An Interest Groups Theory of Human Capital Accumulation: Theory and Evidence¤

José Pineda and Francisco Rodríguez
Department of Economics
University of Maryland
College Park, MD 20742

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Abstract

Investment in human capital accumulation, government consumption and total government expenditures present a striking negative correlation with capital shares. This correlation is robust to alternative speci…cations, lists of controls, and exclusion of outliers. Causality tests strongly support the hypothesis that the direction of causation runs from capital shares to the government spending variables. We present a political economy model of interest groups that can account for these correlations. In contrast, a median voter model predicts positive correlations between capital shares and the government spending variables.

1 Introduction

Di¤erences in rates of investment in human capital accumulation across countries are substantial. While Haiti, Guatemala and Indonesia all spend less than 3% of their GDP in education and health expenditures, most OECD countries as well as some developing countries such as Costa Rica and Panama devote more than a tenth of GDP to it. These di¤erences have potentially vast implications for economic growth and welfare.[1] What are their sources? Can all of

¤Rodríguez: Assistant Professor, University of Maryland at College Park. rodrigf@econ.bsos.umd.edu. Pineda: Graduate Student, University of Maryland at College Park. jpineda@wam.umd.edu. The authors wish to thank Allan Drazen, Samuel Bowles, James Crotty, Eduardo Zambrano and participants at Seminars at the University of Massachussetts, Amherst and the University of Maryland at Baltimore County for helpful comments and suggestions

[1] Most cross-country regressions …nd the e¤ect of the stock of human capital on economic growth to be signi…cantly correlated with growth. For summaries of these results see Barro and Sala-i-Martin (1995), Barro (1997), and Aghion and Howitt (1998). A number of models have been proposed to account for this correlation, ranging from extensions of the neoclassical

it be accounted for by variations in per capita income and age structure of the population, or do di¤erences in the political process across countries also help to explain it?

This paper is an attempt to contribute to the understanding of why some societies devote more resources to human capital accumulation than others. Our focus will be on the role that politics play in the determination of public investment in human capital. Our strategy will be to contrast the predictions of the two main competing models of politics - the median voter model and the interest groups model - with the empirical evidence. We center on the explanatory power of these theories to explain a strong negative association that exists in the data between the share of capital income in GNP and investment in human capital as well as redistributive and total government expenditures. We argue that only a theory of interest groups - that is, a theory that gives a central role to the capacity of money to a¤ect politics - is consistent with the patterns that arise in the cross-country data.

The intuition for our result is simple. In the interest groups model policy-makers respond to the in‡uences of a variety of political pressures coming from diverse sectors. We center our attention on two types of groups: owners of physical capital (capitalists) and owners of human capital (workers). Workers will prefer a higher rate of investment in human capital than capitalists: therefore investment in human capital should be negatively related to the political power of capitalists. In our framework, a group's initial resources will be a primary determinant of its political power, as these resources determine both the incentives the group has to carry out political action as well as its resources to do so. An increase in capital's share in GNP, by raising the resources that capital owners have to mobilize politically, will shift policies towards those most preferred by capitalists and thus lower the equilibrium level of human capital accumulation.

As Figures 1 and 2 show, this hypothesis seems broadly consistent with the empirical evidence. In these …gures we show the partial correlation of capital shares with public spending on education and public spending on health (as a percent of GDP) after controlling for a set of alternative explanatory variables.[2]

growth model that incorporate human capital (Mankiw, 1995, Mankiw Romer and Weil, 1992) to endogenous growth models where the existence of human capital generates long-run sustained economic growth (Uzawa, 1965, Lucas, 1988). Some caveats about the results have however been pointed out in the literature. The …rst one is that a number of regressions have found a negative association between economic growth and female secondary schooling while at the same time …nding a positive association between male secondary schooling and economic growth. However, the coe¢cient on female secondary schooling has proved fragile to the addition of more recent data and only appears after fertility rates are controlled for, suggesting that the total e¤ect of women's education on growth occurs through decreased fertility. Furthermore, this …nding appears inconsistent with the microeconomic evidence and thus likely to be due to sampling error. The second one is that, although secondary and higher level education has a signi…cant e¤ect on growth, primary schooling seems to have no independent e¤ect on growth. However, primary schooling is a prerequisite for secondary and higher schooling and in that sense it is related to growth. See Barro, 1997, for a discussion of these results. However, Lant Pritchett (1996) does o¤er a dissenting view of the e¤ect of human capital on growth.

[2] The controls are the log of initial income per capita, log of total population, percentages

Both correlations are strongly negative. We show in Section 4 that this pattern of results extends to other variables and is robust to speci…cation, exclusion of outliers and controls for endogeneity.

Our paper is related to two existing strands of research. Fernandez and Rogerson (1995) and Bourgoignon and Verdier (2000) have provided models in which the rich either have or acquire through their participation in coalitions the power to in‡uence the level of investment in human capital. These papers study the conditions under which wealthier groups choose to use their power in order to restrict human capital accumulation. Our model centers on understanding the determinants of that power and of systematically testing hypotheses that arise from this type of models. Another strand of the literature (see for example Benabou, 1994 and Durlauf, 1996) has analyzed the determination of investment in human capital in contexts of high labor mobility. Precisely because of the assumption of high labor mobility, these models may be more relevant for understanding di¤erences in education spending across localities within a country than across countries. Benabou (1996) goes a step further in his model of localities and shows that alternative institutional arrangements can a¤ect growth through their e¤ects on the e¢ciency of education spending. Our model can be used to understand when we should expect the politics of di¤erent countries to produce these institutional di¤erences.

The rest of the paper is organized as follows: In Section 2 we present our basic framework, which consists of two alternative political economy frameworks - a median voter and an interest groups model - combined with a simple economic model of investment in human capital. We show that an interest groups model is well able to explain the existing patterns in the data while a median voter model is unable to do so. Section 3 discusses the role of the endogeneity of political mobilization and factor prices as well as the availability of alternative redistributive mechanisms for our results. In Section 4 we explore in more detail our empirical evidence and argue that our results are not due to choice of speci…cation, in‡uential outliers, or reverse causation. We conclude by sketching the implications of our results for existing debates among alternative views of distributive politics.

2 Two Political Economy Models of Human Capital Accumulation

In this section we provide a simple stylized description of an economy with heterogeneity in the distribution of human and physical capital and examine the ability of two alternative political economy assumptions to account for the observed correlation between capital shares and public investments in human capital. We show that, within the framework of our economic model, the median voter hypothesis is unable to account for the observed relationship between

of the population under 15 and over 65, initial life expectancy, and a set of continent and period dummies.

government spending and capital shares, as it predicts a positive relationship between human capital accumulation and factor shares when the median voter owns no capital. This prediction can be reversed if we assume that the median voter owns signi…cant amounts of capital. However, such an assumption is empirically hard to justify. In contrast, an interest groups model can naturally explain the observed correlations.

