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Rent-Seeking Distortions and Fiscal Procyclicality

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Abstract

Recent research has demonstrated that while government expenditures are countercyclical in most industrialized countries, they tend to be procyclical in developing countries. We develop a dynamic political-economy model to explain this phenomenon. Simulations of the model allow us to quantitatively compare the relative role of common explanations for fiscal procyclicality. We conclude that rent seeking within the fiscal process can explain fiscal procyclicality better than other common explanations, such as borrowing constraints and macroeconomic volatility. (JEL E62, D72, F41)

It has been observed that fiscal policies differ greatly across income lines. Fiscal policies in almost all high-income countries are countercyclical[1], reflected in countercyclical government expenditures and deficits, and procyclical tax revenues. Fiscal behavior in developing countries is quite different. Whether in

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[1] Throughout this paper, procyclicality or fiscal procyclicality will refer to some combination of procyclical deficits, procyclical government expenditures, and countercyclical tax rates. The focus will mainly be on government expenditures. Countercyclical polices are a combination of countercyclical deficits, countercyclical government expenditures, and procyclical tax rates. Data is from the International Monetary Fund's World Economic Outlook database from 1970 to 2003.

Latin America (Gavin and Perotti, 1997) or elsewhere in the developing world (Kaminsky, Reinhart and Vegh, 2004), governments tend to spend and borrow more as economic conditions improve. That is, they conduct procyclical fiscal policies.

The objective of this paper to provide a theory of fiscal cyclicality that takes into account the basic stylized facts of fiscal policy in high-income and developing countries. We will see that the difference across income lines in the conduct of fiscal policy is mainly on the expenditure, not the revenue side of the ledger. Particularly, there is are indications that government transfers are the main countercyclical component of spending in high-income countries.

Since social-insurance programs make up a large share of government transfers in high-income countries, we find it realistic to model the cyclical component of government expenditure as the provision of intertemporal insurance for consumers. In this model, fiscal policy tends to be countercyclical. To explain why fiscal policy differs in developing countries, we consider two types of distortions. First, we add a political distortion, where the government may use the fisc to extract rents. Second, we tighten borrowing constraints. These two distortions correspond to two commonly suggested explanations for the procyclicality of fiscal policy in developing countries.

We show theoretically that fiscal policy may become less countercyclical and indeed procyclical as the institutional capacity of the government to extract rents increases. This phenomenon occurs because a government that values both consumer welfare and extracted rents would tend to extract rents when consumers' marginal utility of consumption is low. The intuition is similar to that in Battaglini and Coate (2006). There, public officials seek rents when the marginal value of the public good is low. Here, the cyclical component of public spending is intertemporal insurance. The marginal value of such insurance is endogenously countercyclical. Thus rent extraction is procyclical. As a government's institutional ability to extract rents increases, rent extraction may dominate the cyclicality of government spending, making the latter procyclical.

As for the other modelled explanation, we show that it is theoretically plausible that binding borrowing constraints make government transfers less countercyclical. However, we find that borrowing constraints fail to explain fiscal procyclicality in two ways. First, in simulations of the model, borrowing constraints do not significantly contribute to fiscal procyclicality. Moreover, they only contribute to fiscal procyclicality when fiscal policy is already procyclical due to political factors. This is because a forward looking government will attempt to save more (and spend less) in business cycle peaks in anticipation of potential constraints on borrowing in the future. Spending will be more countercyclical when borrowing constraints are not binding, compensating for its procyclicality when constraints are binding. Second, our model predicts that borrowing constraints bind, and thus affect the cyclicality of government expenditure, in business cycle downturns. If borrowing constraints were the cause for fiscal procyclicality, we would expect spending to be more procyclical during downturns. In fact, government expenditure in developing countries is no not much different in business cycle peaks and in troughs.

1 Stylized Facts

Figures I-III present the main cross-country differences in fiscal policies. The most striking difference between fiscal policies in developing- and high-income-countries is in government expenditure, as demonstrated in Figure I. The graph plots the correlation between the cyclical component of real government expenditures and the cyclical component of real GDP between the years 1970 and 2003, against PPP GDP per capita in 1970. Cyclical components are measured using a Hodrick-Prescott (HP) filter. Expenditures are countercyclical in all but a handful of high-income countries, but procyclical in almost all developing countries in the sample. A negative correlation between the degree of procyclicality and income per capita is apparent.

It is difficult to assess the cyclicality of tax policies, since time-series data on tax *rates*–the relevant policy variable–are unavailable for most developing countries. While there is anecdotal and indirect evidence that tax rates may be countercyclical in a number of developing countries (see for example Kaminsky, Reinhart, and Vegh, 2004), this does not translate into a difference in the cyclicality of tax revenues. As Figure II demonstrates, the cyclicality of tax revenues is not correlated with GDP per capita. The average correlation between tax revenues and GDP is similar in developing countries (.43) and in high-income countries (.44).

In high-income countries, the combination of countercyclical government expenditures and procyclical tax revenues generates unambiguously procyclical surpluses, with an average correlation of .43 between their cyclical component and the cyclical component of GDP. Developing countries, whose expenditures and revenues are both procyclical, show great variance in the cyclicality of their surpluses, as shown in Figure III. Surpluses in developing countries are acyclical on average.

It appears that the differences in fiscal policies across income lines can be mainly attributed to differences in government spending patterns. So far, we have looked at total government expenditure, which includes government consumption, investment, transfers, and interest payments. It is interesting to consider the cyclicality of some of these components. Table I presents the basic stylized facts. Government investment and consumption are both procyclical in high-income countries with correlation coefficients not much different than in developing countries[2]. Interest payments are acyclical, on average, in both income groups[3]. The main remaining component of total government expenditure is transfer payments. Transfer payments would appear to be the main driver of high-income countries' countercyclical spending patterns. The figures in Table I may also indicate that transfer payments are more procyclical than other components of government spending in developing countries.

Focusing on developing countries, Table II compares the cyclicality of overall government spending during periods that are above the HP filter trend to below-trend periods. The difference between these two correlations is not statistically significant, indicating that spending is no less procyclical in good times than in bad. We also look at the correlation of the cyclical components of real government expenditure and real GDP when excluding crisis years, defined as those when cyclical output dropped by more than two standard deviations. As shown in Table II, the procyclicality of government expenditure drops by a statistically insignificant margin. In fact, in several recent output drops of those magnitudes (South Korea, 1998; Turkey, 2001; Argentina, 2002) government spending was above-trend. There is no evidence that the procyclicality of government expenditure is restricted to cyclical downturns.

[2]This contrasts with Talvi and Vegh's (2005) finding that high-income countries' government consumption is acyclical. In any case, their findings are consistent with the view that transfers are the main countercyclical component of government spending in high-income countries.

[3]Data on interest payments was available for only a subset of countries, and for fewer years. The data is also from a different source, the International Monetary Fund's Government Finance Statistics.

2 Literature Review

Gavin and Perotti, 1997, and Kaminsky, Reinhart and Vegh, 2004 provide the primary evidence of the procyclicality of fiscal policies in developing countries. Additional empirical work by Lane (2003) and Alesina and Tabellini (2005) shows that political distortions play a role in explaining fiscal procyclicality where it is present. The latter show that controlling for a measure of corruption, fiscal policy's cyclicality is no longer correlated with income per capita. An empirical exercise in Appendix B reaffirms Alesina and Tabellini's (2005) results. In contrast to their result, we do not find that democracy plays an important role in explaining cross-country differences in fiscal cyclicality.

A number of explanations have been proposed for the phenomenon of fiscal procyclicality. They fall into three broad categories. First, Gavin and Perotti (1997) suggest that borrowing constraints in developing countries are the cause for fiscal procyclicality. When borrowing constraints are binding, governments may have no choice but to rely entirely on tax revenues to finance expenditures. This forces governments to either cut expenditures or raise taxes in bad times, yielding fiscal procyclicality. Riascos and Vegh (2003), and Mendoza and Oviedo (2006), also explore the role financial market imperfections. Second, a number of theories suggest that political distortions may cause fiscal procyclicality. Talvi and Vegh (2005) show that political distortions based on Tornell and Lane's (1999) "voracity effect" may be the culprit for procyclical policies. Alesina and Tabellini (2005) develop a voting model, in which procyclicality is a side effect of voters' attempts to discipline rent-seeking officials. Third, it has been suggested that the procyclicality of fiscal policy in developing countries may be no more than an optimal reaction to the different stochastic environment confronting developing countries. Talvi and Vegh's (2005) political-economy model, for example, requires an interaction between a political distortion and higher macroeconomic volatility to generate fiscal procyclicality.

This paper contributes to the literature on fiscal procyclicality by presenting a macroeconomic model of fiscal policy that allows for these three proposed explanations for fiscal procyclicality. Beyond proposing a political economy model for fiscal procyclicality, it provides a unique contribution to the literature by allowing a theoretical and quantitative analysis of the comparative potential of each of these explanations to account for the fiscal procyclicality observed in developing countries.

