When Government Spending Serves the Elites: Consequences for Economic Growth in a Context of Market Imperfections

by

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Abstract. Government spending should be regarded as a social and political phenomenon, not merely as a technical choice. We argue that there is an implicit contract between the organized elites and politicians which often leads to a pro-elite allocation of public resources. A natural and simple taxonomy of government spending follows from this view: spending in public goods broadly defined which mitigate market failures versus spending in non-social subsidies, mainly a vehicle to serve the elites. We theoretically and empirically show that pro-elite spending biases are costly in terms of economic growth. The empirical findings are exceptionally robust.

1. Introduction

This paper argues that government spending should be regarded as a social and political phenomenon, not merely as a technical choice. We argue that under certain conditions an implicit contract between the organized elites and politicians may emerge. This often leads to a pro-elite allocation of public spending. This paper theoretically and empirically examines the consequences of pro-elite biases in the allocation of government spending for economic growth under conditions of imperfect markets.

The analysis highlights credit market failure, as well as failures associated with the creation of new knowledge (R&D) and environmental externalities, all of them recognized by the literature as important and pervasive in both rich and poor countries alike. Market failures, in combination with politicians' pro-elite biases lead to government spending allocations that often retard economic growth. The theoretical analysis shows that credit market imperfections reduce households' human capital investment and may restrict the size of the pool of individuals potentially able to create new ideas. By contrast, credit market imperfections tend to cause little direct impact on the aggregate level of physical capital investment by firms.

This would call for direct public subsidies to households (in kind or in cash), instead of subsidies to firms (unless they explicitly target R&D and environmental protection), as a

way of countering the negative effect of credit market failure on economic growth. Yet, governments tend to spend a large share of their budget in subsidies directed to firms, which as a consequence of certain features of the political process discussed below, are appropriated by the large firms which are generally immune to credit market imperfections. Moreover, in most countries only a tiny fraction of the firm subsidies is directed to promote R&D and environmental protection, areas where market failure are well documented and likely to be relevant for large firms as well.

The analysis leads to a natural taxonomy of government spending. It distinguishes between expenditures that alleviate the negative effects of market failure on asset investment, generally referred to as expenditures in "public goods", and expenditures in private goods or non-social subsidies that do not[1]. The latter include commodity market subsidies, energy subsidies, credit subsidies and grants to corporations, loan guarantees, and bailouts of failed private financial institutions, among many others. Non-social subsidies often constitute a large fraction of government spending and tend to be captured by the elites (Coady et. al., 2006, Baig et al., 2007;)[2].

This is not merely a study on the effects of the composition of government spending on growth. The taxonomy proposed here is based on certain key characteristics of politicians

[1] As discussed later, we define "public goods" broadly to include certain direct subsidies to households (education, health, and other social transfers), expenditures in environmental protection, R&D, and knowledge diffusion, as well as expenditures in conventional public goods.

[2] An illustration of the magnitude of these subsidies is provided by the following examples: worldwide farm subsidies reached $500 billion in 2001, 1.5% of the world GDP or 4.5% of total government revenues (Anderson et. al., 2006). In a sample of 48 countries, governments are estimated to spend in the range of 1 to 5% of annual GDP on fuel subsidies mostly benefiting large firms and wealthier households (Coady et. al., 2006). Examples about the enormous public costs of recent bail outs of large financial corporations (in part needed as a consequence of their inadequate regulation) in the USA and other countries abound in the popular press. The direct cost to US taxpayers of the S&L financial crises of the late 1980s has been estimated at $150 billion mostly spent over the period 1989-92 or about 4% of the total federal spending in each year (Curry and Shibut, 2000). The main source of the crisis was the decision to deregulate the industry in the early eighties. No one knows what will be the final cost of the current mortgage crisis to US taxpayers, but such cost may dwarf the S&L costs.

which make most of them systematically favor the wealthy, whose economic interests are mainly represented through the ownership and especially the control of the corporate sector. It is certainly nothing new to say that if governments wanted to maximize social welfare they should concentrate on the provision of public goods, including "pure" public goods as well as other goods which the private sector under supplies as a consequence of obvious market failures. Yet, as illustrated earlier and shown below, governments tend to direct a large share of public resources to subsidize the wealthy corporate sector, both directly and through market interventions, despite that such a sector is mainly immune to most market failures. Given a fiscal budget, corporate subsidies crowd out the provision of many public goods and reduce the ability of the government to deal with the negative consequences of market failure. Governments appear willing to accept significant social losses for the sake of favoring the elites.

Several studies have shown the existence of specific public policies (i.e. trade policies) used by governments to benefit especial interest lobby groups, in exchange for bribes and/or political contributions (Grossman and Helpman, 2002). While this may be a mechanism appropriate to analyze the connections between policies and the lobbying of specific groups, it may not illuminate the much more pervasive but also less obvious ability of the elites, as one class, to generate systematic policy biases in their favor[3]. This

[3] To assume that the elites are able to act as one class may seem exaggerated. However, in most countries the elites are able to act with at least a degree of cohesiveness as shown by the existence of powerful and centralized business federations representing the corporate sector in almost all countries. These organizations mostly perform generic lobbying, generally not targeted to benefit any particular industry, but instead to "improve" the overall policy environment to the extent that such improvements favor their common interests. Furthermore, the elite may have de-facto political power due to their small number and thus greater ability to solve the collective action problem (Acemoglu and Robinson, 2008).

cannot merely be explained as a direct exchange of bribes or campaign contributions between specific groups and politicians[4].

There are more subtle and effective mechanisms that the elites, as an organized entity, can use to generate an overall policy environment favorable to their interests: (i) the creation of an ideology of the elites. Given that subsidies to firms are mainly captured by the large firms controlled by the elites, it would be to their benefit to promote certain viewpoints, for instance, "subsidies to firms are good for growth and employment," possibly using think tanks, the media and universities under their control as instruments to propel the gospel. This ideology may create an environment of complacency towards non-social public subsidies which are often regarded to perhaps affect distribution but not economic efficiency. (ii) The implicit contract. Politicians know that if they are "well-behaved" (meaning keep the economy stable and normal, while maintaining or enhancing pro-elite policies) they will be rewarded through steep speech fees, juicy consulting, directories, and so forth, especially once they leave office. We show below that this implicit contract is supported, that is, there are incentives to both parts to make such a contract a stable equilibrium. A politician facing a choice between spending fiscal money in improving public schools in a poor neighborhood or subsidizing a large firm, may choose the latter. After all, the grass root organization in the poor neighborhood has little to offer the politician (perhaps not even votes, due to the low voter turnouts by the poor) while it is always possible to obtain significant private benefits from the large firm

[4] After all unions, grass root organizations, student organizations, or even organizations of the poor could also bribe and offer political contributions to politicians. Yet the overall policy environment is not precisely dedicated to benefit such groups. Non-elite groups can eventually get especial favors from governments but mainly if they resort to political action including strikes and other means to create social upheaval. Often the especial benefits to politically active non-elite groups are at the cost of neglecting the needs of other segments of the ordinary citizens that are less politically vigilant, not at the cost of the benefits to the elites.

or its associates once they leave office. Furthermore, the subsidy to the firm can be publicly justified as an incentive to the firm to "create more jobs for the poor".

This paper shows that in a context of market failure, the pro-elite bias of government spending is not only an issue of distribution as the ideology of the elites has led many to believe, but it also has grave negative consequences for economic efficiency and growth. Switching government spending from non-social subsidies to public goods broadly defined is likely to be good for economic efficiency and growth. We subject this hypothesis to rigorous empirical testing using a large sample of developed, middle income, and poor countries. We show that, unlike other findings in the government spending and growth literature, this result is robust to a variety of changes in the econometric method used, control variable selection, data sample, and countries included. This study may thus be regarded as a modest contribution to attenuate the pro-elite ideological biases discussed earlier.

Empirically measuring the strength of the effect of the fiscal mechanisms on growth has been the object of many studies. A weakness of this literature has been the general lack of a solid conceptual framework that would allow them to establish a clear taxonomy of expenditures to generically separate spending patterns that are pro growth from those that are not. This conceptual weakness is probably a reason for its rather disappointing and non-robust findings. Barro (1991), and Levine and Renelt (1992), for example, find that government spending has a negative effect on growth, while Ram (1986) finds a positive correlation. Still others find that there is no correlation between both variables (Kormendi and Meguire, 1985; Sala-i-Martin, 1997). More recent analyses have shifted their attention to the composition of government expenditures (Easterly and Rebelo, 1993,

Islam, 1995, Devarajan et al., 1996). However, these studies have not yielded more definitive results than the studies that use aggregate spending.

2. Conceptual Model and the Central Hypothesis

We focus on three types of market failures: (i) Asymmetric information, moral hazard and transaction costs in credit markets that result in credit rationing and other capital market effects (Rothschild and Stiglitz, 1976; Stiglitz and Weiss, 1981; Hayashi, 1985). (ii) Spillovers in the generation, adoption, and diffusion of knowledge (Hoff and Stiglitz, 2000) and externalities affecting environmental resources (Dasgupta, 1996). (iii) The well known inability of a market economy to autonomously provide for conventional public goods or goods that tend to be non-exclusionary and/or non-rivalrous.

The obvious effect of (ii) and (iii) is that the economy may under-invest in R&D, knowledge diffusion and environmental protection, and conventional public goods, respectively. The effects of credit market failure on asset accumulation are more complex. Below we provide a theoretical framework for the analysis of the latter effects.

2.1 Credit market failure

Recent empirical literature has shown that credit market failure is pervasive in both poor countries (Haque and Montiel, 1989) and rich ones (Attanasio et. al., 2008; Grant, 2007; Jappelli, 1990; Zeldes, 1989). We consider two types of credit market failures: credit rationing due to collateral requirements, and transaction costs that cause a wedge between the cost of lending and borrowing money[5].

2.1.1 Assumptions.

[5] Hayashi (1987), for example, defined economic agents as credit constrained if either (i) they face some quantity constraint on the amount of borrowing, or (ii) the loan rate available to them is higher than the rate at which they could lend.

Consistent with existing empirical evidence, we assume that credit rationing affects only some of the households and firms (presumably the least wealthy), while others can borrow freely in the formal sector[6]. To sharpen the analysis, we assume that constrained firms and households are those with net wealth below a certain critical level which impedes access to the formal credit market. This confers an advantage to financially unconstrained firms. However, below we show that by remaining small, constrained firms may still coexist with unconstrained ones due to the existence of credit transaction costs in addition to credit rationing.

Additional assumptions: (A.1) The economy is small and open; firms and households are price-takers in input and output markets, and the unconstrained firms can borrow freely in the international market. (A.2) Firms produce a single output using physical capital and various types of labor skills under constant returns to scale, and a common production technology. The production function is homothetically separable in capital and the various types of labor inputs. (A.3) Individuals invest in human capital, which combined with their fixed factors -such as their innate ability level- produce enhanced labor productivity (i.e., higher labor skills) through a "production function" which, due to the fixity of the individual's ability, is subject to decreasing marginal product to human capital[7]. (A.4) The various labor skills are perfect substitutes for each other in the firms' production function up to a scale factor. One hour of a high-skilled worker is equivalent to more than one hour of work by a lower skilled worker.