2.1 A Median Voter Model

We illustrate the problems the median voter hypothesis has in justifying the capital share - investment in human capital correlation with a simple model of a small open economy that satis…es the assumptions necessary for factor price equalization and therefore faces …xed factor prices w and r for human (H) and physical (K) capital. We will have two types of agents in this economy: workers, who own only labor, and capitalists, who own labor and capital. Workers comprise more than half of the population, making a worker the decisive - or median - voter. Letting y_i stand for the pre-tax income of individual i, where i = h denotes workers (who own only human capital) and i = k denotes capitalists (who own both human and physical capital) , we can write:

$$y_h = wH$$

$$y_k = wH + rK$$

with total GDP being:

$$n_h y_h + n_k y_k = n_h wH + n_k wH + n_k rK$$

where n_i denotes the number of agents of type i. Normalizing $n_h + n_k = 1$, this becomes:

$$wH + n_k rK$$

Taxes are levied on capital owners to …nance the accumulation of human capital. We assume that taxes collected equal ¿$n_k rK$ minus collection costs $D(n_k rK; ¿)$. We use a simple functional form $D(x; ¿) = \cdot x¿^2$ for the costs of collecting taxes at a rate of ¿ on a tax base x. This simple functional form embodies the assumption that collection costs are proportional to the deadweight costs from capital taxation, which are quadratic in the tax rate.[3] The balanced budget constraint speci…es that:

[3] The fact that deadweight losses are quadratic in the tax rate was …rst pointed out by Samuelson (1964). See Also Atkinson and Stiglitz (1980, p. 367-370).

$$H = n_k r K (¿ ¡ \cdot ¿^2) \tag{1}$$

After-tax incomes are:

$$y_h = wH \tag{2}$$
$$y_k = wH + rK(1 ¡ ¿) \tag{3}$$

As workers make up more than half the population, the decisive (or median) voter is a worker. Thus the voting equilibrium in a well-functioning democracy is given by the tax rate that maximizes:

$$y_h = wH = wn_k r K (¿ ¡ \cdot ¿^2) \tag{4}$$

which is simply:

$$¿ = \frac{1}{2 \cdot} \tag{5}$$

Spending on human capital accumulation as a percent of GDP will be:

$$h = \frac{n_k r K (¿ ¡ \cdot ¿^2)}{wH + n_k r K} = \frac{1}{4 \cdot} \frac{n_k r K}{wH + n_k r K} = \frac{1}{4 \cdot} ®: \tag{6}$$

It is thus straightforward that:

$$\frac{dh}{d®} > 0: \tag{7}$$

Investment in human capital accumulation as a percentage of GDP is positively related to the capital share. The intuition for this result is quite simple - as investment in human capital is …nanced with taxes on physical capital, a higher capital share implies a higher availability of resources to …nance human capital accumulation. This intuition carries over in a very straightforward manner to more general speci…cations of the tax schedule: as long as workers can make capitalists pay for part of the cost of human capital accumulation, then a higher share of resources in the hands of capitalists means that the cost to workers of accumulating higher levels of human capital is smaller, leading them to vote for higher levels of h.[4] Equation (7) makes it hard to reconcile a median voter model with the correlations between capital shares and investment in human capital described in Sections 1 and 4.

[4] This is a special case of the Meltzer and Richard (1981) result that redistribution is increasing in the level of inequality in median voter environments.

2.1.1 Ownership of Capital by the Decisive Voter

One way to temper this result is by introducing ownership of capital by the median voter into our model. In that case she would set τ to maximize

$$wH + \varphi n_k r K(1 - \tau) \tag{8}$$

where φ is the fraction of capital held by the median voter. In this case the first order condition for maximization of (8) with respect to τ implies:

$$\tau = \frac{1}{2\cdot} - \frac{\varphi}{2\cdot w(1-\varphi)}. \tag{9}$$

Note that spending on human capital accumulation as a percent of GDP is:

$$h = \frac{H}{Y} = (1-\varphi)\theta(\tau - \cdot\tau^2) \tag{10}$$

Now θ is a globally invertible function of w, as

$$\theta = \frac{n_k r K}{w(1-\varphi)n_k r K(\tau - \cdot\tau^2) + n_k r K} = \frac{1}{w(1-\varphi)\left[\frac{1}{\cdot} - \frac{1}{4} - \frac{1}{4w^2}\left(\frac{\varphi}{1-\varphi}\right)^2\right] + 1} \tag{11}$$

has $\frac{d\theta}{dw} < 0$ everywhere. Call the inverse of (11) $w = p(\theta)$ with $p'(\cdot) < 0$. Using this function, together with (9) and (10) gives us:

$$h = (1-\varphi)\theta\left[\frac{1}{\cdot} - \frac{1}{4} - \frac{1}{4p(\theta)^2}\left(\frac{\varphi}{1-\varphi}\right)^2\right] \tag{12}$$

the derivative of this expression with respect to θ has an indeterminate sign.[5] The higher the amounts of capital owned by the median voter, the less likely it is that an increase in the capital share will lead her to raise the tax on capital. Given a sufficiently high level of φ, the negative correlation between capital shares and investment in human capital can be justified with a median voter hypothesis.

Is it reasonable to assume that the median voter owns a substantial amount of capital? Although we lack systematic data on wealth ownership for a large number of countries, the data that exists suggests that median levels of wealth are extremely low. In the United States, for example, 84% of net worth and 93% of financial wealth is held by the top quintile of the wealth distribution.

[5] It can be checked that at $\varphi = 0$, $\frac{dh}{d\theta} = \frac{1}{4k} > 0$, whereas at $\varphi = \frac{w}{1+w}$ (effectively the upper bound of φ as it induces $\tau = 0$) $\frac{dh}{d\theta} = -\frac{1}{w} < 0$.

Only 4.7% of net worth and 0.1% of …nancial wealth belongs to the lowest three quintiles [Wol¤,1998]. These numbers are slightly higher - but still low - for other developed economies.[6] Regrettably, data on wealth distribution is scarce for developing countries, but what there is - along with simple casual observation - indicates that it is much more unequal. For example, the gross capital income of the poorest half of the Venezuelan population is only x % of total gross capital income.[7] Given that this number is gross of debt, it is likely that the net capital income of the median voter in this case is actually negative! Furthermore, there is systematic data for a large number of developing countries showing that inequality in the ownership of at least one important asset - land - is markedly higher in developing countries than in developed countries.[8] Taken together, the facts that the distribution of income is systematically more unequal and that credit markets are substantially less developed in poor countries suggest that the distribution of capital must be more unequal than in rich countries. The bottom line is that in the overwhelming majority of countries the proportion of wealth in hands of the majority of the population is negligible, indicating that ¼ is likely to be very near zero (or even negative), making the derivative of (12) with respect to ® likely to be positive.

2.1.2 Endogeneity

The derivation of equation (11) also brought out the fact that the correlation between ® and h discussed in Section 1 is, in the framework of our model, a correlation between two endogenous variables. Therefore, in principle it would be desirable to estimate the system of equations given by equations (10) and(11). We address this issue in Section 4, where we carry out instrumental variables estimation of (10).