There is a large macroeconomic literature on fiscal policy, stemming from

Barro (1979)[4] and a natural point of departure would be to build on them in modelling fiscal policy. The difficulty in doing so is that this line of research usually models tax policy alone. Government expenditure patterns are, with some exceptions, modeled as an exogenous process. On the other hand, the main stylized facts in need of explanation are differences in the cyclicality of government expenditure. This paper follows Battaglini and Coate (2006) in allowing government expenditures, tax rates, and deficits to be endogenously chosen. The novelty here is modelling government expenditures as providing intertemporal insurance for consumers who do not have access to capital markets. Modelled as such, government expenditures are endogenously countercyclical.

3 The Model

A small open economy consists of two types of agents: a continuum of homogeneous consumers and a government. The addition of a neoclassical firm in the following section for purposes of calibration does not alter any of the model's results. There are two goods: consumption c and leisure (represented as $1-\ell$, where $\ell \in [0,1]$ is labor). Consumers face an exogenous wage process w_t, with support $[w_{\min}, w_{\max}]$ and jointly choose their labor contribution and consumption in each period. They do not have access to capital markets. This friction provides the rationale for government spending. The government uses its ability to borrow and save in international capital markets to provide intertemporal insurance for consumers. The model's results would also hold if only a fraction of consumers had no access to financial markets.

Modeling fiscal policy in such a way has two advantages. First, we have seen that the main source of countercyclicality in the spending behavior of governments in high-income countries is government transfers, of which social insurance programs are a large component. Second, fiscal policy used for this purpose would naturally tend to be countercyclical. This biases the model against fiscal procyclicality, which the modeled political and economic distortions will need to overcome.

A political distortion is introduced by allowing the government to extract rents through the fiscal process. These rents may be viewed as funds diverted for the government's political objectives, or as funds transferred to special interest

[4] See, for example, Chari and Kehoe (1999), S. Rao Aiyagari et al (2002), and the papers cited therein.

groups. In addition to the utility it receives from providing intertemporal insurance to consumers, the government also values the quantity of rents extracted.

3.1 Consumers

A representative consumer replaces the continuum of consumers, given their homogeneity. The representative consumer chooses consumption and hours worked in each period to maximize lifetime utility. She has preferences over consumption and hours worked as follows:

$$\sum_{t=0}^{\infty} \beta^t u\left(c_t, \ell_t\right)$$

Preferences are such that $u_c > 0, u_{cc} < 0, u_\ell < 0, u_{\ell\ell} < 0$, and the Inada conditions hold. Utility is separable in leisure and consumption, so that $u_{c\ell} = 0$. The consumer has no ability to borrow or to save. Consumers obtain income from labor earnings, which generate wages w_t per unit of labor supplied, and are taxed at a rate of τ_t. In this section, wages are exogenous, but they will be determined endogenously when firms are introduced in the following section. The representative consumer also receives a lump-sum transfer of g_t from the government. The consumer knows w_t, τ_t, g_t at the beginning of each period. Her budget constraint is:

$$(1) \quad c_t = \left(1 - \tau_t\right) w_t \ell_t + g_t$$

Since the consumer has no access to credit markets, her optimization problem of maximizing lifetime utility subject to (1) is static in each period, yielding the following first order condition:

$$(2) \quad \left(1 - \tau_t\right) w_t u_c + u_\ell = 0$$

3.2 The Government

The fiscal agent's preferences over citizen welfare and rent extraction are as follows:

$$(3) \quad \sum_{t=0}^{\infty} \beta^t \left[\left(1 - \alpha\right) u\left(c_t, \ell_t\right) + \alpha v(S_t)\right]$$

where S_t are the rents extracted by the fiscal agent at time t and $\alpha \in [0, 1)$ is a parameter representing the relative importance he places on rent extraction compared to citizen welfare. The function $v(S)$ is strictly concave, and satisfies the Inada conditions. High levels of α could represent high levels of corruption, the absence of appropriate fiscal safeguards or fiscal transparency, or a political process governing the fisc that creates large incentives for pork-barrel spending. Rents could be viewed as being diverted for the political objectives of the government, or as rents transferred to special interest groups.

The cyclical component of government spending is used solely for two purposes in the model: social insurance and rents. We do not suggest that these are the only components of government expenditure in reality. The results of the model would be identical if the government used its fiscal resources for other purposes, as long as they have no particular cyclical pattern. Also, with homogeneous consumers, social insurance includes no inter-personal transfers. We are therefore understating the size of the budget allocated to social insurance. In short, the model should be viewed as a model of the cyclicality of fiscal policy, not its budgetary composition.

The government generates revenues from distortionary taxes on consumers' labor income. Tax revenues can be costlessly transformed into a unit of the transfer payment, g_t, or into a unit of extracted rents, S_t. Rent-seeking occurs within the fiscal process, i.e. total government expenditure is given by:

$$(4) \quad G_t = S_t + g_t$$

The government has access to international capital markets and can borrow and save at a constant and exogenous interest rate r. The government's budget constraint is:

$$(5) \quad S_t = \tau_t w_t \ell_t + b_{t+1} - (1 + r) b_t - g_t$$

where b_t is government borrowing (or saving, when its sign is negative) in the form of one-period bonds, denominated in units of the consumption good and due for repayment at time t.

It will be convenient to combine the government's and consumers' budget constraints to obtain an overall resource constraint:

$$(6) \quad S_t = w_t \ell_t - c_t + b_{t+1} - (1 + r) b_t$$

3.3 Sequence of Events

In each period the sequence of events is as follows:

1. The shock to the wage rate w_t is realized.

2. The government chooses a vector $\{g_t(w_t, b_t), \tau_t(w_t, b_t), b_{t+1}(w_t, b_t), S_t(w_t, b_t)\}$. It announces and can credibly commit to a policy vector $\{g_t, \tau_t\}$. It takes into account that its policy uniquely determines consumers' choice of consumption $c_t(g_t, \tau_t, w_t)$ and labor contribution $\ell_t(g_t, \tau_t, w_t)$ through (1) and (2).

3. Consumers observe the policy vector $\{g_t, \tau_t\}$ and the wage rate, w_t, and choose their consumption $c_t(g_t, \tau_t, w_t)$ and labor contribution $\ell_t(g_t, \tau_t, w_t)$.

As is common in the Ramsey taxation literature, we can reformulate the government's problem, such that it is choosing consumer allocations directly, while taking into account that its chosen allocations must satisfy the consumer's optimality conditions. Unlike the Ramsey taxation literature, it is impossible to remove all policy variables from the government's decision problem. The government's problem is to chose $\{g_t(w_t, b_t), \tau_t(w_t, b_t), b_{t+1}(w_t, b_t), S_t(w_t, b_t), c_t(w_t, b_t), \ell_t(b_t, w_t)\}$ to maximize (3), subject to (6), and the implementability constraints (1) and (2). Additional constraints reflect the government's ability to use lump-sum transfers, but not to impose lump-sum taxes, and that the government faces a borrowing constraint:

$$\begin{aligned} g_t &\geq 0 \\ b_{t+1} &\leq b_{\max} \end{aligned} \tag{7}$$

where $b_{\max} = \min\left\{\bar{b}, \frac{w_{\min}}{r}\right\}$, with $\bar{b}$ and $\frac{w_{\min}}{r}$ representing an exogenous borrowing constraint and the highest level of debt that can be repaid almost surely, respectively.

3.4 Maximization Problem

Replacing S_t using (6), and g_t using (1), the government's maximization problem is:

$$
\begin{aligned}
\max_{c_t,\ell_t,\tau_t,b_{t+1}} \quad & E_0 \sum_{t=0}^{\infty} \beta^t \{(1-\alpha)\, u(c_t,\ell_t) \\
& +\alpha v\left[w_t \ell_t - c_t + b_{t+1} - (1+r)\, b_t\right] \\
& + \frac{1-\alpha}{\alpha} \mu_t \left[(1-\tau_t)\, w_t u_c(c_t) + u_\ell(\ell_t)\right] \\
& + \frac{1-\alpha}{\alpha} \gamma_t \left[c_t - (1-\tau_t)\, w_t \ell_t\right] + \frac{1-\alpha}{\alpha} \delta_t \left(b_{\max} - b_{t+1}\right)\}
\end{aligned} \tag{8}
$$

where μ_t is the Lagrange multiplier on constraint (2), γ_t is the multiplier of the the non-negativity constraint on g_t, and δ_t is the multiplier of the borrowing constraint, all multiplied by the constant $\frac{1-\alpha}{\alpha}$ for future notational convenience. The first order conditions of the government's problem yield:

$$u_c + \gamma + \mu\,(1-\tau)\, w u_{cc} = \lambda \tag{9}$$

$$-u_\ell + (1-\tau)\, w\gamma - \mu u_{\ell\ell} = w\lambda \tag{10}$$

$$\gamma\ell = \mu u_c \tag{11}$$

$$\lambda = \beta\,(1+r)\, E\lambda' + \delta \tag{12}$$

in addition to (1), (2) and (6) and the complementary slackness conditions $g\gamma = 0$ and $\delta\,(b_{\max} - b') = 0$. Time t subscripts are suppressed and x' represents a variable x's value in the following period. E is the expectations operator. The variable λ_t is defined as:

$$\lambda_t \equiv \frac{\alpha}{1-\alpha} v'(S_t) \tag{13}$$

and is introduced for notational convenience: it leaves equations (9) to (12) unchanged in the special case $\alpha = 0$. In this case the government's maximization problem is:

$$
\begin{aligned}
\max_{c_t,\ell_t,\tau_t,b_{t+1}} \quad & E_0 \sum_{t=0}^{\infty} \beta^t \{u(c_t,\ell_t) \\
& +\lambda_t \left[w_t \ell_t - c_t + b_{t+1} - (1+r)\, b_t\right] \\
& +\mu_t \left[(1-\tau_t)\, w_t u_c(c_t,\ell_t) + u_\ell(c_t,\ell_t)\right] \\
& +\gamma_t \left[c_t - (1-\tau_t)\, w_t \ell_t\right] + \delta_t \left(b_{\max} - b_{t+1}\right)\}
\end{aligned} \tag{14}
$$

with λ_t now the Lagrange multiplier on the overall resource constraint (6), where $S_t = 0 \; \forall t$.

