small groups (lower costs of organizing) with clear and common interests; and have the economic means to bribe, or legally fund political campaigns.

positively correlated with rural development, but only after one controls for the endogeneity of this expenditure decisions.

There are two ways to interpret these strong results. Corruption causes less funds to arrive to the rural world, and causes these funds to be biased in favor of private subsidies, both of which are correlated with lower effectivity (in terms of rural development) of public spending; therefore, the observed empirical effect of public spending is lower and not significant precisely because of corruption. The second view is that if corruption was not widespread in the continent, governments would have been much more effective at achieving agricultural growth and rural development.

VIII.- Sensitivity Analysis

The main sensitivity analysis has to be performed around our arbitrary assumption about expenditure assignments. We identified gray area items and we used different rules to allocate them to the public goods and private subsidies accounts. The obvious way to test the effects of our arbitrary assumptions is to work with the extremes, assign all gray area expenditures to the private subsidies account and then to the public goods account. In Table 9 we show the effects of these changes in the rural development equation. We see that when the gray area items are added to the private subsidies account, the marginal effect of public investments becomes higher (column 1), than when these items are added to the public investments account (column 3), but none of this coefficients is significant. Perhaps the most important finding is that, after controlling for the endogeneity of the composition of rural spending, the composition of rural spending significantly affects agricultural growth (columns 2 and 4). Of course the level of the effect changes, but not the direction or significance. We interpret these results as corroborating that it is the unambiguously public investment component of the public goods investment account which drives this important result.

In the political economy equations we note that the effect of corruption does not change in the equations after changing the rural expenditure shares, but the effect of openness changes. In the equation of rural expenditure composition, the effect of openness is not significant when all gray area items are considered private, but has a higher and significant effect when gray area items are considered as all public.

In the equation that estimates the share of total rural public expenditure (β), we explored the effects of changing the openness variable. We used both predicted trade openness from the WDI trade shares, and the observed effective barriers to trade (tariff and export taxes revenues over the value of trade). We discover that the main results of that equation are robust. Corruption negatively determines the amount of rural funds, and openness also reduces the observed β.

Finally, we discuss the effects of changing the selected time frames. We changed the time frame from 1986-2000 to 1985-1999 and 1987-2001, with no significant changes in the results. We also changed the four year averages to five year averages. Here we noticed important changes, but it is hard to really disentangle how much of the changes are due to changing the time averages, and what is due to using three observations in the time horizon instead of four (which reduces available observations from 65 to 48 per equation). In the rural development equation we notice that the coefficient of expenditure composition does not significantly change (neither using observed nor predicted values), but its precision is significantly reduced. Using predicted values, the coefficient is marginally significant. Similar results can be observed in the expenditure shares equations, no significant changes in the coefficient values, but a general reduction in precision. However, the main results presented in the previous section persist: corruption reduces the amount of funds assigned to the rural world, and openness is positively correlated with the share of rural public good investments.

IX.- Conclusions

Two important and robust results may be extracted from this study. First, corruption has had observable effects in the allocation of public funds in Latin America. Countries with higher levels of corruption consistently allocate a lower share of their public funds to the rural world. The second result is that the composition of these rural expenditures and its political endogeneity matters: countries that invest a greater share of their rural funds in public goods, and at the same time reduce private subsidies, have higher rural income as proxied by agricultural output. This latter result can only be confirmed after controlling for the endogeneity of the political decision of allocating funds, which confirms that if corruption were lower, public expenditures would be more effective in achieving rural income growth and development.

We also found that total rural expenditure positively affects agricultural income, but this result is dependant to the way in which we classify and define public spending. Nonetheless, the marginal effect although not always significant is always larger once the endogenous component of total rural expenditures is accounted for.

The results of this empirical analysis have important implications for policy design and for the development community. First, the growing importance that development agencies like the World Bank have been assigning to governance issues seems justified. Corruption, obviously is bad from the perspective of deviating policy from the social optimal. This result seems quite obvious; however, if the effects of corruption have consequences for development, the harm is compounded over time. Finally, the usual policy recommendation of investing in public goods like infrastructure and human capital can be again supported by our study. However, our analysis not only suggests were to add spending, but it indicates where to cut it from.

References

Balestra, Pietro and Marc Nerlove, “Pooling cross section and time series data in the estimation of a dynamic model: the demand for natural gas,” *Econometrica*, 34:585-612, (1966).