[6]Whited (1992), for example, presents empirical evidence showing the existence of asymmetric information in debt markets and that a significant portion of firms were liquidity constrained while others were not constrained at all.

[7] Henceforth, we will refer to the "household" or individual worker interchangeably as agents that invest in human capital as a source of labor skills.

Assumptions A.1 to A.3 are fairly standard in the literature. Assumption A.4 is less so, but is made to reduce the dimension of the labor market effectively to just one market. This assumption, in combination with (A.2) allows for the existence of a composite wage rate and a labor aggregator function. The wage rates for the various skill levels are derived with reference to the composite wage rate according to the corresponding skills This assumption oversimplifies the effects of labor skill differences in production but one needs to keep in mind that the focus of the analysis is not the labor market and that relaxing A.4 is unlikely to change the results qualitatively.

2.1.2 Supply of labor skills and human capital

Each worker has one unit of raw labor. By investing in human capital (h), she can increase her effective labor power by a function $1+\psi(h)$. By A.3, $\partial\psi/\partial h>0$; $\partial^2\psi/\partial h^2<0$. Also, we assume $\psi(0)=0$. If $h=0$, then the effective labor is just equal to raw labor with wage, w. As will be shown below, given perfectly competitive labor markets and A.4, the wage rate of a worker with human capital h_s is $w_s=(1+\psi(h_s))w$.

Financially unconstrained individuals face a fixed lending rate *r* at which they can borrow unlimitedly. Constrained individuals cannot borrow at all and consequently have to finance their investment (and consumption) out of their own wealth. Each worker maximizes her utility over two periods. Initially the individual earns a given wage rate, according to her initial level of h-which without loss of generality we assume is zero- and has a fixed level of wealth, s_0. Whether or not an individual is financially constrained depends on her initial level of wealth.

The worker's utility in period 1 is $u(c_1)$, where c_1 is the level of consumption, $c_1=w+s_0+B-h$, (the level of borrowing, $B\geq 0$ for unconstrained households and

$B = 0$ for constrained ones). In period 2, the individual earns an augmented wage level from investing in human capital and repays the amount borrowed. The discounted utility in period 2 is $u(c_2)/(1+\rho)$ (ρ is time discount rate) and $c_2 = (1+\psi(h))w - (1+r)B$. The worker maximizes the present discounted value of her utility.

Access to formal lending requires a minimum level of initial wealth. Let s* be the money in period 1, in addition to wage income, needed to finance both (optimal) consumption and the investment in human capital. Lending institutions then set a minimum wealth level requirement to access formal lending. The required initial wealth level should cover a minimum fraction of s^* , $\bar{s} = \xi s^*$, where $0<\xi<1$. The two-period optimization is,

(1) $\max_{h,B} u(c_1) + u(c_2)/(1+\rho)$.

First order conditions for the *unconstrained* individuals (i.e., those with $s_0 \geq \bar{s}$) are:

(2) $u'(c_1) - ((1+r)/(1+\rho))u'(c_2) \leq 0; \qquad [u'(c_1) - ((1+r)/(1+\rho))u'(c_2)]B = 0;$

(3) $-u'(c_1) + (\psi'(h)w/(1+\rho))u'(c_2) \leq 0; \qquad [-u'(c_1) + (\psi'(h)w/(1+\rho))u'(c_2)]h = 0.$

Assuming an interior solution, combining (2) and (3) yields

(4) $\psi'(h^u)w = 1+r$.

Unconstrained individuals optimally invest in human capital at a level h^u by equalizing the marginal value product of human capital to the marginal cost of borrowing. Substituting the optimal investment level h^u into (2) yields the optimal borrowing level, *B**. Strict concavity of ψ ensures that h^u is increasing in w (and decreasing in r). From (4) it follows that $\partial h^u / \partial s_0 = 0$, human capital investment by an unconstrained worker is unaffected by her level of wealth.

For *Financially constrained* individuals (i.e. $s_0 < \bar{s}$) Equation (2) becomes a strict inequality of reverse sign,

(2') $u'(c_1) - ((1+r)/(1+\rho))u'(c_2) > 0$;

Condition (3) is still valid and holds as an equality if $h^c > 0$. In fact, the level h^c is given by solving this equality. Combining (2') and (3) (assuming h^c >0) shows that,

(5) $\psi'(h^c)w > 1+r$.

Using (4) we have $\psi'(h^c) > \psi'(h^u)$, which is the key distortion caused by credit market imperfections. Strict concavity of ψ implies that for identical individuals $h^u > h^c$.

From (3) it follows that $\partial h^c / \partial r = 0$ and $\partial h^c / \partial s_0 > 0$; that is, the cost of capital does not affect investment of financially constrained households but their level of initial wealth increases investment in human capital.

The "Investment Jump" effect: Consider a subsidy m to a financially constrained individual. The subsidy will have a positive marginal (continuous) effect on h if the individual remains under the same financial regime, i.e., if she remains financially constrained. However, if m is sufficient to make $s_0 + m \geq \bar{s}$, then the financial regime of the individual switches, becoming now unconstrained. This, in turn, means that the investment-initial wealth schedule may have a discontinuity, having a discrete rise possibly of a much greater magnitude than what the within-regime marginal effect would be. Thus, the potency of subsidies to constrained households in raising human capital can be quite large. For the households that are near the border of the financial regime, even a small lump-sum subsidy can have a dramatic effect on h by propelling them into an unconstrained financial regime. We call this the *Investment Jump Effect*. Appendix A provides an illustration of this effect.

From assumption A.4, it follows that since each individual has just one unit of raw labor, the individual $i's$ labor supply in period 2 in efficiency units is $(1+\psi(h^i))$. The economy's aggregate labor supply in efficiency units, L^S, is the sum of the efficiency labor of C financially constrained individuals and U unconstrained individuals. Thus,

$$L^S = \sum_{c\in C}(1+\psi(h^c)) + \sum_{u\in U}(1+\psi(h^u)). \tag{6}$$

The level of aggregate labor supply in efficiency units is decreasing in the proportion of financially constrained individuals. For a fixed C+U level, L^S is decreasing in C.

Since the total level of human capital in period two is less than optimal, there is aggregate underinvestment in human capital. Moreover, there is no market mechanism that would induce unconstrained households to invest more in human capital to compensate for the underinvestment by constrained households. As we shall see, this is an important difference with the case of firms' investments in physical capital.

Important implications of the previous analysis are summarized in the following Lemma.

Lemma 1. *(i) Across-the-board lump-sum subsidies to all households increase the aggregate supply of efficiency labor, possibly inducing the Investment Jump effect among a subset of them and reduce the extent of the distortion represented by the* $\psi'(h^c)-\psi'(h^u)$ *gap. (ii) Subsidizing the cost of capital (r) increases investment by unconstrained households and the aggregate labor supply in efficiency units, but it exacerbates the original distortion.*

The proof of Lemma 1 is self-evident following by inspection of Equations (1) through (6) and our earlier comments. Part (i) is its most important one. The untargeted household subsidy causes a double positive impact on human capital: (a) it increases h among constrained households that remain so; (b) It reduces the number of constrained

households inducing the Investment Jump effect for those individuals that are able to switch regimes from constrained to unconstrained. As a consequence of this double effect, lump-sum subsidies to households even if untargeted, can be highly effective in promoting human capital investment and in offsetting the distortion caused by imperfect credit markets. By contrast, subsidies to the cost of capital can also increase human capital investment but at the cost of worsening the distortion.

An important consequence of the promotion of human capital investment induced even by untargeted household (direct) subsidies is that the pool of individuals with potential capacities to create new ideas is likely to be enhanced. This, in turn, may increase the flow of new ideas which, as is well recognized, is a key source of productivity growth. Lemma 2 below presents this result and proof.

Lemma 2. (On productivity growth). *Subsidies to households are likely to induce faster productivity growth over time on a permanent basis*[8]*.*

Proof. The creation and adaptation of new ideas requires that a large and rising number of individuals be able to continuously participate in such intent. In addition, the creation of ideas needs social interactions among large numbers of individuals. The continuous process of try and errors and mutual exchange of experiences by a large number of able individuals is a key source of productivity growth. Unleashing human creativity needs a minimum level of knowledge and other forms of human capital. When a large segment of the population is marginalized from such a process as a consequence of their inadequate human capital, the potential for interactions and creativity are greatly curtailed and the flow of new ideas is diminished. Consequently, the rate of productivity growth is likely to

[8] Here we focus only on the effect of direct subsidies to households. The household sector can also be the indirect beneficiary of subsidies to firms. However, as we show below, subsidies to firms tend to benefit mostly large corporations owned by households unaffected by credit constraints. In addition, we also show that the wage effect (which could benefit non-elite households) of subsidies to firms is likely to be small.

be low as well. Thus, a pro-household government spending, by contributing to increase human capital and thus to enlarge the potential pool for human creativity, is likely to have permanent effects on productivity growth and hence economic growth. An economy that allows a large portion of its population to acquire the levels of knowledge needed to be part of the pool of potential discoverers has a permanent advantage by constantly pushing its relevant knowledge frontier over one that condemns most of its population to inadequate human capital $\otimes$.

Lemma 2 emphasizes not only the level of human capital as a condition for an individual to be part of the creativity networks but especially the density of the creative interaction networks as an essential source of productivity growth. Thus, a minimum level of human capital enables an individual to be part of a creation network (which may raise her wage), but the key issue is that the rate of development of new ideas depends on an externality; that is, on the interactions with similarly qualified individuals which, in turn, depends on the density of the creativity networks.

2.1.3 Physical capital investment and the economy's demand for labor[9]

By A.2, the firms' production function is separable in the various labor skills and capital; that is, the firm's j production function is $q^j = (a_{-1} + \Delta) f(k^j, l^j(l_0^j, l_1^j ....l_M^j))$, where k^j is firm j's capital, $l^j(l_0^j, l_2^j ....l_M^j)$ is an increasing and homogenous of degree one function of the M+1 labor skills used by the firm, and the function $f(\ )$ is also homogenous of degree one. The term $(a_{-1} + \Delta)$ represents a total factor productivity function which is comprised of the existing productivity level plus its increase during the current time. According to Lemma 2 the *increase* in productivity, Δ, depends on the aggregate level of

[9] This section focuses on physical investments by firms abstracting by the time being investment in R&D which are likely to be affected by market imperfections other than credit market imperfections.

human capital and density of the creativity networks. This reflects the idea that people with a minimum level of human capital are constantly producing new ideas, some of which contribute to Δ.