3.5 Dynamic Analysis

The sequence (12) is a supermartingale in λ_t. When $\beta(1+r) \geq 1$, λ converges almost surely to 0, since $\lambda_t \geq 0 \; \forall t$. This convergence implies asymptotically infinite levels of rent extraction, S_t, and of consumption, c_t, financed by an infinite level of assets, $-b_t$. To avoid dynamics of this sort, we assume $\beta(1+r) < 1$. With this assumption, the sequence (12) converges almost surely to an invariate probability distribution of debt, b_{t+1}. (See Mendoza and Oviedo (2006) for an extensive discussion of a system with dynamics of this sort.)

A first result, whose proof is in Appendix A, is useful in analyzing the model's dynamics.

Lemma 1 *It is never optimal for the government to tax and transfer in the same period.*

The intuition of this result is as follows. Since taxes are distortionary, it is always more efficient to decrease the lump sum transfer to citizens than to increase taxes. It can never be optimal to tax and transfer at the same time. This should not be viewed as a counterfactual prediction of the model and is again driven by the assumption that consumers are homogeneous. If consumers were heterogeneous there could still be a redistributionary reason to tax some consumers and transfer to others.

Equation (12) is a standard intertemporal Euler equation. But (13) indicates that it is rent extraction, not consumption or hours worked, that is smoothed. In the case $\alpha = 0$, it is the marginal rate of intertemporal substitution, λ, that is smoothed, with no guarantee of consumption smoothing. Substituting (11) and (1) into (9), and using the complementary slackness condition, $\gamma_t g_t = 0$, highlights this result:

$$(15) \quad u_c(c_t) + \gamma_t (1 - \sigma_t) = \lambda_t$$

where σ_t is the coefficient of relative risk aversion with respect to consumption, defined as:

$$(16) \quad \sigma_t \equiv -\frac{c_t u_{cc}}{u_c}$$

Recall that consumers have no access to capital markets, while the government can only implement a given allocation through lump-sum transfers or distortionary taxation. Only allocations that conform to (2) are implementable. When the transfer good is provided, $g_t > 0$, $\gamma_t = 0$, and we retrieve the standard consumption smoothing result: $u_c(c_t) = \lambda_t$. However, when the government chooses to tax, $\tau_t > 0$, $g_t = 0$ and $\gamma_t \geq 0$ (due to Lemma 1). The term $\gamma_t (1 - \sigma_t)$ then reflects the deviation from full consumption smoothing due to the distortionary costs of taxation required to implement a desired consumption allocation. If lump sum taxation were allowed, $\gamma_t = 0$, and the government would provide a first-best level of consumption, $c_t = u_c^{-1}(\lambda_t)$, both when taxing and when transferring. When risk aversion is low: $\sigma_t < 1$, the government will allow consumers to over-consume relative to the first best. This is because the implementability constraint (2) would require very high taxes and very large increases in hours worked to bring the consumer to the first-best level of consumption. When risk aversion is high $\sigma_t > 1$, the government allows the consumer undershoot the first-best level of consumption, as the distortionary taxes needed to raise revenue cause consumers to adjust consumption excessively. In the case of logarithmic preferences ($\sigma_t \to 1$), these two effects offset each other and the first best is implementable. However, taxation still causes dead-weight losses, as evident from (2).

Two important results follow when combining (15) with (13), which we write here for the case $g_t > 0$:

$$(17) \quad u_c(c_t) = \frac{\alpha}{1-\alpha} v'(S_t)$$

First, since $v(.)$ is strictly concave, rent extraction is decreasing in the marginal utility of consumption. Thus governments will chose to extract more rents in "good times". Second, the parameter α governs the optimal allocation between the provision of the transfer good (to obtain the desired level of c_t) and rent extraction. As α increases, the government will allocate more cyclical expenditures to rents, S_t, and less to the transfer good, g_t. Equation (15) will make g_t countercyclical, while S_t will be procyclical, as long as consumption is procyclical. When rent-seeking motivations (α) are low, g_t will dominate the cyclicality of government spending and government expenditure will be countercyclical. As α increases, the cyclicality of S_t may come to dominate and government expenditure will be procyclical.

We now formalize these results, for the case of i.i.d. shocks and looking at a single period, with a predetermined level of indebtedness, b_t. Government expenditure is inversely related with income when $\alpha = 0$. For preferences of a specific functional form, we show that government spending becomes less countercyclical (or more procyclical) as the parameter α, governing rent-seeking, increases.

3.6 i.i.d Shocks

We consider how government expenditure, $G_t = g_t + S_t$, responds to a change in income, reflected in the wage rate w_t, when the government is entirely altruistic, $\alpha = 0$, and when it is rent-seeking, $\alpha > 0$. We consider a government entering a period with a predetermined level of debt, b_t. This, of course, abstracts from the long-term dynamic interactions between fiscal policy and debt. In the following section, simulations provide the dynamics of the system, allowing for the evolution of debt to interact with the cyclicality of fiscal policy.

If shocks are i.i.d, the current realization of the shock to w_t provides no information regarding future shocks. In this case, if borrowing constraints are not binding, the left hand side of (12) is only a function of the government's choice of b_{t+1}. An increase in b_{t+1} leaves the government with a higher level of debt in the following period, so that (12), (13), and the requirement that the government be able to repay its debts almost surely, imply that the right hand side of (12) is increasing in b_{t+1}. Combining equation (17) with (12) and (13), when $g_t > 0$ ($\gamma_t = 0$) gives:

$$(18) \quad u_c(c_t) = \frac{\alpha}{1-\alpha} v'(S_t) = \beta(1+r) E\lambda_{t+1}(b_{t+1})$$

Where the first equality is written for those states for which it is optimal to provide the transfer payment ($g_t > 0$), and we assume for the moment that b_t is such that the borrowing constraint is slack for all possible wage realizations $w_t \in [w_{\min}, w_{\max}]$. Rewriting (6) gives:

$$(19) \quad S_t + c_t - b_{t+1} = w_t \ell_t - (1+r) b_t$$

We conjecture that $w_t \ell_t$ is strictly increasing in w_t. Then equations (18) and (19) require that S_t and c_t both be strictly increasing in w_t and that b_{t+1} be strictly decreasing in w_t. We now provide a lemma stating that our conjecture is correct. This lemma will also imply that any discussion of the cyclicality of variables with respect to wages also holds with respect to income.

Lemma 2 *When transfers are provided ($g_t > 0$), income ($w_t \ell_t$) is increasing in wages.*

Proof. See Appendix A. ■

Since $\beta(1+r) < 1$, increases in c_t and S_t due to changes in w_t may not be infinitesimal, even though shocks are i.i.d. (5) now implies that an increase in w_t causes $g_t - \tau_t w_t \ell_t$ to decrease, since $b_{t+1} - S_t$ is decreasing and b_t is predetermined at time t. Recalling that when $g_t > 0$, $\tau_t = 0$, this means g_t is decreasing in income, for those wage realizations for which $g_t > 0$. This logic also holds if $\alpha = 0$.

To ensure that g_t is decreasing in w_t over the entire support of w, it still remains to be seen whether it is the case that $g_t = 0$ for wage realizations that are higher than those for which $g_t > 0$. Lemma 3 states that there exists a cutoff wage below which $g_t \geq 0$, and above which $g_t = 0$.

Lemma 3 *If there exists an income level for which $\tau_t > 0$ and an income level for which $g_t > 0$, there exists a cutoff wage, w^*, below which the government transfers, $g_t \geq 0$, and above which the government taxes, $\tau_t \geq 0$.*

Proof. See Appendix A. ■

Given that g_t is decreasing in w_t when $g_t > 0$, and $g_t = 0$ below a cutoff wage, g_t is decreasing in w_t for all $w_t \in [w_{\min}, w_{\max}]$. The result in proposition 1 follows directly.