2.2 Equilibrium with Interest Groups

As we discussed above, the median voter hypothesis cannot - within the framework of our simple model - give us a satisfactory explanation for the negative correlation between capital shares and public investment in human capital. As we now show, such a correlation can be accounted for with a simple model of interest groups and political in‡uence. In the model we now present, organized groups of capitalists and workers will bargain with politicians over existing policies. We model politically organized groups as capable of o¤ering money contributions to politicians in exchange for policies that are favorable to their interests. The politician evaluates o¤ers of money transfers from capitalists and workers before setting a policy, also taking into account the cost that deviating

[6] 11% of French and 7% of Australian Net Worth is in the hands of the three lower quintiles of these countries' wealth distribution (Wol¤, 1996).

[7] Rodríguez (2000).

[8] Deininger and Squire (1998) report Gini indices based on the distribution of operational holdings of agricultural land assembled from the Decennial FAO World Census of Agriculture. They show that on average Gini coe¢cients in the distribution of land are higher in developing countries than in developed countries.

from the median voter's preferred policy will have for him. The interaction between interest groups and the policymaker is evaluated using the theory of common agency[9].

The structure of the game is simple: organized group i will propose a contribution schedule $C_i(\tau)$ to the policymaker, where the contribution that the policymaker will receive will be conditional on her choice of tax rate τ (with the implied choice of H determined from the government budget constraint). Workers and capitalists set the contribution schedules to maximize their post-tax incomes or consumption levels, which are respectively:

$$d_h = wH - C_h(\tau); \tag{13}$$

$$d_k = wH + rK(1 - \tau) - C_k(\tau): \tag{14}$$

The policymaker is assumed to care about the welfare of workers (the decisive voter) as well as the total amount of campaign contributions that she receives:

$$U_p = wH + \gamma C: \tag{15}$$

for $C = n_h C_h + n_k C_k$. Equation (15) therefore assumes that the elected policymaker cannot maximize the utility of voters: in order to stay in power she must set policies to maximize a linear combination of the decisive voters' utility and the sum of political contributions. This behavior could either represent the needs of the policymakers for a certain amount of resources to stay in power or the fact that the average policymaker will to some degree be "corrupted" by bribes. We do not specify more in detail the microfoundations for (15); for elaborations of the possible microfoundations of an objective function like (15), see Grossman and Helpman (1996) and Rodríguez (1998).

This game has the structure of a common agency game as studied by Bernheim and Whinston (1986). Bernheim and Whinston show:

Proposition 1 A Subgame Perfect Nash Equilibria $\{C_i^*(\tau^*); \tau^*\}$ of a common agency game with quasi-linear utilities will be characterized by the following four conditions:(i) $C_i^*(\tau^*)$ is feasible; (ii) τ^* maximizes the policymaker's utility U_p given the contribution schedules; (iii) For each lobby i; τ^*maximizes the weighted sum of the welfares of the government and that group $\frac{wH}{n} + C + d_i$; (iv) For each lobby i, $U_p^* = wH(\tau^*) + \gamma C(\tau^*) = wH(\tau^{ii}) + \gamma \sum_j C_j(\tau^{ii})$ where $j \in \{h, k\}$, $j \neq i$ and τ^{ii} is the tax rate that maximizes the policymaker's utility function when $C_i = 0$.

[9] See Bernheim and Whinston (1986) and Dixit, Grossman and Helpman (1997).

Condition (ii) implies that

$$U_p^{\prime} = \frac{d}{d\lambda}\{wH(\lambda) + \gamma[n_h C_h(\lambda) + n_k C_k(\lambda)]\} = 0; \tag{16}$$

where $'$ denotes derivative with respect to λ. Condition (iii) implies that

$$\frac{1}{\gamma} U_p^{\prime} + d_i^{\prime} = 0.$$

Substituting the former into the latter we get:

$$d_h^{\prime} = \frac{d}{d\lambda}(wH(\lambda) - C_h(\lambda)) = 0; \tag{17}$$

$$d_k^{\prime} = \frac{d}{d\lambda}(wH(\lambda) + rK(1-\lambda) - C_k(\lambda)) = 0. \tag{18}$$

Multiplying these conditions by n_h and n_k respectively and summing them up, we get:

$$\begin{aligned} \frac{d}{d\lambda}[n_h wH(\lambda)] + \frac{d}{d\lambda}[n_k wH(\lambda) + n_k rK(1-\lambda)] &= \frac{d}{d\lambda} n_h C_h(\lambda) + \frac{d}{d\lambda} n_k C_k(\lambda) \\ &= -\frac{d}{d\lambda}\frac{wH(\lambda)}{\gamma}. \end{aligned}$$

where the last step follows from (16). In other words, the equilibrium λ is such that:

$$\frac{d}{d\lambda}\{wH(\lambda) + \gamma\{wH(\lambda) + n_k rK(1-\lambda)\}\} = 0. \tag{19}$$

Government policies are chosen as if to maximize a weighted average of voters' utility function and that of organized lobbies. Although we have derived (19) from the microfoundations of the common agency model, it can also be derived from a number of models with the property that policies are on the contract curve between governments and lobbies.[10] Substituting (1) into (19) and reorganizing we get:

$$\frac{d}{d\lambda}\left\{wn_k rK(\lambda - \cdot\lambda^2)(1+\gamma) + \gamma n_k rK(1-\lambda)\right\} = 0.$$

This condition implies:

$$\lambda^{\alpha} = \frac{1}{2\cdot} - \frac{1}{2\cdot w}\frac{\gamma}{1+\gamma}. \tag{20}$$

[10] See Zusman (1976), Hillman (1989), and Scarpa (1994) for examples.

Spending on human capital as a fraction of GDP will therefore be:

$$h = {}^{i}{}_{¿}{}^{¤} \; i \; \cdot ¿^{¤2}{}^{¢} \; ®: \tag{21}$$

Note that we can write the capital share as:

$$® = \frac{\mu \quad 1 \quad {}_{3} \quad ´ \quad {}_{2} \quad ¶}{1 + \frac{w}{\cdot} \quad \frac{1}{4} \; i \; \frac{1}{4} \quad \frac{}{1+¸} \quad \frac{1}{w^2}}: \tag{22}$$

It is easy to con…rm that $\frac{d®}{dw} < 0$[11], making ® globally invertible in w. Therefore we can write w = p(®), with $p' < 0$. Substituting this function and (20) in (21) we get:

$$h = \frac{®}{\cdot} \quad \tilde{A} \quad \frac{1}{4} \; i \; \frac{1}{4} \quad \mu \quad \frac{¸}{1+¸} \quad ¶_2 \quad \frac{1}{p(®)^2} \quad ! \tag{23}$$

with

$$\frac{dh}{d®} = \frac{h}{®} \; i \; \frac{1}{®w} \frac{2 \quad {}_{3} \quad \frac{}{1+¸} \quad ´ \quad {}_{2} \quad \frac{1}{w^2}}{1 + \quad {}_{3} \quad \frac{}{1+¸} \quad ´ \quad {}_{2} \quad \frac{1}{w^2}} \; ? \; 0:^{12} \tag{24}$$

Note that as $\frac{}{1+¸}\frac{1}{w}$ tends from below to 1, $\frac{dh}{d®}$ becomes negative. In other words, when the wage rate is su¢ciently small (so that capitalists do not care much about their labor income) or when the political power of money is large (high ¸), increases in capital's share will lead to a reduction in spending on human capital accumulation[13]. The reason is simple: a higher ®, by concentrating a greater proportion of income in the hands of capitalists, gives them greater power to use that income in order to a¤ect the policies carried out by politicians. That is, it raises the purchasing power of capitalists. As capitalists desire a lower level of human capital accumulation than workers they will use that enhanced political power to pressure for lower spending in h.