Baum, Christopher; Mark Schaffer; and Steven Stillman, “Instrumental Variables and GMM: Estimation and Testing,” Working Paper No. 545, Department of Economics, Boston College, Boston, 2003.

Damania, Richard; Per Fredriksson; John List; “Trade Liberalization, Corruption, and Environmental Policy Formation: Theory and Evidence” *Journal of Environmental Economics and Management*, 46:490-512, (2003).

FAO (1997), *Report on the 1990 World Census of Agriculture*, FAO, Rome, 1997. Data also available at: http://www.fao.org/es/ess/census/default.asp .

FAO (2005a) *FAO Statistical Yearbook 2004*, FAO, Rome, 2005.

FAO (2005b), *GPRural. Base de Datos de Estadísticas e Indicadores de Gasto Público Agrícola y Rural*, FAO Regional Office for Latin America and the Caribbean, Santiago, Chile, 2005. Available at: http://www.fao.org/Regional/LAmerica/prior/desrural/gasto/presentacion.asp .

Fan, Shenggen; Connie Chan-Kang; and Anit Mukherjee, “Rural and Urban Dynamics and Poverty: Evidence from China and India,” IFPRI, Food Consumption and Nutrition Division, Discussion Paper 196 (2005).

International Monetary Fund (IMF), *Government Finance Statistics Yearbook*, issues: 1990-2003, IMF, Washington DC.

Instituto Nacional de Estadísticas INE (1998), *VI Censo Nacional Agropecuario 1997*, Santiago, Chile, 1998.

Jazairy,Idriss; Mohiuddin Alamgir; and Theresa Panuccio (1992), *The state of world rural poverty: An inquiry into its causes and consequences*, New York University Press for the International Fund for Agricultural Development IFAD, New York, 1992.

Kaufmann, Daniel; Aart Kraay; Massimo Mastruzzi, “Governance Matters III: Governance Indicators for 1996-2002,” World Bank, Washington DC, (2003).

López, Ramón, “Effect of the Structure of Rural Expenditures on Agricultural Growth and Rural Poverty in Latin America,” IADB, Paper RUR-04-01, Washington DC, (2004).

López, Ramón; and Gustavo Anríquez, “Poverty and Agricultural Growth: Chile in the 1990s”, ROA Project, FAO, (2003).

Olson, Mancur, *The Logic of Collective Action: Public Goods and the Theory of Groups*, Harvard University Press, Cambridge MA, (1965).

Zellner, Arnold, “An Efficient Method of Estimating Seemingly Unrelated Regressions and Tests of Aggregation Bias,” *Journal of the American Statistical Association*, 57: 348-368 (1962).

Table 1 Rural Expenditure Categories Assignment

(Category Shares of Total Rural Expenditure in Parenthesis)

Private (36.87)	**Public (21.26)**	**50/50 (8.48)**	**More Likely Private (3.67)**	**More Likely Public (5.04)**	**Administrative Costs (24.69)**
Internal and External Marketing	Research and Development and Technology Transfer	Irrigation Infrastruc-ture	Integrated Rural Development Programs	Regularization of Agricultural Property	Administrative Costs
Focalized Rural Production Promotion	Soil Water and Natural Resources Conservation	Forestry Promotion	Fishery Promotion	Housing	
	Plant and Animal Species Protection			Regularization of Water Property Rights	
	Communication Infrastructure			Infrastructure for Social Institutions	
	Public Roads			Land Purchases and Expropriations	
	Rural Electrification Projects				
	Drinking Water for Rural Communities				
	Total Social Services (Health and Education)				

Table 2 Openness Indices Ranking
(1985-2001 averages in decreasing order)