Proposition 1 *With i.i.d shocks, for a given level of government debt (b_t) the government transfer (g_t) is (weakly) decreasing in income.*

Corollary *When no rent-seeking is present, $\alpha = 0$, $S_t = 0$, so that government expenditure $G_t = g_t$ is (weakly) decreasing in wages.*

It is difficult to obtain a general result regarding cyclicality of S_t. To facilitate the analysis, we assume a specific functional form for consumer preferences.

Assumption 1 *Consumer preferences take the following functional form:*

(20) $$u(c_t, \ell_t) = \log(c_t) + h(\ell_t)$$

where $h'(.) < 0$ and $h''(.) < 0$.

Assumption 1 ensures that as long as borrowing constraints are not binding, (18) holds over the entire support of w. This is because with preferences over consumption taking the logarithmic form, $(1 - \sigma_t) = 0 \; \forall w_t$, in equation (15).

Assumption 1 also implies that $w_t \ell_t$ is increasing in w_t even when $g_t = 0$ and $\tau_t > 0$. This is because whenever $g_t = 0$ and $\tau_t > 0$, equations (1) and (2) can now be combined to state

$$(21) \quad 1 = c_t u_c(c_t) = -\ell_t u_\ell(\ell_t) = -\ell_t h'(\ell_t)$$

Since $h''(.) < 0$ there is a unique level $\ell_t = \bar{\ell}$ that satisfies (21). It must therefore be the case that $w_t \ell_t = w_t \bar{\ell}$ is increasing in w_t.

With these two results stemming from Assumption 1, (18) and (19) imply directly that S_t is increasing in w_t, as formalized in the following proposition:

Proposition 2 *Given Assumption 1, i.i.d shocks, and a given level of government debt (b_t) rents (S_t) are (weakly) increasing in income.*

Finally noting that $G_t = g_t + S_t$ and that (17) implies that S_t's proportion of G_t is increasing in α, we obtain the following result:

Proposition 3 *Given Assumption 1, i.i.d shocks, and a given level of government debt (b_t), government spending (G_t) is (weakly) decreasing in income when $\alpha = 0$. Government spending becomes (weakly) increasing in wages for a sufficiently high level of α.*

3.7 Borrowing Constraints

Could the presence of borrowing constraints generate procyclical fiscal expenditures, even in the absence of a rent-seeking government? When borrowing constraints are binding ($b_t = b_{\max}$) and no rent-seeking is present, (5) becomes:

$$(22) \quad g_t - \tau_t w_t \ell_t = b_{\max} - (1+r) b_t$$

Since the government is either transferring or taxing in a given period, but not both, $g_t = \max\{b_{\max} - (1+r) b_t, 0\}$. Since the first term is predetermined at time t, g_t is the same for any income realization for which the borrowing constraint is binding. It is worth noting that, in a dynamic sense, it is most likely that $g_t = 0$ when borrowing constraints are binding. The requirement that debt be repaid almost surely would necessitate a tax-financed debt repayment, with government transfers set to zero. The analysis that follows is unaffected by this fact.

If the borrowing constraint is binding, government spending is unaffected by the realization of the stochastic shock. For those income realizations for which the borrowing constraint is not binding, $b_{t+1} < b_{\max}$, so that (22) turns into

$$(23)\quad g_t - \tau_t w_t \ell_t = b_t - (1+r)\, b_t < b_{\max} - (1+r)\, b_t$$

The government transfer is always lower for those income realizations where the borrowing constraint is not binding. Lemma 4 below states that borrowing constraints are binding when the wage realization is low. Since government expenditure is unaffected by income when borrowing constraints are binding and is lower (and decreasing in income based on Proposition 1) for the higher income levels where borrowing constraints are not binding, government expenditure remains decreasing in income even when borrowing constraints are present. Propositions 1-3 remain intact even in the presence of borrowing constraints.

Lemma 4 *For a given level of debt (b_t) if borrowing constraints bind for an income level reflected in a wage rate $\tilde{w}$, they also bind for all $w < \tilde{w}$.*

Proof. See Appendix A. ■

When the government cannot seek rents ($\alpha = 0$), borrowing constraints may make government spending less countercyclical, but not procyclical. Moreover, Lemma 4 implies that borrowing constraints are expected to bind in business cycle troughs. If borrowing constraints are the cause for the procyclicality of government expenditure, we would expect government expenditure to be more procyclical in business cycle troughs, which is not evident in the data.

3.8 Summary of Results

1. The government's provision of social insurance spending (g_t) is decreasing in income.

2. When the government is entirely altruistic ($\alpha = 0$), government expenditures are decreasing in income.

3. With a specific class of preferences (Assumption 1), if the institutional capacity of the government to extract rents through the fiscal process (α) is sufficiently high, government expenditures are increasing in income.

4. Borrowing constraints do not alter these results.

5. If the government is not rent-seeking, borrowing constraints may make the response of government spending to income less pronounced. However, this occurs at low wage realizations. This is counter to the stylized

fact that government expenditure is similarly procyclical in business cycle peaks as in troughs.

4 Numerical Simulation

This section provides a quantitative analysis of the model's dynamics. The simulations indicate that neither borrowing constraints nor the volatility of the business cycle can account alone for fiscal procyclicality. On the other hand, increases in rent-seeking do yield procyclical fiscal policy of the magnitudes observed in developing countries.

4.1 Preferences

We now assume that consumers' preferences take the following form:

$$(24)\quad u(c, \ell) = \log c + A \log (1 - \ell)$$

while the government's preferences over rents will take the CRRA form:

$$(25)\quad v(S) = \frac{S^{1-\eta}}{1-\eta} \qquad \text{for } \eta \in (0, \infty);\ \eta \neq 1$$

$$v(S) = \log S \qquad \text{for } \eta = 1$$

We assume that $\eta = 1$, so that the government is as risk averse as its citizens. A sensitivity analysis, available upon request, demonstrates that the simulations' qualitative results are not altered with different degrees of government risk aversion.

The model is simulated in three environments. First, it is simulated with the business cycle features of the United States. This simulation shows countercyclical government expenditures when no rent-seeking motivation is present and procyclical government expenditures when rent-seeking motivations are sufficiently high. Second, a simulation with Argentina's more volatile business cycle demonstrates that the higher volatility observed in emerging markets in fact causes government spending that is more *countercyclical*. This is because, with higher business-cycle volatility, there is an even stronger demand for intertemporal social insurance. With a rent-seeking government, spending again becomes procyclical. Finally, the model is simulated with the business cycle features of Argentina and borrowing constraints. The results do not appear to be significantly affected by borrowing constraints.

Before turning to the simulation results, the model's calibration is described. We show that when neoclassical firms are introduced, the wage rate is perfectly correlated with the productivity shock, so that we can use the standard stochastic processes for productivity shocks to calibrate the wage process in our model.

4.2 Firms

Firms produce the uniform consumption good using labor as a single input, with the following production technology:

$$(26) \quad f(\ell_t) = e^{z_t}\ell_t$$

Where ℓ_t is the quantity of labor supplied and z_t is a productivity parameter. The first order condition of the firms' profit maximization problem implies:

$$(27) \quad w_t = e^{z_t}$$

so that there is a monotonic relationship between the wage process and the exogenous productivity shock.

4.3 Calibration

We assume the productivity shock, z_t, follows an AR(1) process:

$$(28) \quad z_t - \bar{z} = \rho(z_{t-1} - \bar{z}) + \epsilon_t$$

where $\bar{z}$ is the trend level of productivity, which is normalized to 0; ρ is the degree of autocorrelation; and ϵ_t is an i.i.d shock normally distributed with mean 0 and variance σ^2. For the U.S., the model is calibrated to match z_t to the Solow residual. Since the model is calibrated to annual data, this yields $\rho = 0.95^4$ and $\sigma = 0.0144$.

As suggested by Mendoza (1991), when calibrating the model to match Argentina's business cycle features, Argentina's terms of trade are used as the exogenous shock. Using the International Monetary Fund's (IMF) World Economic Outlook (WEO) data for the period 1970-2003, Argentina's business cycle process can be represented as $\rho = 0.60$ and $\sigma = 0.079$.

We assume an annual interest rate of 4%. β is calibrated to ensure that when calibrated to the business cycle features of Argentina, the economy's debt-to-GDP ratio is on average 24%, matching Argentina's average indebtedness in the 1990s, based on World Bank Global Development Finance and World Development Indicators data. This results in $\beta = 0.952$. The value of A, the relative marginal value consumers place on leisure compared with consumption, is calibrated to induce consumers work at most 1/3 of their disposable time.

4.4 Results

Figure IV presents the simulations' main results. The solid curves represent the correlation between government expenditure and GDP in three sets of simulations, each across a range of values of α (rent-seeking). The lines' intersection with the y axis are the results of benchmark models, in which $\alpha = 0$, i.e. with no political distortion. To allow comparison with the data, the actual correlation between (the cyclical components of) GDP and government expenditure in the U.S. and Argentina are shown in dotted lines. We plot simulations for $\alpha \in [0, 0.5]$. For $\alpha > 0.5$, the model's dynamics are identical to those when $\alpha = 0.5$. In that range, rent-seeking motivations are high enough to preclude any social insurance ($g_t = 0 \ \forall t$).