Another way of looking at this derivative is by expressing (24) as:

$$\frac{dh}{d®} = \frac{¿^{¤} \; i \; \cdot ¿^{¤2}}{n_k} + \frac{1 \; i \; 2 \cdot ¿^{¤}}{n_k} ® \frac{@¿}{@®}: \tag{25}$$

[11]
$$\frac{d®}{dw} = \; i \; ®^2 \quad " \quad \tilde{A} \quad \frac{1}{\cdot} \quad \frac{1}{4} \; i \; \frac{1}{4} \quad \mu \quad \frac{¸}{1+¸} \quad ¶_2 \quad \frac{1}{w^2} \quad ! \; + \frac{w}{2\cdot} \quad \mu \quad \frac{¸}{1+¸} \quad ¶_2 \quad \frac{1}{w^3} \quad # \; < 0:$$

[13] If $\frac{}{1+¸}\frac{1}{w} > 1$, then the wage rate is su¢ciently small and the political in‡uence of money is so high as to induce a tax rate of zero (which of course implies $\frac{dh}{d®} = 0$).

The …rst term in the right-hand side of (25) is positive and the second one is negative. The …rst term re‡ects the fact that, at any given tax rate, a higher capital share implies that there are more resources to …nance human capital investment through taxation, raising the median voter's incentive to attempt to extract these resources. We call this the income e¤ect. This term is positive, implying that as capital's share goes up, there should be more investment in human capital accumulation. It was the only term present in the median voter model and generated that model's problematic implication for the relation between human capital accumulation and the capital share. As we pointed out in our discussion of the median voter model, this e¤ect is present as long as workers can make capitalists pay for part of the cost of human capital accumulation; in those cases a higher share of resources in the hands of capitalists means that the cost to workers of accumulating higher levels of human capital is smaller. But it is now counterbalanced by another e¤ect - what we call the political power e¤ect - that represents the changes in the distribution of political power occurring as a result of a higher capital share.

The above model is intentionally simple. Therefore several objections could be leveled at it. First, it could be argued that it does not really make political power endogenous since it assumes that capital and labor are fully mobilized politically, not taking into account the e¤ect that changes in the functional distribution of income can have on the degree of political mobilization. Second, it assumes …xed and exogenous factor prices, therefore ruling out any e¤ect that investment in human capital can have on the well-being of di¤erent groups indirectly through factor prices. Third, it assumes that there is no possibility of redistribution via other means than human capital accumulation. We address these three issues in turn.

3 Extensions

3.1 Endogenous Political Mobilization

In the previous section we assumed that both capitalists and workers were politically mobilized. All individuals belonged to an organized interest group at the same time as they were voters. Therefore the weight of interest groups was proportionate to their population shares. The extent of political mobilization was thus exogenous. It could be argued that the above model does not really take into account political power as it simply assumes its distribution. Changes in factor shares, however, imply changes in the incentives that individuals have to organize politically and therefore on that distribution of political power. Understanding how changes in capital shares a¤ect incentives for political mobilization would be a necessary part of a complete theory of how money a¤ects politics, and could conceivably alter our results.

In this Section, we model political mobilization in a simple tractable way by assuming that each group must pay a cost $°_i$ in order to organize politically.

Each group weighs the cost of political organization against its bene…ts before deciding whether to organize or not. Therefore there are four possible pure strategy equilibria: one in which no group is organized, one in which only labor is organized, one in which only capital is organized, and one in which both groups are politically organized. We label these potential equilibria respectively as Cases 1-4. It is easy to solve for ¿ and H in each of these cases. In Case 1, contributions will be zero, so that the policymaker will simply maximize the utility of the median voter and equilibrium policies will be as derived in 2.1. This will also be the case in Case 2, as the analog of equation (19) in this case will imply that policymakers should maximize the utility of workers. The solution for Case 4 is already derived in section 2.2. As to Case 3, the solution can be derived by noting that the analog of (19) in that case would imply

$$\frac{d}{d¿}\{wH(¿) + ¸n_k rK(1 ¡ ¿)\} = 0: \qquad (26)$$

Table 1: Policies and payo¤s under alternative equilibria

Case	¿¤	H¤
1	$\frac{1}{2·}$	$\frac{n_k rK}{4·}$
2	$\frac{1}{2·}$	$\frac{n_k rK}{4·}$
3	$\frac{1}{2·} ¡ \frac{1}{2·}\frac{1}{1+¸n_k}\frac{1}{w}$	$n_k rK\frac{1}{·}\left(\frac{1}{4} ¡ \frac{1}{4}\frac{1}{1+¸n_k}\frac{1}{w}\right)^2$
4	$\frac{1}{2·} ¡ \frac{1}{2·}\frac{1}{1+¸}\frac{1}{w}$	$n_k rK\frac{1}{·}\left(\frac{1}{4} ¡ \frac{1}{4}\frac{1}{1+¸}\frac{1}{w}\right)^2$
5	$\sum_{i=o;n;j=o;n} p_{hi}p_{kj}¿_{ij}$	$\sum_{i=o;n;j=o;n} p_{hi}p_{kj}H_{ij}$

Case	$U_h^¤$
1	$w\frac{n_k rK}{4·}$
2	$w\frac{n_k rK}{4·}$
3	$wn_k rK\frac{1}{·}\left(\frac{1}{4} ¡ \frac{1}{4}\frac{1}{1+¸n_k}\frac{1}{w}\right)^2$
4	$\frac{1+¸n_h}{\sum p_l} w\left(\sum p_h H^{¤4} ¡ H^{¤3}\right) + \frac{n_k}{n_l} rK\left(¿^3 ¡ ¿^4\right) + wH^4$
5	$\sum_{i=o;n;j=o;n} p_{hi}p_{kj}U_{hij}^¤$

Case	$U_k^¤$
1	$w\frac{n_k rK}{4·} + rK\left(1 ¡ \frac{1}{2·}\right)$
2	$w\frac{n_k rK}{4·} + rK\left(1 ¡ \frac{1}{2·}\right)$
3	$wn_k rK\frac{1}{·}\left(\frac{1}{4} ¡ \frac{1}{4}\frac{1}{1+¸n_k}\frac{1}{n_k w^2}\right) + rK\left(1 ¡ \frac{1}{2·} + \frac{1}{2·}\frac{1}{1+¸n_k}\frac{1}{w}\right)$
4	$\frac{1+¸n_h}{\sum p_k} w\left(\sum p_h H^{¤4} ¡ H^{¤1}\right) + wH^4 + rK\left(1 ¡ ¿^4\right)$
5	$\sum_{i=o;n;j=o;n} p_{hi}p_{kj}U_{kij}^¤$