	(X+M)/ GDP PWT	(X+M)/ GDP WDI	(X+M)/ GDP PWT Prediction Error	(X+M)/ GDP WDI Prediction Error	Effective Barrier To Trade	Effective Import Tariff	(Ag. X + Ag. M) / Ag. GDP
1	Jamaica	Panama	Jamaica	Panama	Mexico	Mexico	Jamaica
2	Honduras	Jamaica	Paraguay	Jamaica	Brazil	Chile	Costa Rica
3	Nicaragua	Costa Rica	Nicaragua	Brazil	Bolivia	Nicaragua	Honduras
4	Panama	Honduras	Honduras	Costa Rica	Nicaragua	Brazil	Panama
5	Costa Rica	Dominican Republic	Panama	Paraguay	Jamaica	Bolivia	Uruguay
6	Paraguay	Paraguay	Brazil	Honduras	Chile	Jamaica	Nicaragua
7	Dominican Republic	Nicaragua	Costa Rica	Chile	Venezuela	Guatemala	Argentina
8	Venezuela	Chile	Venezuela	Dominican Republic	Uruguay	Paraguay	Ecuador
9	Chile	Ecuador	Chile	Venezuela	Ecuador	Costa Rica	Dominican Republi
10	Ecuador	Venezuela	Dominican Republic	Bolivia	Guatemala	Uruguay	Chile
11	Mexico	Bolivia	Bolivia	Ecuador	Paraguay	Ecuador	Mexico
12	Bolivia	Mexico	Argentina	Nicaragua	Colombia	Argentina	Paraguay
13	Guatemala	Guatemala	Ecuador	Argentina	Costa Rica	Venezuela	Venezuela
14	Uruguay	Uruguay	Mexico	Mexico	Peru	Panama	Guatemala
15	Colombia	Colombia	Peru	Peru	Argentina	Peru	Brasil
16	Peru	Peru	Uruguay	Uruguay	Panama	Dominican Republic	Peru
17	Argentina	Argentina	Guatemala	Guatemala	Dominican Republic		Bolivia
18	Brazil	Brazil	Colombia	Colombia			

Table 3 Openness Indices Correlation

	(X+M)/ GDP PWT	(X+M)/ GDP WDI	(X+M)/ GDP PWT Predicted	(X+M)/ GDP WDI Predicted	Effective Barrier To Trade	Effective Import Tariff	(Ag. X + Ag. M) / Ag. GDP
(X+M)/GDP PWT	1						
(X+M)/GDP WDI	0.720	1					
(X+M)/GDP PWT Predicted	0.769	0.503	1				
(X+M)/GDP WDI Predicted	0.454	0.833	0.593	1			
Effective Barrier To Trade	0.009	0.205	-0.097	0.126	1		
Effective Import Tariff	-0.058	0.106	-0.155	0.030	0.892	1	
(Ag. X + Ag. M) / Ag. GDP	0.588	0.508	0.355	0.364	-0.008	-0.074	1

Table 4 Corruption Measures Ranking (Averages 1998-2000)

In decreasing order

	PRS Group		Transparency International	World Bank
1	Costa Rica	(1)	Chile	Chile
2	Chile	(2)	Costa Rica	Costa Rica
3	Dominican Republic	(2)	Peru	Uruguay
4	Guatemala	(2)	Uruguay	Brazil
5	Nicaragua	(2)	Brazil	Peru
6	Bolivia	(3)	El Salvador	Jamaica
7	Brazil	(3)	Jamaica	El Salvador
8	Ecuador	(3)	Mexico	Argentina
9	Jamaica	(3)	Argentina	Cuba
10	Peru	(3)	Guatemala	Panama
11	Uruguay	(3)	Nicaragua	Mexico
12	Venezuela	(3)	Colombia	Dominican Republic
13	Argentina	(4)	Bolivia	Colombia
14	Mexico	(4)	Venezuela	Bolivia
15	Honduras	(5)	Ecuador	Venezuela
16	Panama	(5)	Honduras	Guatemala
17	Paraguay	(5)	Paraguay	Honduras
18	Colombia	(6)		Nicaragua
19				Ecuador
20				Paraguay

Note: Figures in Parenthesis Indicate ranking. Several countries have the same ranking as PRS measures corruption in integers from 0 to 6.

Table 5 Correlation of Corruption Measures

	PRS Group	**Transparency International**	**World Bank**
PRS Group	1		
Transparency International	0.532	1	
World Bank	0.535	0.932	1

Table 6 Share of Public Investment in Total Rural Expenditure (μ)