When calibrated to the business cycle features of the United States, the model predicts countercyclical government expenditure when no political distortion is present. In fact, the model's prediction is close to the actual cyclicality of government expenditure in the United States. Moving along the x axis, as rent-seeking motivations increase, fiscal policy becomes less countercyclical, then procyclical.

With the business cycle features of Argentina, the results are qualitatively the same. Without the political distortion, government expenditure is more countercyclical, compared to the simulation with the business cycle features of the United States. This is because the need for intertemporal insurance for consumers increases with higher business-cycle volatility. Matching the cyclicality of government expenditure observed in Argentina requires intermediate degrees of rent-seeking motivations ($\alpha \approx 0.2$). With the business cycle features of the United States, even lower degrees of rent-seeking are required to generate procyclical government spending. This is because with the relatively low volatility of the business cycle of the United States, even moderate degrees of rent-seeking shut down the intertemporal insurance role of government spending (consumption smoothing can be achieved through taxation, with relatively small tax-distortion costs).

In the first two simulations we excluded any simulation round in which borrowing constraints were binding. The third simulation, including borrowing constraints, included simulation results where borrowing constraints were binding at least 10% of the simulation periods. Figure IV shows that even while borrowing constraints are binding, the results of the model are both qualitatively and quantitatively similar. Binding borrowing constraints do not induce procyclical spending when no rent-seeking is present.

5 Conclusions

Imperfections in capital markets are frequently assumed to be the main culprit for the procyclicality of fiscal policy. The volatile business cycle environment in developing countries is also often cited. The theory presented here raises questions regarding the these economic causes for procyclicality. It demonstrates theoretically and numerically that use of the fiscal process for rent-seeking purposes is a plausible alternative explanation.

The model presented in this paper assumes that the main function of fiscal policy, and the main reason for its countercyclicality in industrialized countries, is intertemporal insurance provided by governments to their citizens. Given the proportion of high-income countries' budget spent on social insurance, this assumption would appear to be a reasonable one. While showing that rent-seeking within the fiscal process can cause fiscal procyclicality, the model may also contribute to explaining why the resources devoted to social insurance in many developing countries is smaller than in industrial countries.

The paper provides interesting policy insights as well. The liquidity that international financial institutions provide to developing countries during financial crises is partially motivated by the perception that imperfections in international financial markets make it difficult for developing countries to borrow during crises. The idea that this insurance may be counterproductive due to moral hazard has a long history. However, this paper questions the utility of this insurance from a new angle. The model presented here implies that in some countries, rent extraction may be procyclical. If this is indeed the case, lending by international financial institutions may provide relief to the citizens of developing countries during these crises, but the anticipation of such assistance enables additional rent extraction during good times, so that much of this assistance is actually paying, ex-post, for rent-seeking activities that have already occurred. Finally, conditionality imposed by these institutions typically restricts deficits following crises. The model predicts that unless fiscal austerity targets are imposed over the entire cycle, they may not be welfare improving. This paper suggests that focussing on deficit targets without addressing the deficiencies of fiscal institutions provides at best a partial solution to the problems of fiscal policy in developing countries.

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Appendix A: Proofs

Lemma 1 *It is never optimal for the government to tax and transfer in the same period.*

Proof. Assume by contradiction that in a certain period $g_t > 0$ and $\tau_t > 0$. Since $g_t\gamma_t = 0$, $\gamma_t = 0$, which in turn implies that $\mu_t = 0$, due to (11). This last result uses the fact that $u(c, \ell)$ satisfies the Inada conditions, so that $u_c(c_t) \neq 0$ for any finite level of consumption. Combining equations (9) and (10) with the fact that $\gamma_t = \mu_t = 0$, we obtain:

(A1) $u_c + wu_l = 0$

Comparing (A1) with (2) implies that $\tau_t = 0$, contradicting the assumption that $\tau_t > 0$. ■

Lemma 2 *When transfers are provided,* $g_t > 0$*, income,* $w_t\ell_t$*, is increasing in wages.*

Proof. If ℓ_t is increasing in w_t, $w_t\ell_t$ is unambiguously increasing in w_t. If, conversely, ℓ_t is decreasing in w_t, $u_\ell(c_t, \ell_t)$ is increasing in w_t. Given that we are considering the case $g_t > 0$, which via Lemma 1 implies that $\tau_t = 0$, (2) imposes that $u_c(c_t, \ell_t)$ is strictly decreasing in w_t. With c_t strictly increasing in w_t, (18) requires that S_t be strictly increasing and b_{t+1} be strictly decreasing in w_t. Finally, having asserted that S_t and c_t are strictly increasing, and b_{t+1} strictly decreasing in w_t, the left hand side of (19) must be increasing in w_t. Given that b_t is predetermined, this requires that $w_t\ell_t$ also be increasing in w_t. ■

Lemma 3 *If there exists a wage rate in the support of* w*, for which* $\tau_t > 0$ *and a wage rate for which* $g_t > 0$*, there exists a cutoff wage,* w^**, below which the government transfers,* $g_t \geq 0$*, and above which the government taxes,* $\tau_t \geq 0$*.*

Proof. Let w^* be the highest wage rate at which which $g_t \geq 0$ is non-binding. Since g_t is decreasing in w_t, this wage rate must be either $w_{\max}$ or some w^* for which $g_t \geq 0$. If $w_{\max}$ is the highest wage, the fact that g_t is decreasing in w_t requires that $g_t \geq 0$ is non-binding for all values of $w \in [w_{\min}, w_{\max}]$. This violates the assumption that there exists a wage for which $\tau_t > 0$ is optimal, due to Lemma 1. Thus, there must be a wage w^*, which is the largest wage for which $g_t \geq 0$ and the non-negativity constraint $g_t \geq 0$ is non-binding. Consider now any wage, $w_{low} < w^*$. We have already seen that equations (18), (19) and (5) imply $g(w_{low}) > g(w^*)$ is optimal, as long as $g(w_{low})$ does not violate $g(w_{low}) \geq 0$. This must be the case since $g(w^*) \geq 0$ by assumption. Then it must be the case that $g_t \geq 0$ $\forall w < w^*$. By our definition of w^*, $g_t = 0$, and therefore $\tau_t \geq 0$ for all $w > w^*$. w^* is the cutoff wage below which the government transfers and above which the government taxes. ■

Lemma 4 *At a given level of debt b_t, if borrowing constraints bind for a wage level $\tilde{w}$, they also bind for all $w < \tilde{w}$.*

Proof. Let $c(\tilde{w})$, $S(\tilde{w})$, $\ell(\tilde{w})$, $b'(\tilde{w}) = b_{\max}$ be the solution to the government's optimization problem when b_t is given and $\tilde{w}$ is the wage realization. Assume, by contradiction, that there exists a wage $w_{nb} < \tilde{w}$ for which $b'(w_{nb}) < b_{\max}$ is the optimal debt choice. Let $c(w_{nb})$, $S(w_{nb})$, $\ell(w_{nb})$ denote the optimal choices of other variables when b_t is given and w_{nb} is the wage realization. Since $w_{nb}\ell(w_{nb}) < \tilde{w}\ell(\tilde{w})$, due to Lemma 2, (18) and (19) imply that $c(w_{nb}) < c(\tilde{w})$, $S(w_{nb}) < S(\tilde{w})$ and $b'(\tilde{w}) > b'(\tilde{w}) = b_{\max}$. This contradicts the assumption that $b'(w_{nb}) < b_{\max}$. Therefore borrowing constraints must bind for w_{nb}. ■

Appendix B: Empirical Evidence

A number of empirical studies have captured the stylized facts of the cyclicality of fiscal policy and attempted to explain the potential causes for differing cyclical patterns among countries. It has been shown elsewhere that fiscal policy is often procyclical, mainly in developing countries (Gavin and Perotti, 1997; Kaminsky, Reinhart, and Vegh, 2004). A number of studies have sought the causes for fiscal procyclicality through cross-country regressions. Their results demonstrate that much or all of the cross-country heterogeneity in fiscal procyclicality, attributed to differences in income per capita in the introduction to this paper, is due to political-economy factors, consistent with the theory presented here. In high-income countries, Lane (2003) is unable to reject the hypothesis that political-economy factors contribute to the procyclicality of government expenditures in high-income countries. Alesina and Tabellini (2005) conclude that fiscal procyclicality is no longer correlated with income per capita after controlling for corruption in a panel regression including both high-income and developing countries. They show that both democracy and its interaction with corruption are also statistically significant in explaining the procyclicality of government expenditures. However, corruption remains a statistically significant explanatory variable for the procyclicality of government expenditures even after controlling for democracy and its interaction with corruption, implying that procyclicality is correlated with corruption even in non-democracies.

This leaves a residual theoretical need for a model of fiscal procyclicality that does not require voters' disciplining of the fiscal process.