The flow of productive new ideas (i.e., the additions to the existing knowledge, a_{-1}) depends on the pool of qualified people, that is, on the *stock* of human capital. If the stock of qualified people increases, the rate of the flow of new ideas expands because there are more people engaged in the process of creating new ideas. This also increases the density of qualified people which facilitates the interactions thus enhancing further their effectiveness in creating new ideas. Even if the stock of qualified people is constant, there will exist a flow of productive new ideas which allows that the total factor productivity of the economy increases over time (i.e., to allow Δ to be positive)[10]. Also, a_{-1} is a function of the knowledge that was developed in the past. The level of $a_{-1} + \Delta(L^s)$ is assumed taken as given by firms. For notational simplicity we will define $a(L^s) \equiv a_{-1} + \Delta(L^s)$.

Assumption A.4 allows us to write the labor aggregate used by firm j as $l^j = \sum_{s=0}^{M} (1+\psi_s) l_s^j$, where l_s^j is the number of workers of skill s used by the firm j. Without loss of generality we order the labor skills from the least skilled, l_0 ($\psi(h_0)=0$) to the most skilled l_M.

The variable or short run profit function of firm j conditional on a given level of k^j is,

[10] Here is the following analogy: Society can be compared to an engine that is in permanent operation. The engine produces a constant output. The rate of new output being produced per unit of time will depend on the power or size of the engine (e.g. no. of cylinders). The engine is society. The output is the flow of new ideas annually produced. And the size of the engine is given by the size and the degree of interactions of the pool of individuals able to engage in new ideas. This in turn depends on the stock of human capital. The level of productivity is given by the stock of existing ideas while the growth of total factor productivity is given by the rate of new ideas being produced.

(7) $$\pi^j = \max_{l_i^j} paf(k^j, \sum_{i=0}^{M}(1+\psi_i)l_i^j) - \sum_{i=0}^{M} w_i l_i^j ,$$

where p is the output price. The first order conditions are,

(8) $$paf_2 = w_i/(1+\psi_i), \qquad i = 0,1,.....,M$$

Since w is the wage rate for the workers with zero skills, then from (8) it follows that $paf_2 = w_i/(1+\psi_i) \equiv w$, for all $i = 0,1,.....M$. That is, the wage rate for workers of skill $\psi_s(h_s)$ is $w_s = (1+\psi_s(h_s))w$, proportional to the wage of the unskilled workers. This is the wage menu faced by the household in choosing its optimal human capital, as discussed in the previous section.

Note that the unskilled wage rate is equal to the marginal value product of the labor aggregator (paf_2), which means that w can be considered a "composite" wage rate of the labor aggregator l^j. Thus, we can express the firm's profit maximization problem with reference to the labor aggregator and composite wage only,

(9) $$\pi^j = \max_{l^j} paf(k^j, l^j; a) - wl^j \equiv k^j g(ap, w)$$

The firm j chooses the aggregate level of labor independently of the decisions regarding the demand for specific labor skills, and with reference only to the composite wage rate and not the skill-specific wage rates. The unit profit function $g(ap, w)$ is linearly homogenous, increasing in ap, decreasing in w and convex (Diewert, 1981). Moreover, the said conditions on g imply that $\partial g/\partial a > 0$, $\partial^2 g/\partial p \partial a > 0$, and under plausible conditions $\partial^2 g/\partial w \partial a < 0$ [11]. The assumption of constant returns to scale implies that the variable profit function is linear in k^j and the demand for total efficiency labor from firm

[11] Using Hotelling's lemma the latter condition merely implies that the firm's output supply is decreasing in the wage rate (Diewert, 1981).

j is equal to minus the derivate of the profit function with respect to w, $l^j = -k^j g_2(ap, w)$ (Diewert, 1981).

The economy's total demand for labor in efficiency units is equal to the sum of the labor demands across all firms, $\sum l^j \equiv L^D$. That is,

$$L^D = -g_2(ap, w)\sum k^j . \tag{10}$$

So far, the firms' behavior has been analyzed conditional on a given level of physical capital. Thus, the role of the credit market imperfections is not yet apparent. We now consider the firms' investment decisions.

At the beginning of period t, firm *j* has a given stock of capital, k_0^j, which is adjusted by choosing a level of investment, I^j,to maximize profits. Thus, firms can adjust their investment levels within the same period, whereas households, as we saw in the previous section, cannot adjust their supply of skills within the first period[12]. Investments in human capital can be affected much more slowly than investments in physical capital.

Let own financial capital for constrained and unconstrained firms be $\chi^i \geq 0$ ($i = c, u$) and their initial levels of physical capital be k_0^i ($i = c, u$). Assume that the minimum critical level of total owned capital by the firm, $\bar{k}$, is necessary for accessing capital markets. That is, unconstrained firms total initial wealth is $\chi + k_0 \geq \bar{k}$.

For unconstrained firms, r^f is the opportunity cost of their capital. In the second stage unconstrained firms choose optimal investment, I^u,

$$\max_{I^u}(k_0^u + I^u)g(ap, w) - r^f(I^u - \chi^u) \quad \text{for } k_0^u + \chi^u \geq \bar{k} \tag{11}$$

[12] This assumption regarding the asymmetry between the time required for human and physical capital investment reflects the fact that in the real world some human capital investments often need decades to be completed while investment in physical capital can be completed within a few years.

The first order condition yields,

(12) $g(ap,w)-r^f \le 0; [g(ap,w)-r^f][I^u-\chi^u]=0;\ \ I^u-\chi^u \ge 0$

Constrained firms also maximize long run profits by choosing their investment level, I^c,

(13) $\max_{I^c}(k_0^c+I^c)g(ap,w)-r^sI^c$ subject to $r^sI^c \le \chi^c$ for $k_0^c+\chi^c<\bar{k}$

Suppose that $g(ap,w)=r^f$ so that $I^u \ge \chi^u$. This means that if $r^s < r^f$, the constrained firms may obtain a profit by making $I^c=\chi^c/r^s$. The financially constrained firms can be competitive with the unconstrained ones but they need to remain small.

Of course, constant returns to scale means that the firm level profit maximization yields an undefined level of capital for the firm. As usual, however, the total level of capital or investment can be determined at the general equilibrium level. In competitive equilibrium, prices adjust until (12) becomes an equality so that,

(14) $g(a(L^s)p,w^E)=r^f$.

Consistent with Lemma 2, in (14) we have now made explicit the dependence of the total factor productivity function on the total effective supply of skills, L^s, with $a'(L^s)>0$. In a small open economy, p and r^f are fixed. So the adjustment comes from the labor market. If initially $g(a(L^s)p,w)<r^f$, then investment by unconstrained firms will fall, reducing capital and output, and therefore the demand for labor. Thus, w falls, increasing the unit capital profit until $g(a(L^s)p,w)=r^f$. The opposite occurs if $g(a(L^s)p,w)>r^f$. We reach an equilibrium level of the composite wage rate, w^E, which yields (14). Given that the unit profit function (g) is decreasing in w and increasing in a, it follows that the equilibrium wage rate is increasing in a and, hence, in the total supply of labor efficiency, L^s. An increase in the composite wage may induce positive feedback effect

on L^s which would cause a second round upward effect on the wage rate due to the productivity increases, but under the model's assumptions this may not occur as investment in h depends on the relative wage scale, not on the absolute wage levels.

Using (10) it follows that the total labor demand of the economy in efficiency units is,

$$L^D = -K^E g_2(a(L^s)p, w^E) \quad , \tag{15}$$

where $K^E \equiv \sum_{u \subset \tilde{U}} (k_0^u + I^u) + \sum_{c \subset \tilde{C}} (k_0^c + I^c)$, $\tilde{U}$ is the number of unconstrained firms and $\tilde{C}$ is the number of financially constrained firms. $g_2(ap, w^E) < 0$ is the first derivative of the function $g(p, w; a)$ with respect to w. In addition, labor market clearing implies that,

$$L^D = L^S . \tag{16}$$

The total supply of labor efficiency (and also the supply of each skill) is predetermined at time t, given by (6). The demand for efficiency labor must therefore adapt to such supply. Since the composite wage w^E is given by the equilibrium in the capital market (Equation (14)), the aggregate demand for labor efficiency must adjust to L^S via the level of aggregate investment in physical capital by unconstrained firms, which, in turn, determines K^E.[13] Thus, Using (15) and (16) we can write, $K^E = \Omega(L^S; w^E, a(L^s)p)$; convexity and the other properties of g presented earlier mean that the effect of L^s on

[13] This means that the endogenous aggregate level of investment allows for the equalization of the aggregate (efficiency) labor supply and demand. At $w = w^E$ the whole wage structure is determined in accordance with $w_s = (1 + \psi(h_s))w^E$ for all $s = 1, ..., M$. At these wages equilibrium between supply and demand for each skill also occurs due to the assumption that labor skills are perfect substitutes in production. Suppose that this is not the case and that instead there is excess supply of workers of skill s. This causes w_s to have an incipient reduction to a level below the equilibrium one, $(1+\psi(h_s))\,w^E$, which, in turn, induces firms to substitute among skills by using more workers with skill s until the equilibrium wage rate is reestablished. Thus, demand for skills is completely flexible in adjusting to supply of skills.

K^E for a given level of w^E is positive. It can be shown that the effect of L^s via w^E cannot offset the direct effects of L^s on K^E. Thus the total effect, $dK^E / dL^s > 0$.

The level of aggregate output is solved recursively and is given by,

$$(17) \qquad Q \equiv \sum q^j = K^E a\pi_1(ap, w^E) = a(L^s)\ \Omega(L^S; w^E, a(L^s)p)\ \pi_1(a(L^s)p, w^E)$$

where π_1 denotes the first derivative of the function π with respect to p. Equation (17) implies that aggregate output is not affected by firms' credit constraints either, but it is affected by credit imperfections affecting the household sector, which reduces L^S and consequently the level of total factor productivity.

Total labor demand in efficiency units, as well as aggregate output, depend on the *total* capital investment, and not on its distribution between constrained and unconstrained firms. If financial constraints to firms become tighter, say for example if χ^c decreases, the economy's aggregate levels of efficiency labor and of physical capital remain unaffected and, therefore, the aggregate level of output of the economy is not affected either. The reduced investment by financially constrained firms is exactly compensated by greater investment among the unconstrained ones at no efficiency cost until the general equilibrium conditions (15) and (16) are re-established.

This result stands in sharp contrast with the effects of credit market imperfections on households' human capital investments. Such imperfections affect not only the distribution of human capital across households but also the total level of human capital and, hence, the total supply of labor in efficiency units as well as aggregate output. The larger the portion of financially constrained households, the lower the aggregate level of investment in human capital, investment in physical capital and aggregate output.

The solution to the equations (14) to (16) should be interpreted as snapshots in the sense that the solution defines a temporary equilibrium. That is, the equilibrium will be constantly changing even if no exogenous variable varies over time. The reason of course is that the total factor productivity a is constantly changing as its level depends on the stock of human capital and not on its change. Let's retake the definition of $a(L^s) \equiv a_{-1} + \Delta(L^s)$. In the following period there will be a new addition to the stock of ideas, Δ_+, the size of which depends of the stock of human capital; if in the following period the stock human capital rises then $\Delta_+ > \Delta$, and if the stock of human capital remains constant we have that $\Delta_+ = \Delta$, but the economy still grows. Thus, even if L^s is constant, the levels of output, physical capital and the wage rate will continuously grow.