Columns 3 and 4 of Table 1 show the utility levels of workers and capitalists implied by these policies. These utility levels are derived by inserting τ^* and H^* into (13) and (14). They also require solving for contribution schedules. Note that $C_h^1 = C_k^1 = C_k^2 = C_h^3 = 0$. Appealing to condition (iv) in Proposition 1, $C_h^2 = \frac{1}{n}[U_p^1 - U_p^2] = 0$ and $C_k^3 = \frac{1}{n}[U_p^1 - U_p^3] = \frac{1}{4 \cdot n_k} w n_k r K \left[\frac{n_k}{1+n_k}\frac{1}{w n_k}\right]^2$. In order to solve for Case 4 contributions, we must impose the assumption that contribution schedules are globally truthful. This concept, proposed by Bernheim and Whinston (1986), implies that whenever the contribution is non-zero its first derivative with respect to the vector of policies must be the same as that of the agent's utility function. In other words:

$$C_i^T = \max[0; U_i - B_i]: \tag{27}$$

Now equations (17) and (18) imply that this is true at any subgame perfect Nash equilibrium. The assumption of globally truthful contribution schedules therefore implies extending this condition to all out-of equilibrium points where contributions are positive. Bernheim and Whinston show that playing globally truthful contribution schedules will be costless for individuals; furthermore they also show that only equilibria supported by globally truthful contribution schedules will be coalition-proof[14]. Therefore, they argue, this seems like a reasonable assumption.

If we assume global truthfulness, then condition (iv) of Proposition 1 implies:

$$wH(\tau^*) + n\left[C_h^T(\tau^*) + C_k^T(\tau^*)\right] = wH(\tau^{i\,k}) + n\left[C_h^T(\tau^{i\,k})\right] \tag{28}$$

$$wH(\tau^*) + n\left[C_h^T(\tau^*) + C_k^T(\tau^*)\right] = wH(\tau^{i\,h}) + n\left[C_k^T(\tau^{i\,h})\right] \tag{29}$$

substituting (27) into (28) and (29) and noting that $\tau^{i\,k} = \tau^2$ and $\tau^{i\,h} = \tau^3$, we get:

$$wH^{*4} + n\left[n_h \max[0; U_h^4 - B_h] + n_k \max[0; U_k^4 - B_k]\right] \tag{30}$$

$$= wH^{*1} + n\left[n_l \max[o; wH^{*1} - B_h])\right. \tag{31}$$

and

$$wH^{*4} + n\left[n_h \max[0; U_h^4 - B_h] + n_k \max[0; U_k^4 - B_k]\right] \tag{32}$$

$$= wH^{*3} + n\left[n_k \max[o; wH^{*3} + rK(1 - \tau^{*3}) - B_k]\right] \tag{33}$$

[14] A Nash Equilibrium is coalition proof when there does not exist a joint deviation by a subset J of players such that all players in J are better off, holding fixed the strategies of players not in J. See Bernheim and Whinston (1987) and Bernheim, Peleg and Whinston (1987).

It is easy to prove that all four contributions in (30) are strictly positive[15]. We can then use this fact to solve for consumption levels $B_i = y_i^4 - C_i^4$ in columns 3 and 4 of Table 1.

The payo¤s in Column 1 can help us characterize the conditions for sustainability of the di¤erent cases as equilibria. This leads us to Proposition 2:

Proposition 2 For no possible parameter values will case 2 be a sustainable equilibrium. Case 1 will be sustainable as an equilibrium if and only if $U_k^{¤1} \geq U_k^{¤3} - °_k$. If $U_k^{¤1} < U_k^{¤3} - °_k$, then if $U_h^{¤3} \geq U_h^{¤4} - °_h$ case 3 will be the only sustainable equilibrium. If $U_k^{¤1} < U_k^{¤3} - °_k$, $U_h^{¤3} < U_h^{¤4} - °_h$ and $U_k^{¤4} - °_k \geq U_k^{¤1}$ then case 4 will be the only sustainable equilibrium. If $U_k^{¤1} < U_k^{¤3} - °_k$, $U_h^{¤3} < U_h^{¤4} - °_h$ and $U_k^{¤4} - °_k < U_k^{¤1}$ then there will be a mixed strategy equilibrium (which we call case 5) with capitalists organizing with probability $p = \frac{°_h}{U_h^{¤4} - U_h^{¤3}}$ and workers organizing with probability $q = \frac{U_k^{¤1} - U_k^{¤3} + °_k}{U_k^{¤4} - U_k^3}$.

Figure 3 examples of the three possible cases. From (25) we know that there will always be an income e¤ect that leads higher capital shares to be associated with higher h given the level of the tax rate. As the point of this section is to show that there exist additional e¤ects on the tax rate that emerge from changes in political mobilization over and above those discussed in section (2.2), we concentrate on the comparative statics of the tax rate. For analytical convenience, we plot tax rates as a function of w[16]. Note that at high levels of w, the gap between $U_k^{¤3}$ and $U_k^{¤1}$ is small and the only sustainable equilibrium is case 1 (no one is organized). As w falls the gap between U_k^3 and U_k^1 grows, raising the incentives of capitalists to organize themselves. When this gap surpasses $°_k$ and capitalists become organized, the economy can either go directly to case 3 (if $U_h^3 \geq U_h^4 - °_h$, represented in panels b and c) or to case 5 (if $U_h^3 < U_h^4 - °_h$, represented in panel a). In either of these cases, the tax rate falls with the wage rate because capital becomes either partially or totally organized. As w falls further, the gap between U_h^4 and U_h^3 will grow; when this gap surpasses $°_h$ the economy can go to case 4 (if $U_k^4 - °_k \geq U_k^1$, represented in panel b) or to case 5 (if $U_k^4 - °_k < U_k^1$, represented in panel c). In this transition the fall in wage rates is associated with higher tax rates as it leads to more workers' organization. The economies in case 5 will shift to case 4 (panels a and c) when the gap between U_k^4 and U_k^1, which is a decreasing function of w, surpasses $°_k$. At this point there will be a downward shift in the tax rate as a result of greater capitalist organization.

[15] [Put sketch of proof here].

[16] Given the level of political mobilization, invertibility of ® in w is preserved. However, the discrete jumps in the tax rate can cause problems for invertibility, given that a discontinuos change in the tax rate will make a single w be associated with more than one ®. An analogous …gure to …gure 3 can be plotted with ® on the x-axis. This …gure is qualitatively very similar to …gure 3. The one exception is that some levels of ® will correspond to more than one tax rate and some levels of ® will have no tax rate associated with them.

There are a couple of important facts that emerge from the study of these cases. The …rst one is that the additional element of endogenous political mobilization can be associated with either a positive or a negative relationship between wage rates and tax rates. In the transitions between case 3 and 1, 1 and 5 and 5 and 4 tax rates increase with wage rates but in the transitions between 5 and 3 and along equilibrium 5 they fall with wage rates. In other words, the e¤ect of factor prices on the incentives for political mobilization are ambiguous and depend very much on the levels of exogenous parameters corresponding to the economies we are observing. That said, there is a sense in which higher wages do correspond to higher tax rates, and that is due to the fact that when w is su¢ciently high the economy will adopt the highest feasible tax rate $\tau = \frac{1}{2}$, and that when w is less than or equal to $\frac{\cdot}{1+\cdot}$ the tax rate will be zero.