	(1)	(2)	(3)
Corruption (PRS Group)	7.412** (3.075)		
Corruption (Transparency International)		6.994 (4.393)	
Corruption (World Bank)			24.784** (11.066)
Agricultural Openness Index	0.346** (0.151)	0.642** (0.272)	0.217*** (0.073)
Corruption * Openness	-0.058 (0.038)	-0.076** (0.040)	-0.240** (0.106)
Log of Predicted Non Agricultural Output per Capita	21.188* (11.187)	18.958** (10.436)	18.877* (10.378)
Land Inequality (GINI)	-56.141 (53.839)	-57.487 (50.113)	-63.109 (49.628)
Share of Labor in Agriculture	0.479 (0.414)	0.405 (0.393)	0.422 (0.387)
Log of Total Rural Expenditures (βT)	-1.681 (2.427)	-4.030* (2.078)	-3.410* (2.065)
Constant	-91.804 (97.718)	-80.374 (97.054)	-41.695 (89.361)
$\partial\mu/\partial$(openness)	0.169*** (0.072)	0.146*** (0.066)	0.152*** (0.065)
$\partial\mu/\partial$(corruption)	3.171 (1.993)	1.479 (3.397	7.384 (7.743)
Std. Error Group Effects (u_i)	18.144	17.861	17.543
Std. Error Individual Effects ($\varepsilon_{i,t}$)	5.987	6.038	6.063
Group Size (Min.; Avg.; Max)	3; 3.8; 4	3; 3.8; 4	3; 3.8; 4
Combined $\tilde{R}^2$	0.96	0.96	0.96
Groups; Total Observations	17; 130	17; 130	17; 130

Note: (***) Indicates 99% significance level; (**) indicates significance at 95% level; (*) indicates significance at 90% level.

Table 7 Share of Rural Expenditures in Total Public Expenditure (β)

	(1)	(2)	(3)
Corruption (PRS Group)	-1.884** (0.839)		
Corruption (Transparency International)		-1.002 (1.452)	
Corruption (World Bank)			-6.183* (3.250)
Openness Index (Constructed from Penn World Tables)	-0.106 (0.070)	-0.728*** (0.180)	-0.134*** (0.035)
Corruption * Openness	0.028 (0.023)	0.100*** (0.026)	0.225*** (0.048)
Log of Predicted Non Agricultural Output per Capita (z)	0.042 (6.208)	9.538 (5.908)	9.576* (5.508)
Log of Predicted Agricultural Output per Capita	7.913 (7.106)	3.359 (7.112)	-0.090 (6.627)
Predicted Share of Public Investments in Total Rural Expenditures ($\hat{\mu}$)	-0.478*** (0.107)	-0.460*** (0.116)	-0.435*** (0.109)
% Rural	-0.021 (0.212)	0.281 (0.227)	0.391* (0.214)
Log Total Public Expenditures (T)	-2.906** (1.284)	-2.913* (1.634)	-2.325 (1.539)
Constant	27.829 (60.531)	-31.174 (59.761)	-27.566 (54.725)
$\partial\beta / \partial$(openness)	-0.020 (0.031)	-0.075** (0.031)	-0.073** (0.029)
$\partial\beta / \partial$(corruption)	-1.808** (0.855)	-0.732 (1.440)	-5.576* (3.247)
Std. Error Group Effects (u_i)	5.57	8.89	8.67
Std. Error Individual Effects ($\varepsilon_{i,t}$)	2.27	2.51	2.35
Group Size (Min.; Avg.; Max)	1; 3.8; 4	1; 3.8; 4	1; 3.8; 4
Combined $\tilde{R}^2$	0.96	0.96	0.96
Groups; Total Observations	17;122	17;122	17;122

Note: (***) Indicates 99% significance level; (**) indicates significance at 95% level; (*) indicates significance at 90% level.

Table 8 Agricultural GDP per Capita

	(1)	(2)	(3)
Log Total Rural Public Expenditures	-0.008 (0.060)	0.094* (0.056)	
Log of Predicted Total Rural Public Expenditures ($\hat{\beta}T$)			0.100** † (0.049)
Share of Public Investments in Total Rural Expenditures (μ)	0.157 (0.350)		
Share of Predicted Public Investments in Total Rural Expenditures ($\hat{\mu}$)		2.094*** † (0.699)	1.483*** † (0.466)
Openness Index (Constructed from Penn World Tables)	-0.205 (0.226)	-0.359** (0.147)	-0.271** (0.144)
Log of Predicted Non Agricultural Output per Capita	0.076 (0.381)	0.005 (0.231)	0.005 (0.228)
% Rural	-0.272 (1.480)	0.469 (0.990)	0.506 (0.986)
Constant	4.989 (3.499)	3.357 (2.159)	3.247 (2.130)
Std. Error Group Effects (u_i)	0.420	0.430	0.446
Std. Error Individual Effects ($e_{i,t}$)	0.202	0.101	0.099
Group Size (Min.; Avg.; Max)	3; 3.8; 4	3; 3.8; 4	2; 3.7; 4
Log-Likelihood	4.14	20.63	19.52
Groups; Total Observations	17;65	17;65	17;63

Note: (***) Indicates 99% significance level; (**) indicates significance at 95% level; (*) indicates significance at 90% level. (†) Indicates coefficient is statistically different (95% level) from first column estimation.