The following lemma and its corollary summarize the previous analysis,

Lemma 3. *Firms that are not financially constrained compensate for underinvestment in physical capital by financially constrained firms, while unconstrained households do not compensate for underinvestment of constrained households in human capital*.

Corollary to lemma 3. *Growth of total factor productivity, capital and output in the economy are negatively affected by the impact of credit market imperfections on household investments in human capital.*

The theoretical model just presented is of course highly stylized, abstracting from complications which are not central to our problem. The model is not intended to describe reality but rather to illustrate certain key observations; in particular, credit market imperfections tend to have much more serious consequences for the household sector investing in human capital than for the firm sector investing in physical capital. As with any theoretical model, the results can be rendered ambiguous by simply relaxing

some of the assumptions used or by adding factors that are abstracted from the model. However, also as in most other economic models, the objective is to show that the above result is consistent with economic theory, not that it is a universal result under any condition[14]. One could argue that the empirical validity of its testable hypotheses is the ultimate yardstick to evaluate the model's contribution.

2.2 Lobbying and the capturing of government expenditures[15]

Credit market imperfections are often used to justify government subsidies to firms. The availability of subsidies, in turn, induces lobbying and other forms of directly unproductive activities (DUP) or rent seeking by interest groups to exert pressure upon the government to allocate subsidies in their favor. Politicians thus use spending in private goods or subsidies as a way of generating rents form private firms. This makes both the elites controlling the corporate sector and the politicians better off at the cost of society as a whole. This mechanism is perhaps more effective than the use of inefficient regulation of firms as a source of bribes for politicians studied by Shleifer and Vishny ,(1994), Djankov et al (2002) among others, because in the latter case firms end up worse off, only politicians gain. The use of unneeded regulations of firms often makes the elites unhappy which could end in the withdrawal of their political support of politicians that implement such regulations.

[14] There are several possible reasons why investment shortfalls by constrained firms may not be so easily compensated by greater investment by unconstrained firms. For example, constrained firms most likely do not have identical production functions as unconstrained ones, as the model assumes. However, if unconstrained firms are more efficient than constrained ones (as is plausible) then substitution of physical capital investments would likely be even easier. The issue is that for the household sector there are obvious reasons to expect poor substitution among households' investments in human capital, while that is not the case for the firm sector.

[15] This section focuses on physical capital investment by firms abstracting by the time being from investment in R&D which is likely to be affected by market imperfections other than credit market imperfections.

Subsidies to firms are more likely to elicit lobbying and DUP than subsidies to households for three main reasons. First, having fewer firms than households implies that it is easier for producers to organize than consumers. Second, firms are more easily grouped by production activities with common interests than households, which tend to be much more dispersed with regards to both activity type and geography. Third, from the viewpoint of public acceptance, it is easier to justify producers' associations influencing government for the sake of the productive sector than the association of a few wealthy households lobbying for a larger share of household subsidies, for example, foods stamps or public housing benefits.

This difference helps explain an important stylized fact: Most firm subsidies are engulfed by very few, typically the wealthiest, firms while most of the small ones receive little of them. This is despite the fact that a public justification for many such subsidies is the protection of small enterprises "affected by lack of credit"[16].

This also means that subsidies to firms are unlikely to benefit poor households that may own small firms. That is, potential spillovers of firm subsidies into the household sector which could help relieve household financial constraints (and thus reduce the underinvestment in human capital) are likely to be rather negligible.

In contrast, the lower lobbying efforts elicited by the availability of direct subsidies to households implies that such subsidies tend to either concentrate on the lower income households (certain social transfers, food stamps, public housing) or at worst get more or less evenly dispersed across most households (free primary and secondary education,

[16] Farm subsidies are a good example where a small minority of the largest farmers get the lion's share of them (Alston and James, 2003). The same is true for export subsidies, credit subsidies, public credit guarantees, and many other subsidies directed to firms.

health care, social security, and others)[17]. Thus, low income households are able to mitigate their financial constraints through at least part of the cash or in kind household subsidies available while subsidies to firms tend to mainly create rents for the unconstrained wealthier producers. In addition, from (14) and (8) it follows that neither the equilibrium wage rate nor the wage structure are affected by firm subsidies. We summarize these results in the following lemma and its corollary:

Lemma 4. (i) *Politicians have an incentive to spend a significant part of government spending in subsidies to firms as such subsidies elicits more rent seeking activities than direct subsidies to the household sector; (ii) Subsidies to firms tend to concentrate in a few leading firms, and tend to have little effect on the equilibrium wage rates.*

Corollary to Lemma 4. *Subsidies to firms are not likely to spillover into financially-constrained households and, therefore, tend to do little to mitigate the effects of credit market imperfections on investment in human capital by households.*

2.3 Implications for government subsidy policies

The following two propositions summarize the key implications of the lemmas 1 to 4 and corollaries for fiscal subsidy policies:

Proposition 1 (on direct subsidies to households). (i) *Subsidies to households increase the aggregate supply of efficiency labor and enhance the human creativity pool which, in turn, may cause a faster rate of productivity growth, and also more investment in physical capital. All this may lead to a faster rate of economic growth.*

Proposition 2 (on subsidies to firms). *(i) Government subsidies to firms are unlikely to increase aggregate investment in physical capital, cause little spillovers into the*

[17] Note that we refer here to *direc*t subsidies to households. We are excluding subsidies that may indirectly affect households by distorting commodity markets such as certain energy subsidies and others. Subsidies through commodity markets are likely to elicit DUP, in addition to creating other economic distortions.

household sector to relieve its financial constraints and may cause efficiency losses due to DUP. The net effect of subsidies to firms is likely to lower output and economic growth.[18].

2.4 Spending Taxonomy

The previous analysis suggests a simple taxonomy for government spending. We consider two categories of government spending: *Type A or broadly defined public goods*. In addition to subsidies to households (which include social expenditures, social transfers, education[19], and health care) described previously, Type A expenditures also include environmental protection, R&D and knowledge diffusion and conventional public goods (law and order, infrastructure, culture, and others). These expenditures tend to palliate market failures and are likely to complement the efforts of the private sector. *Type B or expenditures in private goods.* These include subsidies to firms such as credit subsidies, export subsidies, farm subsidies, credit guarantees, financial bailouts, outright grants, and other forms of corporate welfare (excluding subsidies that directly target R&D or environmental protection) some of them referred to as "development expenditures". As discussed earlier, this type of spending generally does little to mitigate

[18] But see below for the especial cases of subsidies that directly target R&D and environmental protection.
[19] Government expenditures in education are Type A for two reasons: (i) part of them (especially expenditures in primary and secondary education) reach financially constrained households and thus mitigate the negative impact of credit market imperfections on human capital investment. (ii) other expenditures in human capital may be inaccessible to all households, but they still provide positive externalities associated with knowledge; expanding the number and quality of university professionals induce social benefits over and above the benefits accruing to the individuals that invest in such studies.

market imperfections or to provide other public goods[20]. Instead it tends to exacerbate some of the negative effects of certain market failures[21].

2.5 *The implicit pact and the subsidies to firms*

Although Type A spending may more effectively promote efficiency and economic growth than Type B, politicians may nonetheless have incentives to channel a significant part of government spending towards the latter. Assume that politicians' objective function is to maximize the present value of their utility. This is a function of income while in power, income when they retire, and of obtaining and then retaining political power for as long as the constitution allows. We can thus model the in-power politician's optimization as a two-period model. The politician is in power in the first period, while in the second period she retires. Income while in power is the regular salary (plus political contributions to remain in power as long as possible) and income in retirement is variable, depending on her performance while in office.

While in office, the key concern of the politician is to avoid being booted out of office before her period is due which require a normal and stable performance of the economy. We assume that politicians falling in disgrace as a consequence of disastrous economic performance tend to lose everything, power and the favors from the elites once out of office regardless of the favors that they might have brought to them. The rate of economic growth is assumed not to be part of the objective function, but is part of the

[20] Empirical studies have shown that these subsidies are at best ineffective in promoting investment and technological adoption and, in some instances, counterproductive (see Bregman et al., 1999 for Israel, Lee, 1996 for Korea, Bergstrom, 1998 for Sweden, Estache and Gaspar, 1995 for Brazil, Harris, 1991 for Ireland).

[21] The taxonomy of government spending proposed here is quite consistent with the one recently used by Battaglini and Coate (2008) in their theoretical analysis of fiscal policy, where government spending either finances a public good or is used for pork barrel spending. They find that in equilibrium public good provision is too low. They conclude, as do we, that the economy's output can be expanded by increasing spending in public goods provided that total spending does not increase.

constraint function of the politician. The politician's objective is to help herself which requires a minimum overall economic performance, but once out of office her rewards are not based on whether the economy grew at 4% instead of 3%. Instead, the main rewards are based on how well the politician had served the elites.

Thus, the optimization problem for the politician is to maximize her utility in the first period which is a function of the salary and the length of time she is able to stay in power, plus the discounted value of the variable income in the second period, subject to the constraint that the rate of growth while she is in office is at least as large as a minimum acceptable rate.

Politicians participate in two different political games depending on the stage of their political situation: (i) In-office politicians running for re-election need to attract enough political campaign contributions to remain in power. They thus create demand among the most organized and economically potent actors for government-financed benefits by inducing competition among the many especial interest groups for accessing subsidies. That is, it is important to put state resources up for grabs in a way that can be appropriated by particular groups. One popular way of doing this has been through trade and other price policies including especial privileges (i.e., licenses, monopoly concessions, and so forth). These policies tend to cause market distortions which have led international organizations and economists to persuade politicians to minimize them. An alternative way, which has not received as much interest as the "market" distortions, is the biased allocation of government spending towards Type B goods. As discussed earlier, Type B spending can be appropriated by the groups of the elite through lobbying much more effectively than Type A expenditures in exchange for campaign and other forms of support to the politicians. (ii) In-office politicians in their final period have as a

primary strategy to appeal to the elites as a class rather than promoting competition among specific lobby groups as in case (i). At this stage the politician's emphasis changes from the use of market and non-market privileges for specific groups to more general policies including the consolidation of the pro-elite orientation of overall government spending and other fiscal policies.

In period 2, the retired "successful" politician's income is supplemented by steep speech fees, directory appointments, juicy consulting jobs, and so forth. These benefits can be provided mainly by the elites and its organizations as a reward to former politicians that have been "well behaved" while in office. The incentives are clear: for politicians in office to serve the interests of the elites and for the organized elites to honor the implicit contract and reward those that did the most to enhance their interests. Honoring this implicit contract is rational as it constitutes an incentive for current holders of political power to be as "good" to the elites as possible given the constraint discussed earlier. An important indicator of how big the pro-elite biases of politicians in power are is the share of spending in Type B goods that they choose. Generally the greater the pro-elite biases of politicians, the greater is the preponderance of Type B spending.