Note that in this argument we have not appealed to the presence of liquidity constraints. In the model just sketched, both capitalists and workers can pay the cost of political mobilization regardless of their current resources. However, if we introduced some speci…cation of liquidity constraints, such that group i could not pay the cost of political organization $\circ_i$ unless its current income allows it, a fall in labor shares could relax this constraint for capitalists and make it binding for workers, therefore reinforcing the negative e¤ect that capital shares have on spending on human capital accumulation via the endogeneity of political mobilization.

3.2 Endogenous Factor Prices

To this moment we have maintained the assumption that factor prices are exogenous. Although convenient analytically and for purposes of exposition, this assumption is unrealistic. Government policies can and often do a¤ect domestic factor prices, and governments usually place importance on the redistributive e¤ects of induced factor price changes. Can these general equilibrium e¤ects of human capital accumulation change the ability of our model to explain existing correlations?

The answer depends on whether the endogeneity of factor prices can change the preferences of di¤erent groups over policies. Our model's results rely on the fact that the level of human capital accumulation preferred by workers is greater than that preferred by capitalists. Therefore a rise in capital shares - by bringing about a transfer of resources from workers to capitalists - shifts the political equilibrium in favor of capital and can lead to lower spending on human capital accumulation. When factor prices are endogenous, it is not always true that labor prefers higher levels of human capital accumulation, nor that capitalists always oppose it. Policies to accumulate human capital push down the marginal product and therefore the wage of human capital while pushing up the marginal product and thus the return to physical capital. Whether these changes in factor prices will be strong enough to change groups' preferences over policies will depend on how substitutable human and physical capital are. For high levels of substitutability, factor returns are not much a¤ected by H

and the intuition of the model in the previous sections is maintained. But if substitutability between H and K is low, capitalists may actually prefer higher levels of human capital accumulation than workers. In order to see this more clearly, suppose that the production function takes the CES form:

$$Y = (AK^{\rho} + BH^{\rho})^{\frac{1}{\rho}}$$

where the elasticity of substitution is $\sigma = \frac{1}{1-\rho}$. Suppose also that the economy is totally closed, so that factor prices are endogenous. Given the level of political organization workers will desire the level of human capital accumulation that maximizes (2) and capitalists want the level that maximizes (3). Let us …rst study workers' preferred level of human capital accumulation. This can be derived by noting that

$$\frac{\partial (wH)}{\partial H} = w\left[1 + \frac{(1-\rho)}{\rho}(1-\theta)\right] \tag{34}$$

where θ stands for capital's share. It is evident that for $\rho > 0$ ($\sigma > 1$) (34) is always increasing - therefore workers will desire the maximum level of human capital accumulation, which can be achieved by setting $\tau = \frac{1}{2}$. For $\rho < 0$ ($\sigma < 1$) this is no longer true and the optimal level of H will be that which sets (34) to zero, that is:

$$1-\theta = \frac{-\rho}{1-\rho} \tag{35}$$

which implies that when $\sigma < 1$ labor's share $(1-\theta)$ is decreasing in ρ. Therefore H, which is increasing in θ for $\sigma < 1$, will be positively related with ρ. Figure 1 plots the implied optimal level of τ from the point of view of workers as a function of σ:[17] Workers' preferred tax rate starts out at zero and is increasing in σ up to $\sigma^{*} < 1$. At this point it becomes equal to the revenue-maximizing tax rate $\tau = \frac{1}{2}$, and continues at that level for all $\sigma > \sigma^{*}$.

Similarly we can solve for the preferred tax rate of capitalists. The derivative of (3) with respect to τ will be:

$$\frac{d[wH + rK(1-\tau)]}{d\tau} = w\left[1 + \frac{(1-\rho)}{\rho}(1-\theta)\right]\frac{dH}{d\tau} + rK\left[(1-\theta)\frac{(1-\tau)(1-2\cdot\tau)}{\tau - \cdot\tau^{2}}(1-\rho) - 1\right] \tag{36}$$

[17] Note that H is a monotonically increasing function of τ for $\tau < \frac{1}{2}$. To see this, note that substituting the derivative in the production function with respect to K in the de…nition of H gives H as an implicit function of τ. Taking derivatives and solving for $\frac{dH}{d\tau}$ gives the result.

In order to derive the optimum tax from the point of view of capitalists, τ^k, note that $\tau = \frac{1}{2}$ can never be an optimum because at that tax rate (36) would become negative. Note also that as $\sigma \to 1$ ($\sigma \to 0$) $\tau^k \to \tau^{k*} > 0$. [18] Therefore τ^k and τ^l intersect at least once, but always for values of σ such that the elasticity of substitution σ is strictly less than 1. For higher values of the elasticity of substitution, τ^l will always be above τ^k and workers will prefer higher levels of H than capitalists. Figure 4 illustrates this: For all values of σ that are greater than or equal to one τ^l is higher than τ^k. When $\sigma < 1$ the parameter space is divided in two sections: For $\sigma \in (\sigma^*; 1)$, τ^l exceeds τ^k and the main assumption of our model is satisfied, whereas for $\sigma \in (0; \sigma^*)$ the opposite happens.

It is therefore clear that the opposition of interests between the owners of physical capital and the owners of labor that is the backbone of our model will hold as long as the elasticity of substitution is higher than σ^*. We can get some idea as to the plausible value of σ^* by rewriting (35) as:

$$\Re = \frac{1}{1 - \sigma} = \sigma \tag{37}$$

As (37) must hold at σ^*, it implies that the range $\sigma \in (0; \sigma^*)$ is one in which the elasticity of substitution is lower than capital's share. According to our data, the average value for capital shares is .53, and a full 80% of the sample corresponds to capital shares lower than .66. The average value of the capital share can be much lower - between .35 and .45 - if one attributes a portion of the income from unincorporated enterprises (counted as capital income in national accounts) to labor. It therefore appears that we would need elasticities of substitution that are closer to zero than to one in order for workers to prefer lower levels of investment in human capital than capitalists in the bulk of our sample.

Empirical work on the elasticity of substitution between capital and labor indicates that σ is unlikely to be substantially smaller than 1. It is an often noted fact that capital shares tend to be constant over time despite large swings in the relative supplies of factors of production, suggesting an elasticity of substitution of 1. Betancourt and Clague (1981) provide microeconomic evidence consistent with this hypothesis: they estimate σ using UNIDO data for 17 industries and derive an average estimate of .917. Rowthorn (1996) argues that lower values of σ are plausible, but recognizes that "the economy-wide elasticity of substitution is greater than that suggested by disaggregated studies " since at the economy-wide level consumers substitute between industries. In other words, it is highly likely that for most if not all countries $\sigma > \sigma^*$ and workers desire

[18] To see why, suppose $\tau \to 0$. Then we know that the first term in brackets tends to zero (as this is the workers' maximizing solution). Substituting it in the second term, we get that

$$\lim_{\sigma \to -1} \frac{(1 - \tau)(1 - 2\cdot\tau)}{\tau - \cdot\tau^2} \cdot 0$$

implying $\tau > \frac{1}{2}$, a contradiction.

greater investment in human capital accumulation than capitalists. Therefore, although the case in which capitalists desire higher H than workers is de…nitely of theoretical interest, it does not appear to be empirically very relevant.