Alesina and Tabellini (2005) define procyclical fiscal policy as a combination of a procyclical ratio of government expenditures to GDP and a procyclical ratio of borrowing to GDP, after correcting for terms of trade shocks and past deficits. This follows the approach used in Gavin and Perotti (1997) and Luis Catão and Bennett Sutton (2002). This measure of procyclicality has been critiqued by Kaminsky, Reinhart, and Vegh (2004), who argue that it makes little sense to discuss the cyclicality of policy in terms of outcomes; instead, the cyclicality of policy instruments should be considered. Following Kaminsky, Reinhart, and Vegh (2004) and consistent with the theoretical results of the previous section, we measure procyclicality using the correlation of the HP-filtered components of real government expenditure and real GDP. Although this measure is highly correlated with Gavin and Perotti's (1997) in a cross country comparison, it is interesting to determine whether the results of pervious studies are robust to using this more appropriate procyclicality variable.

Consistent with the results of previous studies, corruption is found to be the main variable determining cross-country differences in fiscal procyclicality. In addition to demonstrating the robustness of earlier results of OLS regressions, we also provide evidence that the relationship between fiscal procyclicality and corruption is not due to reverse causality, through an instrumental variables regression.

Estimation Strategy

Consider the following empirical model:

(29) $P_i = \beta X_i + \epsilon_i$

where P_i is the degree of procyclicality (of government expenditures) of country i, and X_i is a vector of candidate explanatory variables for procyclicality. The choice of explanatory variables for procyclicality follows Alesina and Tabellini (2005). They regress their measure of procyclicality against an indicator of corruption, an indicator of democracy, and initial GDP per capita. In this study, the vector of exogenous variables, X, includes these variables and an a measure government size, as in Lane (2003). OLS regressions confirm that an indicator of *control of corruption* is correlated with the procyclicality of government expenditure; differences in income levels are no longer correlated with procyclicality after controlling for this measurement of corruption.

This approach, employed by Lane (2003), and Alesina and Tabellini (2005), may suffer from reverse causality. While corruption may cause fiscal procyclicality, it is also possible that fiscal procyclicality, caused by other factors, makes it easier for corruption to persist. The problem of reverse causality is particularly important given that the *control of corruption* variable only exists for recent years. While cross-country comparisons of institutional quality tend to be persistent, it is still problematic that the exogenous variable used in an OLS regression such as Alesina and Tabellini's (2005), is measured at the end of the period of the measurement of the endogenous one.

To control for the possibility of reverse causality, OLS regressions are augmented by instrumental variables regressions. In the latter, we use countries' distance from the equator as an instrument for *control of corruption*. As suggested by William Easterly and Ross Levine (2003) and others, this geographical feature is correlated with institutional quality[5]. This is an appropriate instrumental variable since it is clearly exogenous, it is correlated with *control of corruption*, and there is no a-priori reason why it should affect the cyclicality of fiscal policy directly. To further reassure the reader of the strength of this instrument, reported F-statistics of the first stage of the regression are well above the threshold of Stock and Yogo's (2002) test for weak instruments. The results of the IV regression demonstrate that earlier empirical results connecting fiscal procyclicality with corruption were not driven by reverse causality.

The Data

We measure procyclicality using the correlation between the cyclical component (using a Hodrick-Prescott filter) of real government expenditure with the cyclical component of real GDP, over the period 1970 to 2003. This provides one observation for the procyclicality variable, ranging in value from -1 to 1, for each one of the 102 countries in the sample.

We measure corruption using the World Bank's *control of corruption* indicator (Kaufmann, Kraay and Mastruzzi, 2005) averaged over the years 1996-2004 (the entire span of the series). While some forms of rent-seeking may not register as corruption, such as rent-seeking by special interest groups or workers' unions,

[5] The use of another popular measure for institutions, settler mortality, as proposed by Acemoglu, Robinson, and Johnson (2001) also rejects the notion of reverse causality, but yields less robust results, given the loss of observations required to use this instrument.

the definition of the *control of corruption* variable comes close to the theoretical approach employed here. Kaufmann, Kraay and Mastruzzi (2005) define their indicator as "measuring the exercise of public power for private gain", similarly to the way rent extraction is modelled here. The *control of corruption* indicator ranges from -2.5 to 2.5, decreasing in the amount of corruption.

The dummy variable, *Democracy,* is constructed using the Polity IV database as follows. The *Polity IV* variable is constructed by subtracting the Polity IV "Autocracy" indicator from its "Democracy" indicator. Since both indicators are on a scale of 0 to 10, the *Polity IV* variable used here ranges from -10 to 10. The *Polity IV* variable is then taken as the average annual score over the time period considered. *Democracy* obtains a value of 1 if the *Polity IV* variable is positive. For robustness, the same empirical analysis is conducted with the *Polity IV* variable itself and with the *YearsDemoc* variable, which counts the number of years a country is defined as a democracy in the Polity IV sample between 1970 and 2003. We control for income using initial (1970) PPP GDP per capita in US dollars, taken from the Penn World Tables. Government size is accounted for with initial (1970) government expenditure to GDP (using IMF WEO data).

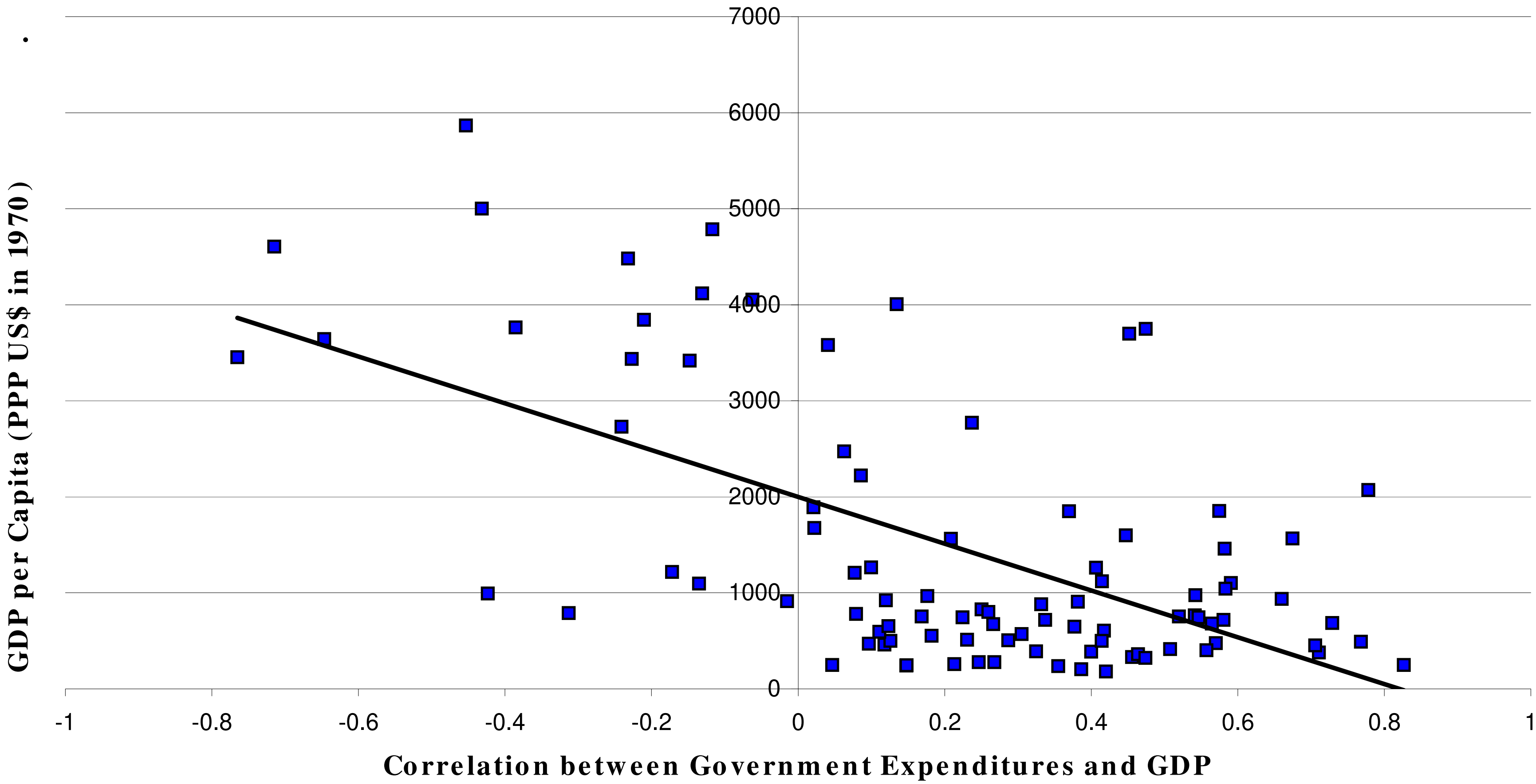
Results

OLS regression results are summarized in Table A.I. Column 1 shows the stylized fact discussed in much of the empirical literature and captured in Figure A.I: Procyclicality is decreasing in income per capita. The pairwise correlation between procyclicality and per-capita GDP indicates that a $1000 increase in 1970 PPP GDP decreases the correlation between the cyclical components of government expenditures and GDP by 15 percentage points. As demonstrated in Column 2, procyclicality is also highly correlated with corruption, with a 1-point increase in the *Control of Corruption* score decreasing the correlation between the cyclical components of government expenditure and GDP by 18 percentage points. This is not surprising, given that GDP and the *Control of Corruption* variable are highly correlated (with a correlation coefficient of 0.87 and T-statistic of 16.9). Column 3 shows that the relationship between corruption and procyclicality is robust to controlling for initial GDP per capita. Corruption remains statistically significant at the 5% level, with a coefficient of similar magnitude, while GDP per capita is only a statistically significant explanatory variable at the 10% level. When additional controls are added in columns 4 and 5, corruption remains statistically significant at the 5% level, while GDP per capita is no longer statistically significant. This indicates that much of the heterogeneity in procyclicality, seemingly across income lines, is due to rent-seeking.