Not all political systems give equal leeway to politicians in their pursuit of serving the elites at the cost of social welfare. Features of democracy, participation and organization of the civil society in political controls, as well as specific political institutions ruling elections and political representation, among many other institutional features, are likely to influence the degree of pro-elitism of politicians. In the empirical analysis we select some of these variables as candidates for instruments of the government spending composition indicators that we use.

2.6 The Hypothesis

The previous analyses lead us to the following testable hypothesis and remark.

The Central Hypothesis: *An exogenous reallocation of government spending from Type B to Type A expenditures promotes faster economic growth.*

Remark*. The reallocation from Type B to Type A expenditures promotes faster growth not only because Type A expenditures are pro-growth but also because Type B expenditures are generally toxic for growth by inducing more waste through higher DUP and exacerbating distortions caused by market failure*.

3. Estimation Issues

In testing the central hypothesis we use the share of Type A goods in total government spending. We now address certain issues which have been raised in the literature regarding the estimation of the growth effects of government spending (Kneller et. al. 1999, Bose et. al. 2007).

Financing and the budget constraint. The impact of a particular government expenditure item on economic growth is intrinsically linked to the mechanism used to finance it[22]. We do not face this problem. Changes in the share of expenditures in public goods in total spending imply a concomitant reduction of expenditures in private goods. That is, there is an unambiguous financing connotation which is incorporated into the estimation.

The Efficiency of Government Spending. We have shown that the share of Type A expenditures is in itself a partial indicator of government spending efficiency. A narrower efficiency issue relates to the efficacy of specific expenditures in the provision of the

[22] For example, the effect of increasing government spending in education on economic growth is likely to be different if such an increase is financed via higher taxes, higher government deficit or by reducing expenditures in health or in other expenditure items. Dealing with this issue requires controlling for a variety of financing sources, which is often a difficult task.

goods and services that they target, which are not necessarily good for growth. There are no a priori reasons to expect that Type A or B expenditures are systematically more or less efficient, using the latter definition of efficiency. Thus, omitting the effect of government efficiency may not be of great consequence to testing the hypothesis that transferring fiscal expenditures from type B to A induces faster growth. In any case, we also use various control variables as measures of bureaucratic efficiency, which could be considered proxies for the level of government efficiency

The lagged effects of government expenditures. The effect of government spending on growth is likely to take time, especially Type A expenditures which often involve projects of long maturity such as health and education[23]. The time lag is likely to be shorter for Type B expenditures which mainly involve financial transfers. We use five year averages as the unit of observation to mitigate this in part. Given the likely time lag asymmetries between Types A and B expenditures, if the empirical estimates corroborate our central hypothesis using five year observation periods, full consideration of the lags would give even a stronger corroboration of such an hypothesis.

Empirical specification and control variables. We use a single equation instrumental variable approach and, alternatively, a system approach. The next section deals with the issues of identification. Here we focus on the control variables which are selected on the basis of three types of theories. The first emphasizes the role of governance and distribution of wealth on growth (Esteban and Ray, 2006; Alesina and Rodrik, 1994; Persson and Tabellini, 1994). The second focuses on structural characteristics of the political constitution (Milesi-Ferretti et al, 2002; Persson, 2002, and Alesina et al, 1997).

[23] Increasing labor training programs may have quite rapid effects. Improving high school education may begin having an effect within a year if the expenditure improves the education of those in the final year of their education, while spending in pre-school education may take much longer.

The third one emphasizes geographic and other natural characteristics of countries as factors influencing economic growth and policies (Sachs et al, 1999).

4. The Estimating Model

Consider the following model,

$$g_{it}^{y} = g_{it}^{a} + \alpha g_{it}^{k} + \gamma g_{it}^{h} + \varepsilon_i + \mu_{it}, \tag{18}$$

where the g_{it}^{y}, g_{it}^{k}, and g_{it}^{h} stand for per capita growth rates of country i at time t of output, per capita physical capital, and per capita human capital, respectively; g_{it}^{a} stands for total factor productivity growth which may include unobserved time varying factors as well, ε_i for fixed or random country effects and μ_{it} for the stochastic disturbance assumed to satisfy the usual conditions.

Consistent with the theoretical model, the share of public goods in government spending (controlling for total government spending) is assumed to affect the growth rate of a as well as the rate of growth of human capital, h. Also, the (lagged) *level* of human capital is likely to affect g_{it}^{a}, g_{it}^{k}, and g_{it}^{h}. That is, $g_{it}^{a}(s_{it-1}, G_{it-1}, h_{it-1}; Z_{it})$, where s_{it-1} is the share of spending in public goods lagged one period, G_{it-1} is total government spending as a share of GDP, h_{it-1} is the stock of human capital also lagged one period, and Z_{it} is a vector of other variables that the literature have considered as affecting productivity growth. The growth of human capital is assumed to depend on similar factors, $g_{it}^{h}(s_{it-1}, G_{it-1}, h_{it-1}; \tilde{Z}_{it})$, where the vector $\tilde{Z}_{it}$ may have some common elements with Z_{it}.

One could also replace the variable g_{it}^{k} in (18) by the variables that are hypothesized to determine them, including of course the government spending variables as well as the many others that the literature has considered important in this respect, and estimate a

fully reduced form equation. The problem of doing this is that g_{it}^{k}, often proxy by the investment/GDP ratio, is likely to capture not only the growth of capital itself but also may reflect the influence of many other, possibly unobserved, factors. So omitting the investment/GDP variable from the estimation may cause significant specification problems. We thus opt to keep the physical capital investment indicator. We also use the lagged level of average years of schooling as a proxy for h_{it-1} as an explanatory variable. So the effect of the government spending variable will be reflected mainly through its effects on total factor productivity growth and the growth of human capital[24]. Thus, substituting the expressions $g_{it}^{a}(s_{it-1}, G_{it-1}, h_{it-1}; Z_{it})$ and $g_{it}^{h}(s_{it-1}, G_{it-1}, h_{it-1}; \tilde{Z}_{it})$ in (18), we obtain the basis for the estimating model of the benchmark regressions,

$$g_{it}^{y} = \beta_1 s_{it-1} + \beta_2 G_{it-1} + \beta_3 h_{it-1} + \beta_4 Z_{it} + \alpha g_{it}^{k} + \varepsilon_i + \mu_{it} . \quad (19)$$

We estimate equations like (19) using various single equation estimators. In addition, we also estimate a system model of two equations with g_{it}^{y} and s_{it} as the endogenous variables. We use a Three Stage Least Squares approach using a specification for the per capita growth equation similar to (19), without of course lagging the government variables (more on the specification of the system equations below).

The most important variables considered as part of the Z_{it} control vector were macro-fiscal variables including government consumption expenditures over GDP, taxes over GDP, per capita level of GDP at the beginning of the sample period (1975), inflation rate,

[24] However, as part of the sensitivity analysis, we also estimated a fully reduced-form version of the model (see Footnote 23 below).

and several others[25]. We also used several control variables related to governance, institutions, demographic, and geography.

Identification and sensitivity analyses

We subject the central hypothesis of this paper to very stringent sensitivity tests but we do not of course claim that such an hypothesis is "proven". While we use reasonably adequate instruments to control for the possibility of reverse causality and econometric methods to in part consider potential omitted variable biases, our emphasis is on rigorously probing the robustness of the estimators to changes in the time period, countries considered, control variables used and econometric specification. This is in fact in the spirit of the robustness analysis prevalent in the literature (Sala-i-Martin 1997).

We first ascertain the existence of a positive correlation between economic growth and the share of public goods in total government spending, which is a necessary (but certainly not sufficient) condition for the central hypothesis of this study to be valid. Next, we consider two key questions: (i) Is such a correlation due to the effect of omitted variables rather than a causal relation between the two variables in question? (ii) If we cannot rule out the existence of a causal relationship between the two variables, what is the direction of such causality?

Omitted Variables. The literature has relied on fixed effects and related estimators which control for fixed omitted variables but not for time-varying omitted variables. To address this issue we use sensitivity analyses, experimenting with as broad a variety of time varying control variables as possible[26]. This approach takes advantage of the recent progress in the collection of a large number of economic, institutional, and political

[25] The use of taxes over GDP in addition to total government consumption expenditure is not a problem in our model since our sample shows a relatively low correlation between taxes and government consumption.
[26] Of course one cannot use all possible controls simultaneously. We follow the approach used by Sala-I-Martin and other authors and use many combinations of subsets of the control variables.

indicators which qualify as potential control variables (previously considered "unobserved" or "omitted" variables).

Even if by definition one cannot directly control for time varying unobserved variables, the larger the number of controls in the estimation, the more likely it is that some of them are correlated with time-varying unobserved effects. If sequentially including a large number of control variables does not affect the statistical significance of the correlation of the variables in question, this may imply that omitted variable biases may not be an issue. The broader and more comprehensive are the sensitivity analyses implemented, the stronger is the presumption that the correlation between spending in public goods and per capita growth is not due to time varying omitted variables.

Reverse Causality. We address the possibility of reverse causality going from economic growth to public goods both conceptually and empirically. The theoretical rationale for the reverse causality argument is that the demand for public goods is likely to increase with per capita income. Strictly, this argument points to an effect of the *level* of per capita income, rather than the rate of *growth* of per capita income, on the level of public goods provided, often known as Wagner's law (Ram 1987; Shelton 2007). Wagner's law mainly applies to total government expenditures, not the share of public goods.

The effect of per capita income on the government's share of public goods is positive only if the income elasticity for public goods is greater than the income elasticity of the demand for private goods provided by the government. Even if this were the case, economic growth would affect the *growth* rate of public goods, not necessarily its level (Kneller et. al. 1999). Thus, the conceptual foundation to expect a strong positive effect of the rate of economic *growth* on the *level* of the share of public goods is rather weak.

Despite the evident conceptual weakness and lack of consistency of the growth-to-share of public good story with the relevant literature on the demand for government expenditures, we do address this possibility further. First, in the single equation estimations we use lagged values of the share of government expenditure in public goods in total expenditures as the explanatory variable, which obviously by itself does not adequately deal with the hypothetical reverse causality. However, we note that the share of public goods has a much smaller variance over time than the highly unstable GDP growth rates[27]. Thus, if GDP growth rates were an important determinant of the level of the share of public goods, it would have required many years of consistently higher or lower growth to explain even a fraction of the large observed differences in such a share across countries. If consistent growth differentials had occurred, they would be reflected in the levels of per capita income. Since we do control for the initial levels of per capita income, this effect would be captured by such a variable.