3.3 Alternative Redistributive Mechanisms

To this point we have ignored the possibility of alternative mechanisms of redistribution. The presence of these alternative mechanisms may modify our story. If there is an exogenous decrease in the wage rate (and consequently a fall in the capital share) and these alternative mechanisms are in place even governments that respond to the wishes of the median voter will react by shifting some resources from human capital accumulation to the other means of redistribution. This can cause human capital accumulation to fall in response to increases in capital shares.

We would like to make two points about this alternative explanation. The …rst one is that there are a number of good reasons why it may be sensible to assume - as we do - that investment in human capital is the only way in which resources can be transferred from rich to poor individuals. More sophisticated instruments of redistribution - such as a progressive system of taxation and a well-developed welfare state - are either inexistent or insigni…cant in many developing countries. The di¢culties associated with monitoring a system of progressive income taxation are vast and require a level of administrative sophistication and institutional capacity which many developing countries have not attained. Furthermore, alternative means of redistribution - such as price controls, subsidies to consumption or production of basic commodities or direct provision - are often highly ine¢cient. It is not a coincidence that economists advising developing countries generally recommend a focus on investments in education and health as the optimal mechanisms for reducing poverty and inequality.

Our second point is that a shift towards this explanation does not solve the problems of the median voter model in accounting for the patterns present in the data. Although it can explain a negative correlation between human capital accumulation and capital shares it implies that as capital shares increase we should see countries shifting their composition of spending towards redistributive transfers and away from investment in human capital, something that does not occur in the data.

To illustrate this point, suppose that the government budget can now be allocated between human capital accumulation H and a redistributive lump-sum subsidy S. The government budget constraint is now:

$$H + S = n_k r K (¿ ¡ \cdot ¿^2)$$

In order to avoid corner solutions, we must assume imperfect substitutability between H and S in worker's utility. This could occur, for example, because human capital and redistribution have di¤erent risk implications for individuals

- being human capital a risky asset whose return depends on future realizations of wages. It could also be due to S being given out partly in the form of in-kind transfers, or because there are separate ine¢ciencies associated with the transfer of S that are increasing in its size and that voters want to keep under control. In any case, imperfect substitutability ensures that voters will want to use both S and H in equilibrium, making the analysis of the comparative statics of the composition of government spending meaningful. We represent worker's utility as:

$$U_h = U(wH; S) = U(wH; n_k rK(¿ ¡ \cdot¿^2) ¡ H) \tag{38}$$

In a median voter environment, politicians will seek to maximize (38). The …rst order conditions for this exercise will be:

$$wU_1 ¡ U_2 = 0 \tag{39}$$

$$U_2 n_k rK(1 ¡ 2\cdot¿) = 0 \tag{40}$$

It is easy to see what the problem is. (40) implies $¿ = \frac{1}{2\cdot}$. Therefore total government spending as a percent of GDP will be:

$$g = s + h = \frac{1}{4\cdot}®; \tag{41}$$

and will be increasing in ®. If substitutability between h and s is su¢ciently high, then a fall in wage rates (a rise in the capital share) will induce a fall in h. But (41) then implies that it should also induce a rise in s and g.

The problem is that there is no indication that either g or s are increasing in capital shares in the data. A widely used measure of redistribution is government consumption, which is, broadly speaking, a measure of non-investment expenditures of the public sector[19]. Figure 5 shows a partial residual plot of government consumption with respect to capital shares. In contrast to what the extension of the median voter that we have just sketched predicts, we …nd that government consumption is not positively associated with capital shares. Indeed, the association is strongly negative, a result that extends to total government spending. We return to this empirical exercise in more detail in Section 4.[20]

[19] There are good reasons to believe that government consumption - which includes payments for goods, services and wages made by all levels of government - performs in many developing countries the redistributive and social insurance functions commonly performed by welfare state institutions in advanced economies. Rodrik (1997, 1998) …nds evidence that in developing countries government consumption is positively associated with exposure to external risk, suggesting that it performs important social insurance functions. In developed countries, the correlation between external risk and social security transfers becomes more signi…cant. Furthermore, in contrast to human capital accumulation, government consumption is commonly found to have a negative e¤ect on economic growth.

[20] The de…nition of general government consumption used for Figure 3 includesall current

4 Empirical Evidence

We now test the comparative implications of our models with a panel of data for developing and developed economies from 1960 to 1997. Our dependent variables will include indicators of investment in human capital accumulation, government consumption, general government expenditures and government investment. Independent variables include the capital share, the log of per capita GDP and a set of other controls. Capital shares are calculated as the sum of operating surplus and depreciation divided by GDP at factor cost. In order to abstract from business cycle e¤ects, we use …ve-year averages of all our variables. A detailed description of the data used is in Appendix 2.

We center on estimating linearized versions of equation (23), which speci…es h as a function of ® and a set of exogenous parameters. We also estimate analogous equations using indicators of general redistributive spending (government consumption), total expenditures and government investment as dependent variables. Our right hand side variables are for the most part common controls in empirical studies of state expenditures. A long tradition in political science has associated the level of government spending with the level of per capita income - the implicit assumption being that many of the public goods provided by governments are luxuries which can be a¤orded once basic necessities have been provided . The point was …rst made by Wagner (1893) although subsequent tests (see Mueller, 1989 and Ram, 1987) have generally failed to …nd support for the hypothesis. Some authors have pointed to the importance of economies of scale in the provision of public goods and therefore to the need for using an indicator of the absolute size of the economy - such as level of absolute GDP or population - as a regressor (Alesina and Waczairg, 1998). Spending on redistribution and human capital accumulation is often targeted to speci…c age groups in the population (the young in the case of education and the old in the case of pensions), so that it seems desirable to control for the age composition of the population. We also use a variable measuring the initial stock of human capital to capture the extent of increasing/diminishing returns in the accumulation of human capital. Thus our baseline regressions control for the log of per capita GDP, the log of population, the percentage of the population aged over 65 and under 15, and initial life expectancy (a common measure of the stock of human capital). We explore the sensitivity of our results to changes in this list of controls below.

Table 2 presents some basic summary statistics for our data. As one can see, there are important di¤erences across countries in our indicators of spending and investment in human capital. Spending on public education ranges from a low

spending for purchases of goods and services (including wages and salaries) by all levels of government, excluding most government enterprises. It also includes most expenditures on national defense and security. This is the tradtional de…nition of government consumption, as in for example World Bank (1999). An alternative de…nition of government consumption, commonly used in growth studies, excludes expenditure on education and national defense and security from the traditional de…nition. Our results still hold when we use that more restrictive de…nition.

of .5 % to a high of 10.5 % of GDP. A good number of countries (mostly in sub-Saharan Africa) have no social security system, while some OECD countries devote between one-tenth and one-…fth of its GDP to it. General government consumption ranges from 4% of GDP (Oman, before the oil boom) to over 30% of GDP (Oman, after the oil boom). These variations are far from only determined by levels of income or geography: for example, the standard deviation of public education expenditures within sub-Saharan Africa (1.99 percentage points) is higher than the di¤erence between its average spending on education and that of the OECD (1.11 percentage points).