A number of (unreported) robustness checks were conducted. Results do not differ when using general- instead of central-government expenditures. They are also robust to the exclusion of oil-producing countries, the five most procyclical countries, and the five most corrupt countries. Table A.II attempts to recreate Alesina and Tabellini's (2005) result that democracy and the interaction between democracy and corruption have explanatory power for the procyclicality of government expenditures. Using three different measures for democracy in Columns 1-3, we were unable to reject the hypothesis that the coefficients on measures of democracy are of no statistical significance, while *Control of Corruption* remains statistically significant at the 5%-10% level. Column 4 adds an interaction term between corruption and democracy as suggested by Alesina and Tabellini (2005), it too is statistically insignificant.

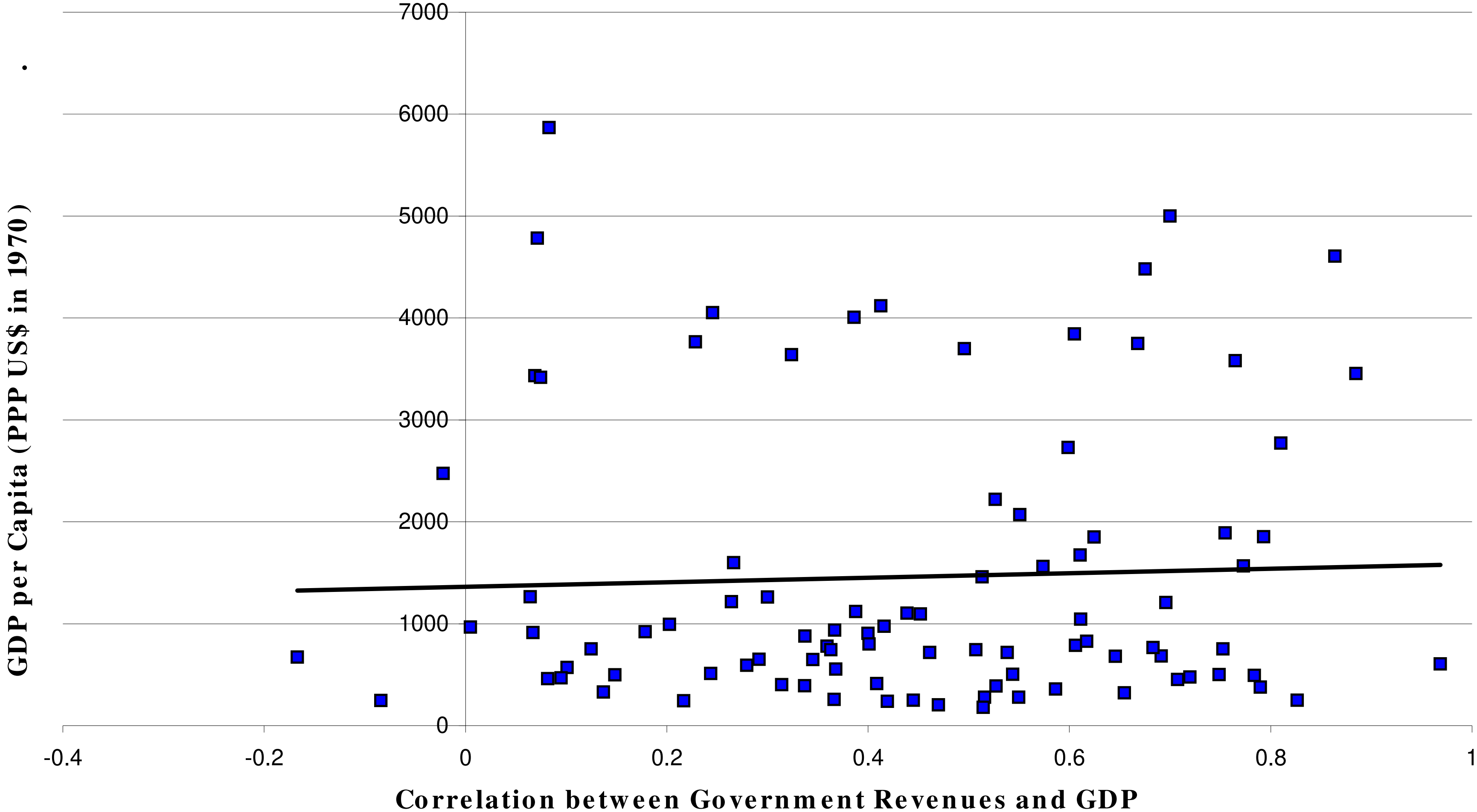
Table A.III conducts an additional robustness check to ensure that the results are not driven by reverse causality. The IV regressions reported in Table A.III control for this possibility by using the absolute value of each country's latitude as an instrument for corruption, as in Easterly and Levine (2003). The results in Table A.III show that the correlation between the procyclicality of government expenditure and corruption remains intact.

Figure I:
Cyclicality of Gov. Expenditures and GDP per Capita



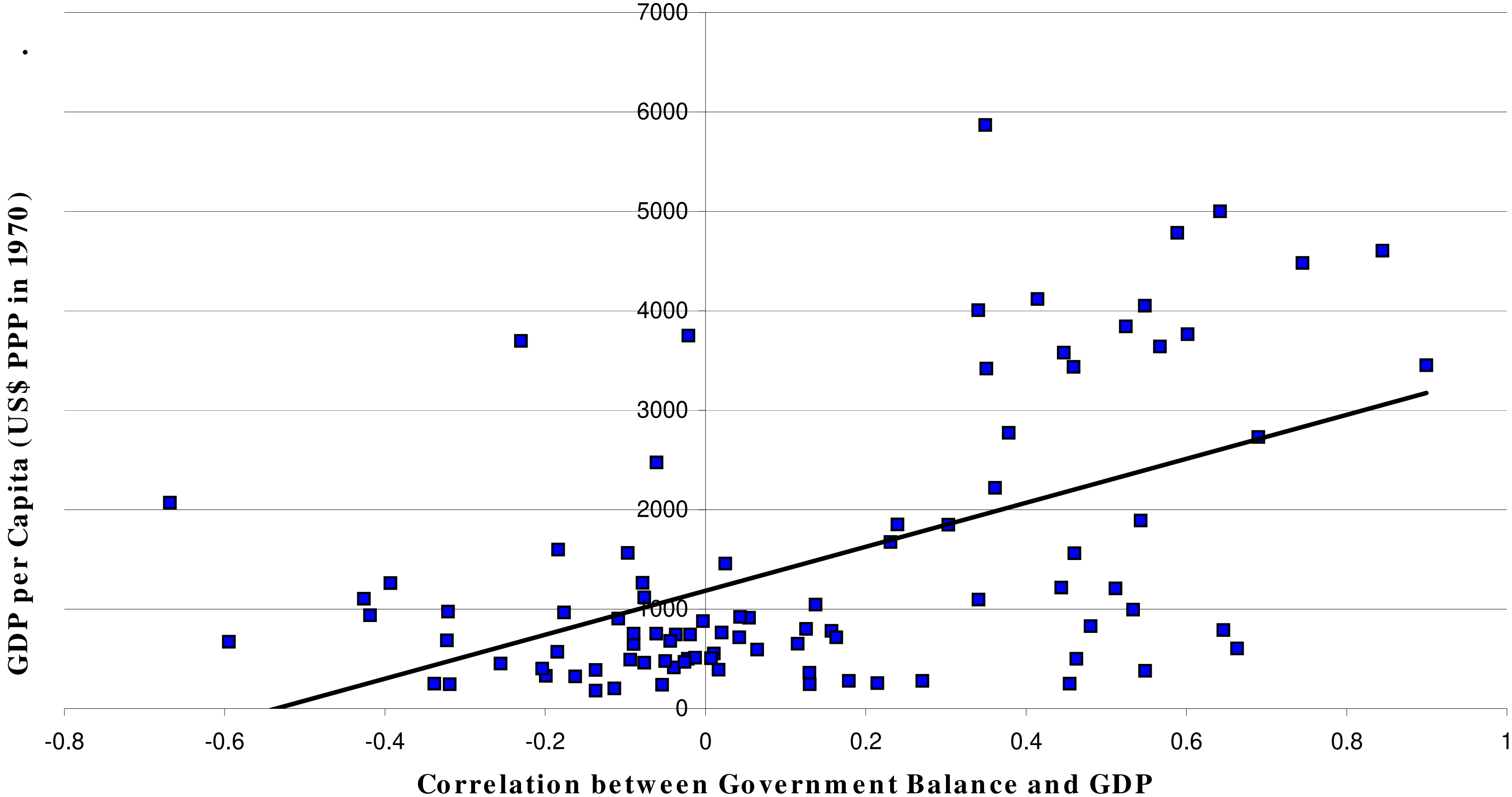
HP-filtered cyclical components total of real central government expenditures and real GDP from 1970 to 2003, using IMF WEO data. PPP GDP per capita in US$ in 1970 is from the Heston, Summers, and Aten (2002) database.