Second, we use instruments. In economy-wide analyses where everything is interconnected, finding adequate instruments that satisfy the exclusion condition is by definition difficult. We use certain measures of democracy as instruments. The empirical literature has systematically found that democracy indicators tend to have only an indirect effect on growth (Brunetti, 1997, Acemoglu et. al. 2008); that is, once the usual controls such as investment, inflation and others are used in the main regression, certain democracy indicators tend to become uncorrelated with growth. As discussed in section 2.5 certain characteristics of democracy as well as certain institutions may be correlated

[27] The coefficient of variability of the per capita GDP growth rate is 1.86, more than six times larger than that of the share of public goods (0.28). Furthermore, the share of government expenditures is highly and positively correlated with its lagged values for 20 years, with a minimum correlation of 0.72 significant at 1%. In contrast, the correlations of growth rate of GDP per capita with its lagged values are smaller in magnitude and change signs. The lack of persistence of per capita GDP growth over time is consistent with earlier findings by Easterly et. al. (2000).

with the allocation of government spending. A plausible hypothesis is that more democratic regimes tend to provide more goods that are beneficial to the majority of the voting population (generally Type A goods) while less democratic regimes may focus more on special interests demands (Type B goods) (Deacon, 2002).

We use two indicators of democracy as well as one political institution indicator that are likely to be correlated with spending in public goods: (i) An overall measure of democracy called Polity. (ii) Number of years of democratic stability. (iii) Political competition as measured by various indicators, including number of political parties, political representation and others. Table B1 provides definitions for these variables.

5. Data

The sample of includes 59 developing and 28 developed countries (using the World Bank definitions) over the period 1980-2004. Table B2 (Appendix B) shows the list of countries. Countries were chosen on the basis of data available. The share of government expenditure in public goods is obtained from the Government Financial Statistics (GFS) complemented with national data sources. GFS data is commonly used in the literature (Shelton 2007). The econometric estimation uses averages over 5 years as the basic unit of observation as a way of smoothing the non-systematic fluctuations of per capita GDP growth. Expenditure in Type A goods include expenditures in health, education, housing, social protection, transport and communication, recreation and culture, environmental protection, and public order and safety. Table B1 provides data source and descriptions and Table B2 gives the summary statistics of the variables used.

We use the central consolidated level of government expenditures. Expenditures at the level of general government would be preferable, but the available data for local governments is scarce and generally incomplete. However, for the few mainly federal

countries that do have such data, we found a high degree of correlation (about 0.85) between the shares of government expenditures in public goods at the levels of general government and consolidated central government.

6. Results

Before discussing the econometric results we comment on certain descriptive statistics. Table I presents summary statistics of Type A and B spending as well as trends over time. Type A or public goods on average account for 50% of the government expenditures, with 85% of that expenditure spent on direct subsidies to households. In general, there is a steady increase in public good expenditures in the sample period (1980-2004), mostly due to increases in direct subsidies to households. Non-social subsidies or Type B expenditures account for about 45% of the government expenditures, of which roughly a quarter are direct subsidies to firms. The rest include indirect subsidies through markets and other means. Both total private subsidies and direct subsidies to firms have been consistently declining in the sample time period but still account for a sizable portion of the total government spending.

We now turn to the econometric results. We report various single-equation estimators of per capita economic growth based on the specification provided in Equation (19). For the vector Z_{it} we use the standard control variables used in the literature[28]. This specification is later subjected to a great number of robustness checks using many other controls. The standard errors of the single equation estimates provided in tables II and III have been corrected for autocorrelation and heteroskedasticity using the Huber/White/sandwich estimator of variance. The first column of Table II shows the

[28] As a proxy for G_{it} we use total government consumption over GDP instead of total government expenditure because the variable total investment/GDP already includes government investment.

OLS results. Lagged share of government expenditure in public goods has a positive effect on GDP per capita growth, significant at 1%. We have the expected signs for investment over GDP, years of schooling, and inflation. Initial per capita GDP (1975) is negative and significant, in support of conditional convergence, a finding that is highly consistent with the literature. In columns 2 and 3 of Table II we report the fixed effects (FE) and random effects (RE) estimators. Share of government expenditure in public goods is consistently positive and significant across all the estimations. Apart from the effect of total government consumption expenditures which becomes insignificant in the RE and FE specifications, all the signs and significance in the OLS estimation are retained in the RE estimation[29].

Reverse causality is a concern despite that, as discussed earlier, the conceptual foundation for this is rather weak. As mentioned in section 4, the fact that in the single equation estimates we use lagged values of share of government expenditure in public goods may in part mitigate this potential problem. In any case, we provide below the estimates of the growth equation using instrumental variables (IV).

Table III reports the IV, FE-IV and RE-IV estimators using the three democracy related instruments discussed earlier. The F-stat of the first stage of the IV regression is above 20 and for FE-IV and RE-IV they are 8.7 and 9.2 respectively. The Sargan test does not reject the null hypothesis suggesting that at least one of the instruments used is adequate. The share of government expenditure in public goods is again positive and significant in all IV estimations. The use of instruments appears to strengthen the results suggesting that the simultaneous equation biases were probably causing downward rather than

[29] In another specification we excluded the total investment/GDP variable to also capture the possible effect of the share of public goods on growth via this variable. While, as expected, the size of the coefficient of the share of public goods does increase, such increase is generally modest and the statistical significance remains the same.

upward biases in the estimated coefficient. It is possible that the IV procedure mitigates attenuation biases due to measurement errors, thus leading to higher coefficient values. Table IV shows the two equation system estimators (per capita GDP growth and share of public goods in government expenditures) obtained using Three Stage Least Squares. One difference with the single equation estimates is that the system estimator uses the current, not the lagged, government spending variables. In addition to probing the stability of the findings to changes in specification, the system estimator helps to provide measures of the second round effects that single equation estimation cannot. Share of public good expenditures affects the rate of economic growth as a primary effect. But then there might be a second round effect arising from the possible effect of the increased GDP growth on share of public good expenditures itself which, in turn, feedbacks into GDP growth. This second round effect may reinforce or mitigate the first round effect. The political variables identify the current share of government spending in public goods equation, while the initial level of GDP and percentage of land in tropics are the identifying variables for the growth equation. The share of government spending in public goods has a positive impact on the rate of per capita GDP growth, significant at 1%. However growth has a negative but insignificant effect on the share of government expenditure on public goods. This confirms the presumption that the direction of causality is mainly from the share of public goods to growth, not the other way around. Thus, the second round effects are not significant.

The quantitative significance of the effects of the share of public goods on the rate of economic growth is quite large regardless of the method of estimation used. In assessing this we use the estimates of Table IV because their size and significance are very similar to the mean estimates obtained through a very large number of sensitivity analyses

reported in the next section. The mean annual per capita growth rate for all countries used over the complete sample was 1.5% (standard deviation: 2.8) and the mean share of expenditures in public goods on total government expenditures was 53% (standard deviation: 16.7). According to the estimates if the average country increased its share of public goods by one half standard deviation (roughly from 53 to 61%) its annual per capita growth rate could be increased by one full percentage point or roughly 40% of the standard deviation of the rate of economic growth; that is from 1.5% to 2.5%.

7. Sensitivity Analysis

We test the robustness of the previous findings in several ways[30].

Bootstrapping. Table C1 shows the bootstrap biased-corrected estimator of the effect of the share of public goods on growth with re-sampling using 10,000 iterations with full re-sample size; it is positive and significant at 1% level thus suggesting that the estimates are not driven by the inclusion or exclusion of particular observations.

Country dominance tests. Figure C1 shows the system estimator and the 5% confidence interval after dropping one country at a time. The coefficients are all positive and their confidence interval falls entirely within the positive range; thus the estimates are not driven by the inclusion of particular countries either. We also re-estimated the models using discrete changes in the country sample randomly subtracting from the sample 5% of countries at a time. The coefficient of interest remained positive within the 5% confidence interval (the latter results are available from the authors).

[30] We conducted the sensitivity analysis for both the single equation and system estimations. However, we only report the sensitivity analyses implemented for the system estimates. We have chosen to report the latter mainly because, unlike the single equation, it allows us to do sensitivity analyses of both the reverse causal effect (from share of public goods to growth) and the sensitivity of the share of public goods to growth results. The results for the single equation estimates, available upon request from the authors, show the same degree of robustness as the system estimates.

Extreme data tests. We perform this test by excluding from the sample alternatively the top and bottom 5% of the values for share of public goods observations and for the rate of per capita GDP growth, respectively. Table C2 shows that performing these rather drastic experiments with the data did not significantly affected the estimates.

Adding control variables. We added a large number of control variables often used in the literature on government spending and growth. We used all the possible combinations of groups of three additional control variables at a time taken from a list of 21 new control variables shown in Table C3. We performed more than one thousand additional regressions. All estimates of the effect of share of public goods on per capita growth turned out to be positive. Moreover, as shown in Table B4, both the weighted (using the value of the log-likelihood of each regression as the weighting factor) and the un-weighted mean value of the estimated coefficients were statistically significant at 5%.

In sharp contrast with the effects of share of public goods on growth, the effects of the rate of growth on the share of public goods is not statistically significant and is positive only in 27% of the regressions (Table C5). Also, the mean coefficient value estimated is negative. That is, reverse causality does not appear to be relevant.

8. Conclusion

This paper has shown that the tendencies of many governments to direct a significant part of their spending in favor of the elites may have dramatic negative consequences for economic growth. Switching fiscal expenditures from non-social subsidies to public goods, keeping total government spending constant, promotes faster economic growth. The empirical results obtained are fully consistent with the theoretical model which shows that under spending in direct household subsidies and in other public goods for the sake of subsidizing the corporate sector has a large and highly significant and permanent

impact on growth. This finding is important because most countries spend a large fraction of their fiscal revenues in private goods; the average country in our sample spends more than 40% of the total government revenues on private goods.

The basic result passed broad and rigorous sensitivity tests with great consistency. The average country can increase its per capita GDP growth rate by one full percentage point (from 1.5% to 2.5%) by increasing its share of public goods from 53% of its government budget to 61% (one half standard deviations). This is a large effect that could, after a few decades, make the difference between development and underdevelopment.

Should this large impact be astonishing? Given that governments spend one third of national income or more, a misallocation of part of such expenditures can be expected to have large consequences. Wasting 10% or more of the total output produced by the economy is a serious issue. Using such an enormous amount of resources in subsidies that are at best ineffective and at worst toxic for growth instead of allocating them to enhance the potential for creativity of individuals, in health care and better infrastructure is likely to be highly deleterious for economic growth.

In addition, this finding is consistent with results of disaggregated micro studies that have used altogether different approaches and data. Micro econometric studies have reported large rates of return to public investment in R&D, to primary and secondary education, and to infrastructure investment as shown by surveys by Alston et al. (2000), Psacharopoulos and Patrinos, (2002), and World Bank, 2000, respectively. These expenditures are all important public goods based on our taxonomy. By contrast, studies have consistently reported very low or negative returns to government non-social subsidies, including energy subsidies, agricultural subsidies, rural credit subsidies and the likes (López and Galinato, 2007; Falck, 2007).