Table 9 Agricultural GDP per Capita. Sensitivity Analysis of the Definition of Rural Expenditure Shares

	Assignment of Gray Area Expenditure Items			
	All Private		**All Public**	
	(1)	**(2)**	**(3)**	**(4)**
Log Total Rural Public Expenditures	-0.018 (0.056)		-0.019 (0.057)	
Log of Predicted Total Rural Public Expenditures ($\hat{\beta}T$)		-0.031 (0.057)		0.046 (0.045)
Share of Public Investments in Total Rural Expenditures (μ)	0.109 (0.239)		0.080 (0.322)	
Share of Predicted Public Investments in Total Rural Expenditures ($\hat{\mu}$)		4.023*** (0.683)		1.176** (0.568)
Openness Index (Constructed from Penn World Tables)	-0.208 (0.219)	-0.503*** (0.175)	-0.204 (0.219)	-0.197 (0.144)
Log of Predicted Non Agricultural Output per Capita	0.110 (0.382)	-0.159 (0.274)	0.078 (0.376)	0.116 (0.275)
% Rural	-0.145 (1.483)	-0.301 (1.007)	-0.275 (1.449)	0.613 (1.142)
Constant	4.804 (3.493)	5.537** (2.432)	5.073 (3.428)	2.902 (2.482)
Std. Error Group Effects (u_i)	0.418	0.302	0.418	0.450
Std. Error Individual Effects ($e_{i,t}$)	0.201	0.138	0.201	0.107
Group Size (Min.; Avg.; Max)	3 ; 3.9 ; 4	2 ; 3.8 ; 4	3 ; 3.9 ; 4	2 ; 3.6 ; 4
Log-Likelihood	4.89	28.76	4.70	15.37
Groups; Total Observations	17 ; 66	17 ; 64	17 ; 66	17 ; 62

Note: (***) Indicates 99% significance level; (**) indicates significance at 95% level; (*) indicates significance at 90% level.

Appendix 1
Construction of Openness Index
Dependent Variable is (Exports + Imports)/GDP – Source WDI, World Bank

	Coefficient	**Std. Error**	**Z-Stat**
Log of Predicted GDP per Capita	-54.45	27.48	-1.98
Square of Log of Predicted GDP per Capita	2.79	1.83	1.52
Population	4.06E-07	2.42E-07	1.68
Area	-1.45E-05	5.09E-06	-2.84
Paved Roads Network	0.13	0.15	0.90
Sea/Fluvial Ports	0.17	0.46	0.37
Telephone Lines / 1,000 Inhabitants	0.10	0.04	2.74
Value of Fuel Exports	-9.48E-05	7.11E-05	-1.33
% Rural	0.17	0.38	0.44
Constant	296.75	104.93	2.83
Autocorrelation Coefficient	0.71		

Standard Error of Group Effect (u_i) = 19.05

Standard Error of Individual Effects ($e_{i,t}$) = 7.57

Number of Observation = 289
Group Size: Average =17 ; Min. = 17 ; Max. =17
$\tilde{R}^2$ = 0.52

Appendix 2
Predicting Non-Agricultural GDP

Dependent Variable is Non-Agricultural GDP per Capita

	Coefficient	**Std. Error**	**Z-Stat**
Predicted Agricultural GDP Per Capita	12.386	14.911	0.83
Area	4.70E-04*	2.71E-04	1.74
Openness Index	4.845	8.270	0.59
Telephone Lines / 1,000 Inhabitants	2.324	2.032	1.14
Crude Oil Output	0.344	0.349	0.99
Population	-2.01E-05*	1.17E-05	-1.71
% Rural	-57.449***	11.872	-4.84
Paved Roads Network (1000's Km)	14.679**	6.721	2.18
Constant	314.337	4025.181	0.08
Autocorrelation (AR1) Coefficient	0.171		

Standard Error of Group Effect (u_i) = 581.284

Standard Error of Individual Effects ($e_{i,t}$) = 557.174

Number of Observation = 289
Group Size: Average =17 ; Min. = 17 ; Max. =17
$\tilde{R}^2$ = 0.73

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