Figure II:
Procyclicality of Gov. Revenues and GDP per Capita



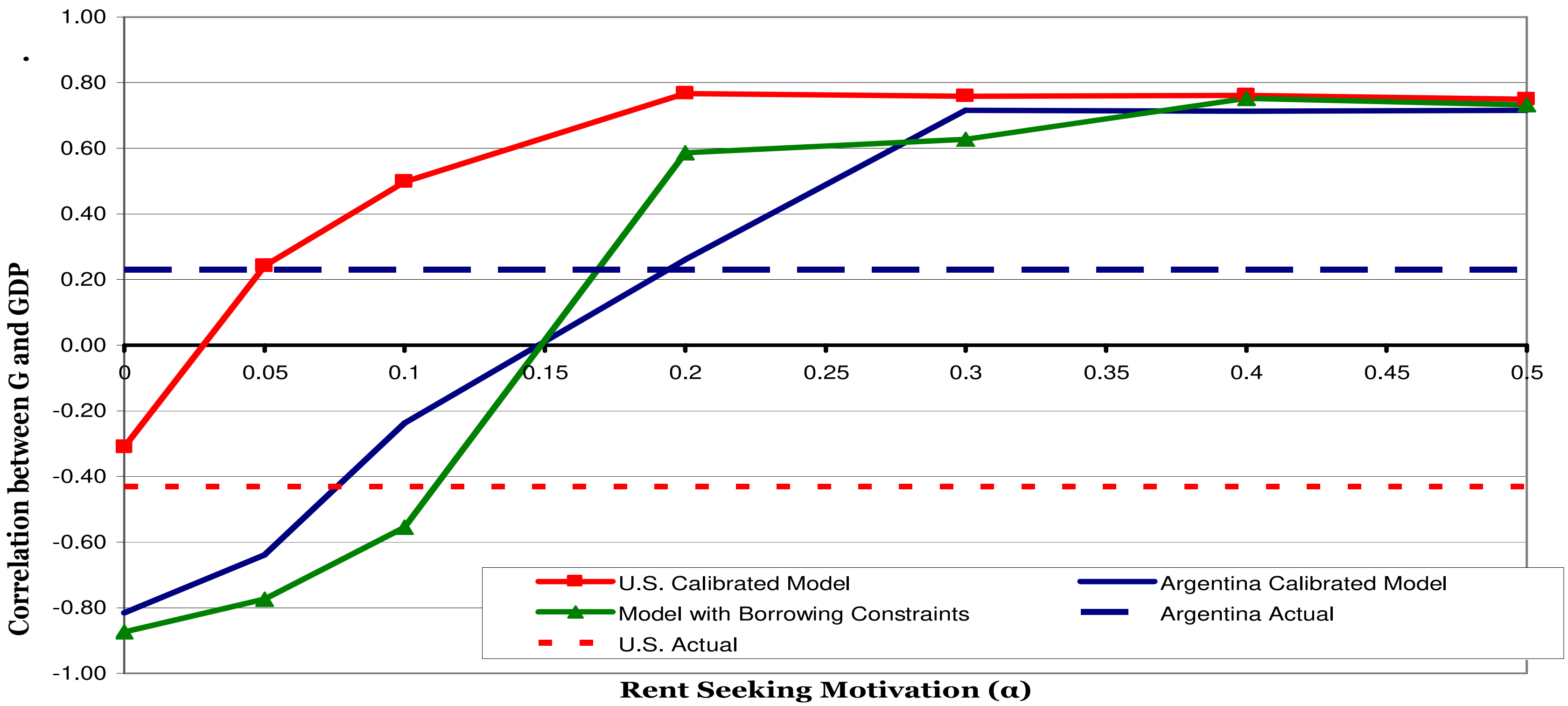
HP-filtered cyclical components of real central government revenues and real GDP from 1970 to 2003, using IMF WEO data. PPP GDP per capita in US$ in 1970 is from the Heston-Summers database.

Figure III:
Cyclicality of Gov. Balance and GDP per Capita



HP-filtered cyclical components of real overall central government balance and real GDP from 1970 to 2003, using IMF WEO data.
GDP per capita in US$ in 1970 is from the Heston-Summers database.

Figure IV: Government Expenditure & Rent Seeking Distortions



Simulated correlations between HP-filtered total government expenditure (G) and output (y) in three sets of simulations: (1) Calibrated to the business cycle of the United States, (2) Calibrated to the business cycle of Argentina, with borrowing constraints never binding and (3) Calibrated to Argentina, including only simulations where borrowing constraints were binding at least 10% of the simulation periods. Changes along the x-axis reflect changes in the α parameter, governing rent-

Table I

Components of Government Expenditure

Average correlation of cyclical component with the cyclical component of GDP

	High-Income Countries	Developing Countries
Total Government Expenditure	-.12	.37
Government Consumption	.21	.23
Government Capital Formation	.29	.30
Government Interest Expenditure	-.07	-.04

Cyclical component estimated using Hodrick-Prescott filter with a smoothing parameter of 100 (annual data)
Source: IMF WEO, except for interest expenditure from the International Monetary Fund's
Government Finance Statistics. Correlations are between 1970 and 2003.
n=81 for developing countries and n=21 for high-income countries, except capital expenditures where
the number of observations is for high-income countries drops to 20.
For interest expenditrures n=20 for high-income countries and n=66 for developing countries.
For interest expenditures, the time period of the correlation varies from country to country.

Table II

Correlation between Government Expenditure and GDP

Comparison along the business cycle

	Developing Countries
All Periods	.37
Excluding Crises	.33
Periods with Ouptut Above Trend	.25
Periods with Ouptut Below Trend	.29

Cyclical component estimated using Hodrick-Prescott filter with a smoothing parameter of 100 (annual data)
Source: IMF WEO. Correlations are between 1970 and 2003.
Crisis periods are defined as periods when the cyclical component of GDP is
two standard deviations below trend or lower.
n=81

Table A.I

OLS Estimates: Dependent Variable:

Correlation between Central Government Expenditure and GDP

	(1)	(2)	(3)	(4)	(5)
Control of Corruption		-.183 ***	-.117 **	-.122 **	-.114 **
		(-6.54)	(-2.2)	(-2.27)	(-2.00)
GDP per Capita	-0.00015 ***		-0.00007 *	-.00007 *	-.00007
	(-7.17)		(-1.72)	(-1.66)	(-1.60)
Government Size				0.178	0.139
				(0.67)	(0.49)
Democracy					-.037
					(-0.51)
Adjusted R-squared	0.36	0.30	0.39	0.38	0.37
n	93	102	93	93	93

T Statistics in parentesis

* - Significant at 10%

** - Significant at 5%

*** - Significant at 1%

Table A.II: Different Measures of Democracy

OLS Estimates: Dependent Variable:

Correlation between Central Government Expenditure and GDP

	(1)	(2)	(3)	(4)
Control of Corruption	-.114 **	-.099 *	-.096 *	-.123
	(-2.00)	(-1.68)	(-1.67)	(-1.15)
Democracy	-.037			-.030
	(-0.51)			(-0.32)
Polity IV		-.007		
		(-0.94)		
Years Democratic			-.003	
			(-0.34)	
Corruption*Democracy				-.013
				(-0.10)
Adjusted R-squared	0.37	0.38	0.37	0.36
n	93	102	93	93

T Statistics in parentesis
* - Significant at 10%
** - Significant at 5%
*** - Significant at 1%
GDP and Size of Government included in regression; results not reported for brevity.

Table A.III: Instrumental Variables Estimation

IV Estimates: Dependent Variable:

Correlation between Central Government Expenditure and GDP

Instrument: Distance from the Equator

	(1)	(2)	(3)	(4)
Control of Corruption	-.213 *** (-5.89)	-.244 ** (-2.19)	-.263 ** (-2.22)	-.263 ** (-2.14)
GDP per Capita		-0.00002 (-0.20)	0.00002 (0.31)	0.00008 (0.31)
Government Size			0.238 (0.75)	0.246 (0.72)
Democracy				.0098 (0.82)
Adjusted R-squared	0.29	0.36	0.34	0.33
n	98	89	89	89
F-Stat in 1st Stage	155.32	200.83	133.18	111.8

T Statistics in parentesis
* - Significant at 10%
** - Significant at 5%
*** - Significant at 1%