Table I: Trends in the Composition of Government Expenditures (% of total spending)

	Government expenditures in Public Goods (Type A)		Government expenditures in Private Goods (Type B)	
	Household Subsidies	Other Public Goods	Direct Subsidies to Firms	Other Private Subsidies
Average over time period (1980-2004) and all countries	45	8	11	35
Period Averages				
1980-1984 average	40	7	14	38
1985-1989 average	40	7	13	38
1990-1994 average	47	8	11	35
1995-1999 average	49	8	10	31
2000-2004 average	51	8	7	33
Top Third (based on share of Type A spending)	62	9	7	21
Middle Third	46	8	10	35
Bottom Third	25	8	16	48
Public Goods: Top 3 countries (average for 1980-04)				
Austria	72	7	5	15
Uruguay	69	7	3	20
Switzerland	68	8	5	18
Public Goods: Bottom 3 countries (average over 1980-04)				
South Africa	13	6	13	59
Indonesia	19	8	16	56
Turkey	22	7	14	56

* Household subsidies include Education, Health, Social Security and welfare, Religion and Culture, public Housing and social transfers. Other public goods include: Environmental Protection, Research and Development, Public Order and Safety, Transport and Communication. Direct subsidies to firms include Economic Affairs (excluding Transport and Communication). Administration expenditures are included in each category.

Table II: Single Equation Estimators of per capita GDP Growth Rate

	OLS	FIXED EFFECTS	RANDOM EFFECTS
Lagged Share of Govt. Exp. in Public Goods in Total Govt. Expenditure	0.029*** [0.011]	0.077*** [0.027]	0.034*** [0.012]
Lagged Total Govt. Consumption over GDP	-0.034* [0.019]	-0.007 [0.075]	-0.027 [0.023]
Taxes over GDP	-0.002 [0.001]	-0.0002 [0.0023]	-0.001 [0.001]
Total Investment over GDP	0.075** [0.030]	0.039 [0.056]	0.075*** [0.034]
Log of Initial per capita GDP	-0.113*** [0.042]		-0.109*** [0.051]
CPI Inflation rate	-0.013*** [0.005]	-0.016** [0.006]	-0.014*** [0.005]
Lag of Log Years of Schooling	1.920*** [0.617]	1.618 [1.486]	1.922*** [0.707]
% Land in Tropical Areas	-0.891* [0.489]		-0.976* [0.592]
Federal Dummy	-0.002 [0.004]		-0.001 [0.005]
Number of Observations	269	252	269
Number of Countries	84	67	84

* significant at 10%; ** significant at 5%; *** significant at 1%, Unit of observation: 5 year averages.

Notes:
i) Small sample and robust standard errors in brackets. Estimated using the Huber/White/sandwich estimator of variance.
ii) Estimates include constants (apart from FE estimation), year dummies (and region dummies for Latin America, East Asia, and Developed countries in the OLS and RE estimations), not shown in the table.
iii) Hausman test is not rejected in favor of Random Effects (p-value of 1.000).

Table III: Single equation Instrumental Variable estimators of per capita GDP Growth rate

	IV	FIXED EFFECTS IV	RANDOM EFFECTS IV
Lagged Share of Govt. Exp. in Public Goods in Total Govt. Expenditure	0.124*** [0.041]	0.201** [0.088]	0.153*** [0.050]
Lagged Total Govt. Consumption over GDP	-0.036* [0.022]	0.059 [0.091]	-0.02 [0.032]
Taxes over GDP	-0.001 [0.001]	-0.004 [0.004]	-0.001 [0.003]
Total Investment over GDP	0.069** [0.032]	0.061 [0.062]	0.068* [0.036]
Log of Initial per capita GDP	-0.136*** [0.045]		-0.135*** [0.047]
CPI Inflation rate	-0.005 [0.008]	-0.012* [0.007]	-0.009 [0.007]
Lag of Log Years of Schooling	1.709*** [0.632]	1.451 [1.685]	1.571** [0.665]
% Land in Tropical Areas	-0.341 [0.621]		-0.521 [0.947]
Federal Dummy	0.002 [0.005]		0.007 [0.008]
Sargan-Hansen Statistic (P-value)	0.400	0.714	0.422
F-stat of First Stage	21.2	8.7	9.2
Number of Observations	269	252	269
Number of Countries	84	67	84

* significant at 10%; ** significant at 5%; *** significant at 1%, Unit of observation: 5 year averages.

Notes:
i) Small sample and robust standard errors in brackets using the Huber/White/sandwich estimator of variance
ii) Estimates include constants (apart from FE estimation), year dummies (and region dummies for Latin America, East Asia, and Developed countries in the OLS and RE estimations), not shown in the table
iii) Instruments for the lagged share of government expenditures in public goods in total government. expenditure: polity, political competition, years of democratic stability, all lagged.
iv) Over-identification restriction that the instruments are valid is accepted comfortably (at p-values greater than 0.400)
v) Hausman test is not rejected in favor of Random Effects (p-value of 0.275).

Table IV: Government Share in Public Goods and GDP per Capita Growth: Three Stage Least Squares estimator

	Growth of GDP per capita	Share of Govt. Exp. in Public Goods in Total Govt. Expenditure
Growth of GDP per capita		-1.305 [1.230]
Share of Govt. Exp. in Public Goods in Total Govt. Expenditure	0.116*** [0.041]	
Total Govt. Consumption over GDP	-0.045** [0.021]	-0.001 [0.102]
Taxes over GDP	0.0002 [0.003]	-0.028* [0.015]
Total Investment over GDP	0.076*** [0.025]	0.274* [0.165]
Log of Initial per capita GDP	-0.127*** [0.028]	
CPI Inflation rate	-0.014*** [0.004]	-0.046 [0.028]
Lag of Log Years of Schooling	1.265*** [0.448]	6.815*** [2.064]
Years of Democratic Stability lagged		-6.973* [4.073]
Political Competition – lagged		35.834*** [8.401]
Polity – lagged		-8.170** [3.980]
% Land in Tropical Areas	-0.597 [0.553]	
Federal Dummy	0.0004 [0.005]	-0.047** [0.023]

No. of Countries:87, Obs.=283, Unit of observation: 5 year averages.
* significant at 10%; ** significant at 5%; *** significant at 1%

Small sample standard errors in brackets; Estimates include constants, year and region dummies (Latin America, East Asia, and Developed), not shown in table

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APPENDIX A: The "Investment Jump": An Illustration

Below we provide an illustration of the investment schedule for households that differ only in their initial levels of wealth using numerical simulation.
Assumptions:
$u = \ln c$; $\psi = bh^{\alpha}$; $\rho = r = 0.05$; $w = 1$; $B = 0$; $b = 5$; $\alpha = 0.5$

Constrained Household: From first order conditions (Equation (3) in the text assuming interior solution for h) we get the following solution in implicit form:

$$(1+s_0)b\alpha h^{\alpha-1} - [\alpha + (1+\rho)]bh^{\alpha} - (1+\rho) = 0 \quad \text{(A1)}$$

Unconstrained household: Equation (4) in the text yields an explicit solution for the unconstrained case,

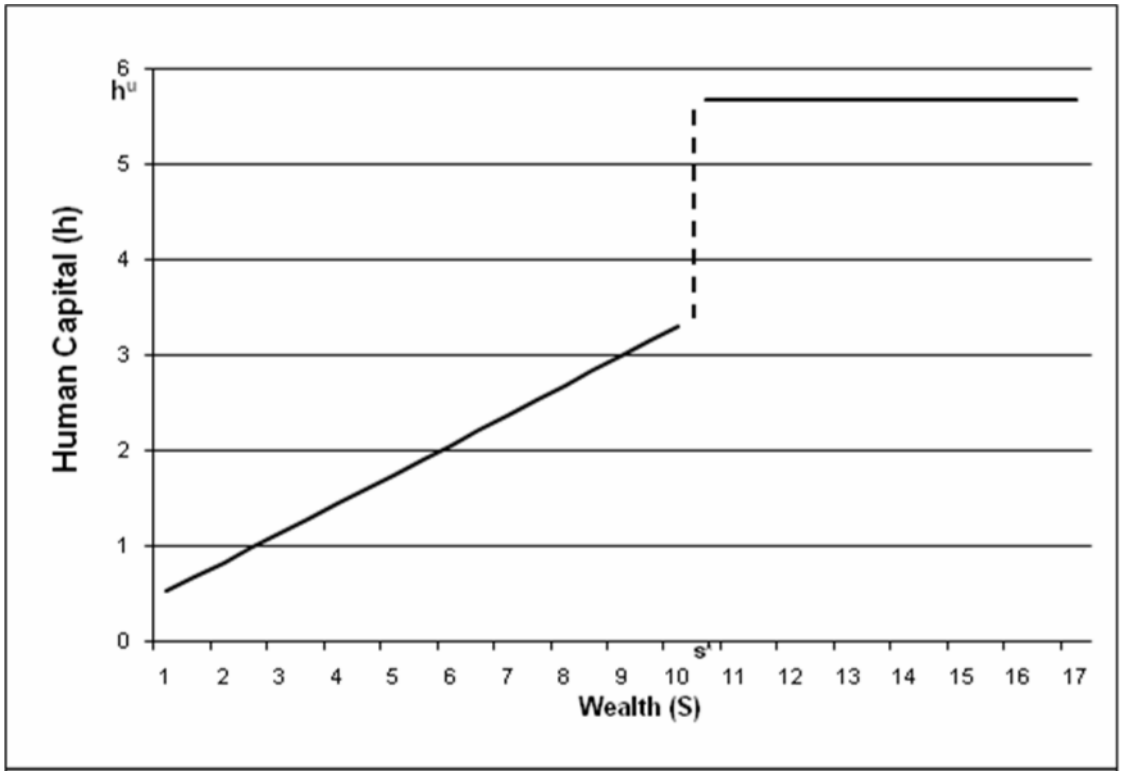
$$h^u = \left(\frac{1+r}{b\alpha}\right)^{\frac{1}{\alpha-1}} = 5.67 \quad \text{(A2)}$$

The optimal solution, h^u, implies that the total financial assets needed to finance such investment plus the household consumption is $s^* \equiv s_0 + B^*$, where B^* is the optimal borrowing level for the unconstrained household. This means that a household without access to the credit market with initial wealth at least equal to s^* will achieve an identical solution to that of a household with full access to credit.
The minimum household wealth required by financial institutions to lend them, $\overline{s}$, must be less than s^* because if $\overline{s} \geq s^*$ no household would borrow. Assume that banks require that the household finance 60% of the total wealth needed to finance the investment and the (optimal) consumption levels, out of its own funds; thus $\overline{s} = 0.6\ s^*$ (using the symbols in the text, $\xi = 0.6$). Given the parameters assumed, we have that s* = 17.57. That is, the minimum household wealth needed to be able to borrow in the formal market is $\overline{s} = 10.54$.
The Table and Figure below show the investment levels for households for a range of initial wealth levels. For initial wealth levels below 10.54 the household is constrained and becomes unconstrained above that level. The key point is that as s_0 increases from 1 to 10 the (constrained) household investment increases gradually by small amounts (investment elasticities between 0.5 and 1). However, when the household wealth increases from 10 to 11 there is a discontinuity on the investment schedule, and thus the *investment jump* occurs: h increases by more than 70% for just a 10% increase in wealth. At this point the household borrows about 6 to complement its own funds of 11. Of course, rich households with initial wealth above 17.57 do not borrow but their investment in human capital is the same optimal level, 5.67.

Table A1. Investment levels by household initial wealth ($\bar{s} = 10.54$)

S_0	Investment levels (h)
1	0.55
2	0.84
3	1.15
4	1.45
5	1.76
6	2.06
7	2.37
8	2.68
9	2.99
10	3.30
11	5.67
12	5.67
14	5.67

Figure A1: Human Capital and Wealth: The "Investment Jump"



APPENDIX B: Data

Table B1: Data and Sources for the Variables used in the Benchmark Regressions

Variable	Description	Years Available	Source
GDP growth (2000 US$)	Real GDP per Capita growth (Constant US$ 2000)	1980 – 2004	World Development Indicators (World Bank)
Share of Govt. Exp. in Public Goods (Type A Goods)	This is the share of government expenditure on public goods (Type A goods). Public goods are defined as expenditures in: I) Subsidies to Households: i) Education ii) Health iii) Social security iv) Religion and culture v) Housing and community amenities 2) Expenditures That Correct Common Market Failures: i)Environmental Protection ii) Research and development 3) "Pure" Public Goods: i) Transport ii) Communication iii) Public order and safety	1980 – 2004	Government Financial Statistics (IMF), Asian Development Bank, Country data
Polity Index (Polity 2)	Score ranges from -10 to 10, with the more democratic a nation, the higher the score. The Polity score is the difference between the institutionalized democracy and autocracy scores, with a higher score indicating a higher degree of democracy. The measures of institutionalized democracy and autocracy are composite indices derived from coded values of authority characteristics	1980-2003	Polity IV www.cidcm.umd.edu
Years of Democratic Stability	Square root of Durability of Polity if Polity 2>0	1980-2005	Polity IV www.cidcm.umd.edu
Political Competition	Score that indicates how competitive is the Political System	1980-2003	Polity IV www.cidcm.umd.edu
Share of Government Consumption over GDP		1980 – 2004	Penn World Tables (2006)
Years of Schooling	Average Years of Schooling of Population over 15	1980-2000 (5 year interval)	Barro and Lee (2001)
Trade Openness	Sati index which is the residual of the regression of Trade on population, area, gdp per capita, dummy for industrialized country, dummy for oil exporter, and imports over export prices. A positive residual implies a more open economy	1980-2001	Pritchett, Lant. 1996. Updated by López and Galinato (2007)

Note: Definitions of the remaining variables are available from the authors.

Table B2: Summary Statistics for the Variables used in the Benchmark Regressions: 5 Year Averages, 1980-2004

	Observations	Median	Std. Dev	Min	Max
Growth of Per Capita GDP	283	1.7	2.8	-13.4	8.2
Share of Government Expenditure in Public Goods on total expenditures	283	55.7	16.6	13.1	83.2
Share of Total Government Expenditure over GDP	283	19	8.2	7.3	54.1
Share of Investment over GDP	283	17.5	8	2.6	50.2
Inflation (%)	283	71.7	443	-0.08	6425
Years of Schooling	283	5.9	2.8	1.2	11.9
% Land In Tropics	283	0.2	0.4	0	1
Polity 2	283	7.4	6.6	-9.6	10
Political Competition 2	283	8.6	3.3	0	10
Years of Democratic Stability	283	2.3	3.5	0	13.9
Distance to the Equator	283	33	17.1	1	60
Proportion of Population aged between 15 and 64	283	62.5	6.1	48.1	73.2
Initial Income Gini	283	37.7	10.8	19.1	61.3
Population Density	283	71.3	660.9	2	6192.8

Country List

Developing:
Argentina, Bangladesh, Bolivia, Brazil, Bulgaria, Burundi, Cameroon, Central African Republic, Chile, Colombia, Congo Dem. Rep., Congo Rep., Costa Rica, Croatia, Dominican Republic, Egypt Arab Rep., El Salvador, Gambia, Guinea, Haiti, Hungary, India, Indonesia, Iran Islamic Rep., Jamaica, Kazakhstan, Kuwait, Latvia, Lesotho, Liberia, Lithuania, Malaysia, Mali, Mauritius, Mexico, Moldova, Nepal, Nicaragua, Niger, Pakistan, Panama, Paraguay, Peru, Poland, Romania, Russia, Rwanda, Senegal, Slovak Republic, South Africa, Sri Lanka, Syrian Arab Republic, Thailand, Togo, Tunisia, Turkey, Uruguay, Venezuela RB, Zimbabwe

Developed:
Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Ireland, Israel, Italy, Japan, Korea Rep., Netherlands, New Zealand, Norway, Portugal, Singapore, Slovenia, Spain, Sweden, Switzerland, Trinidad and Tobago, United Kingdom, United States

APPENDIX C: Sensitivity Analyses

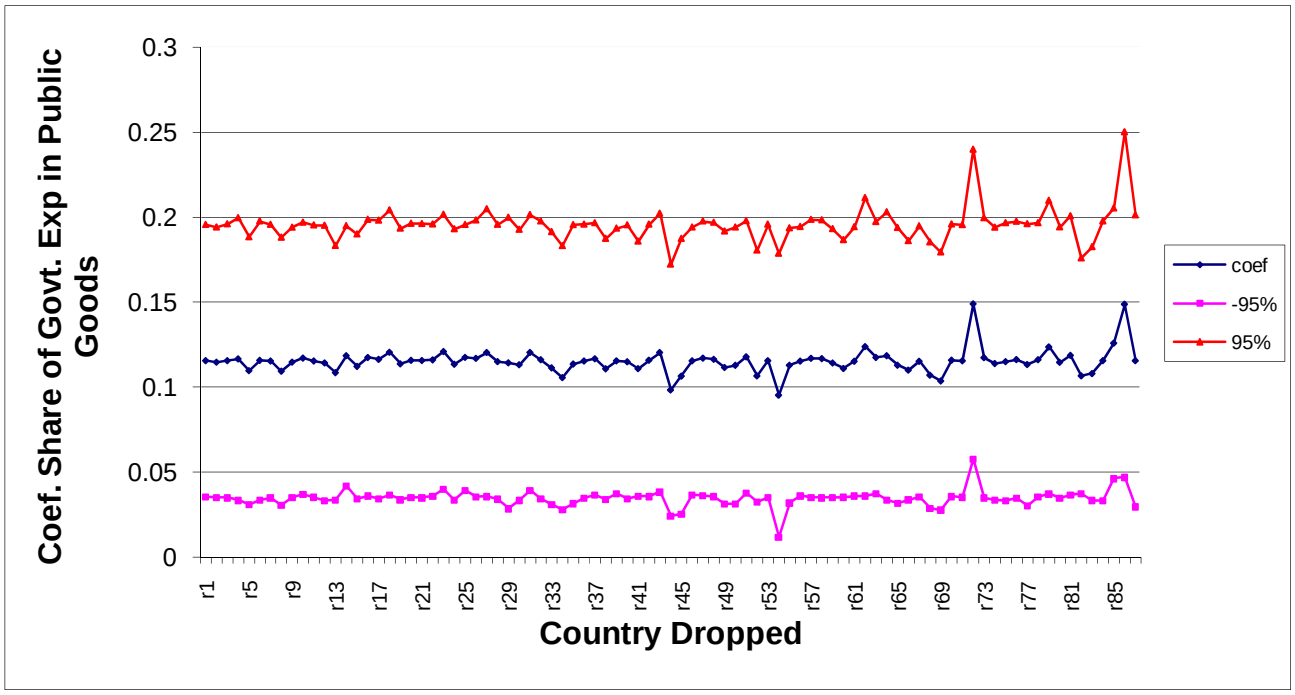
Bootstrapping

Table C1: Bootstrap: Effect of Government Share in Public Goods on GDP per Capita Growth

	Three Stage Least Squares: Bootstrap Corrected Coefficients and Standard Errors (10000 iterations)	
	Benchmark (Table IV)	Bootstrap Bias-Corrected
Share of Govt. Exp. in Public Goods in Total Govt. Expenditure	0.116*** [0.041]	0.110*** [0.047]
Small sample standard errors in brackets significant at 10%; ** significant at 5%; *** significant at 1%		

Country Dominance Checks

Figure C1: Three Stage Least Squares Estimators: One Country Excluded From Each Estimation, 95% Confidence Interval



Extreme Data Observations Checks

Table C2: Changes in Extreme Data Points: Effect of Government Share in Public Goods on GDP per Capita Growth

	Three Stage Least Squares Estimation	
	Bottom 5% Observations Dropped of Share of Government Expenditure in Public Goods	Top 5% Observations Dropped of Share of Government Expenditure in Public Goods
Share of Govt. Exp. in Public Goods in Total Govt. Expenditure	0.189** [0.079]	0.120*** [0.043]
Observations	269	269
	Bottom 5% Observations Dropped of GDP per Capita Growth	Top 5% Observations Dropped of GDP per Capita Growth
Share of Govt. Exp. in Public Goods in Total Govt. Expenditure	0.064** [0.031]	0.092** [0.039]
Observations	269	269

Specification Checks: Adding New Control Variables

Table C3: Additional Control Variables Considered in Robustness Checks

1	Average No. of Revolutions (1980-1999)
2	Presidential System Dummy
3	Ethno-linguistic Fractionalization
4	Fraction of Protestants in 1970
5	Proportional Representation
6	ICRG Law and Order rating 1980-1999 average
7	Fraction of Muslims in 1970
8	Fraction of Catholics in 1970
9	Terms of Trade Growth
10	Trade Openness (SATI index)
11	Initial Income Gini
12	Gini of Education
13	Initial Life Expectancy
14	Initial Primary School Completion Rate
15	logarithm of (1+black market premium) – 1980-89 Average
16	Distance to Equator
17	Dummy Landlocked Country
18	Log of level of Population between 15 and 64
19	Population Density
20	Primary export share of total exports in 1970
21	Corruption

*All combinations of three controls are considered

Table C4: Robustness to Controls: Effect of Government Share in Public Goods on GDP per Capita Growth.

	Three Stage Least Squares Estimation (1330 Regressions)	
	Un-weighted Average of All Coefficients	Averaged Weighted of All Coefficients by Log-Likelihood
Share of Govt. Exp. in Public Goods in Total Govt. Expenditure	0.105** [0.049]	0.106** [0.049]
% of Positive Coefficients	100%	
Addition of three controls per estimation from new control variables listed in table B3 Small sample standard errors in brackets; * significant at 10%; ** significant at 5%; *** significant at 1%		

Table C5: Robustness to Controls: Effect of GDP per Capita Growth on Government Share in Public Goods

	Three Stage Least Squares Estimation (1330 Regressions)	
	Un-weighted Average of All Coefficients	Averaged Weighted of All Coefficients by Log-Likelihood
GDP per Capita Growth	-0.766 [1.640]	-0.629 [1.644]
% of Positive Coefficients	27.14%	
Addition of three controls per estimation from new control variables listed in table B3 Small sample standard errors in brackets; * significant at 10%; ** significant at 5%; *** significant at 1%		