The same assertion applies to the data for capital shares. The variation in capital shares among countries is substantial, going from a low of between .1 and .2 to a high between .8 and .96, depending on the assumption that is made about the appropriate apportionment of income from unincorporated enterprises to capital's share (an issue which is discussed more in depth below). It does appear that capital shares are systematically related to income: the simple correlation with the log of GDP per capita is -.63. As the last …ve rows of Table 2 show, capital shares are lowest in OECD economies and highest in Sub-Saharan Africa. Furthermore, it also seems that di¤erences in shares of capital are related to the distribution of income: the simple correlation between capital shares and Gini coe¢cients is .48 and with wage inequality is .46.[21] It also seems that they are related to the political strength of labor: the partial correlation between capital shares and unionization rates is -.52.

In Table 3 we present some …rst random e¤ects regressions to systematically analyze the relationship between capital shares and our spending variables. The strong pattern arising from these regressions, as was pointed out in the introduction, is that capital's share of GDP seems in most cases to be the single strongest predictor of spending patterns. Capital's share of GDP is negatively associated with spending on public education and public health spending and weakly negatively associated with social security taxes, broadly con…rming our story of a correlation between capital shares and investment in human capital. It is also strongly negatively related to government consumption, a commonly used measure of redistribution[22]. The patterns in the composition of these variables are also suggestive: Public spending in health is negatively related to capital shares, but private spending in health is not. This suggests that the reason behind greater public spending on health when capital shares are low is not simply the greater e¢ciency of investing in h (which should also a¤ect private health spending) but the change that low capital shares induce in the distribution of political power. Likewise, when capital shares rise spending on primary education falls the most; spending on secondary education seems una¤ected and spending on higher education actually rises, suggesting that the e¤ect of capital shares on human capital accumulation is strongest when there is a greater redistributive component to h. However, government investment is unrelated to capital shares - again something that would be suggested by its

[21] Gini coe¢cients are from Deininger and Squire (1997) and wage inequality is from Rodríguez and Pries (2000).

[22] See our comments on footnote 19.

lack of use as a redistributive tool[23]. The fact that total government spending is the sum of government consumption and capital expenditures implies that total government spending is also negatively related to capital shares, again in contrast to the prediction of the median voter model. In sum, our results are broadly supportive of the interest groups model and contradict the implications that arise from the median voter model.

As a number of results in the literature vary widely with the specification of the estimated equation and given that equation (23) is a highly non-linear function, we turn now to exploring the possibility of specification bias in our regressions. The first row of Table 4 reproduces our estimate of the coefficient on capital shares from our baseline specification of Table 3. In the second row we show the results of estimating our system under a specification with fixed country-specific effects, as would be appropriate if the country-specific effects are correlated with the regressors - as they most likely are. Despite the sacrifice in data entailed by dropping all the cross-sectional information, all variables that were significant under the random effects specification remain significant under fixed effects - with the statistical significance of the coefficients on public spending on education and total expenditures weakened but that of social security spending strengthened. In the next two rows we explore sensitivity to functional form. First we show in row 3 the estimates when both the right hand side and left hand side variables are expressed logarithmically, as suggested by Rodrik (1998). Row 4 uses the alternative functional form for redistribution in median voter models that arises out of the classical median voter model of redistribution of Meltzer and Richard (1983), in which the log of the tax rate is a function of the inverse of GDP[24]. The next row turns to the issue of outliers: in order to make sure that our results are not driven by highly influential observations, we exclude all of these observations as measured by the dfbeta indicator (Besley, Kuh and Welsch, 1980).[25] dfbeta measures to what extent the coefficient on capital shares changes when the $j-th$ observation is excluded from estimation. We follow the suggestion of Besley, Kuh and Welsch (1980, p.28) to reestimate the equations excluding all the observations in which dfbeta, scaled by the estimated standard error of the coefficient, is greater than $\frac{2}{\sqrt{n}}$. Figures 6-11 show the residual scatter plots of the spending variables on capital shares after outliers have been excluded.

[23] A similar point is made by Alesina (1997), who discusses the lack of use of public investment as a redistributive tool in the context of fiscal adjustments.

[24] See Meltzer and Richard (1983) for a derivation. Rodriguez (1999) also derives this functional form in the contect of an interest groups model of redistribution.

[25] That is,

$$dfbeta = \frac{r_i u_i}{U^2(1 - h_i)}$$

where r_i is the studentized residual of the regression, u_i is the residual obtained from a regression of the explanatory variable of interest on other explanatory variables, $U = \sum_i u_i^2$ and h_i is the leverage of observation i.

Our capital shares are based on the standard national accounts de…nition of operating surplus, which includes all income from unincorporated enterprises (self-employment). Therefore our capital shares count as income from capital the part of the income of self-employed individuals that should be attributed to labor, overestimating capital's contribution to GDP. The next two rows of Table 4 (rows 6 and 7) explore the sensitivity of our results to this assumption. In them we report the results of regressions where the indicator of the capital share has been adjusted to attribute all (row 6) or 2/3 (row 7) of the income from unincorporated enterprises to labor.[26] In a last robustness test, we reestimate capital shares excluding depreciation from capital's income (row 8).[27] The general picture arising from the tests in Table 4 is that our results are, if anything, strengthened by these changes in speci…cation.

In Table 5 we turn to the issue of sensitivity to alternative controls. Rodrik (1998) has suggested that open economies devote more resources to social insurance, and Wacziarg (1999) has argued that democracies have higher rates of human capital accumulation. In Table 5 we show that our results are not sensible to controlling for these variables. Consistent with Rodrik's hypothesis, total government spending and government investment are positively related to openness, although some of the other variables are not. Wacziarg's hypothesis, in turn, is not con…rmed by our evidence: the coe¢cient on the political rights and civil liberties variables are not statistically signi…cant in any systematic way after capital shares are controlled for. A possible reason for this is that, unlike us, Wacziarg uses indicators of changes in the stock of human capital as his dependent variable. In contrast, our dependent variables measure the resources invested in human capital accumulation. [28] The last column of Table 5 shows an additional robustness test - using mean years of schooling in addition to life expectancy as a measure of the stock of human capital. Our results are again una¤ected by this addition. In what follows, we omit these variables from our speci…cation because they tend to signi…cantly reduce our degrees of freedom.

We have suggested that the absence of a correlation between expenditure per student on secondary and higher education and capital shares is due to the fact that spending on non-primary schooling does not necessarily have redistributive

[26] This is a common adjustment. See for example Krueger (1999). When data on income from unincorporated enterprises was unavailable, we estimated it by using the coe¢cients from a regression of it on per capita GDP.

[27] Conventional estimates of capital's share (see for example Jorgenson and Grillichees, 19xx) include depreciation as part of capital income under the justi…cation that in a competitive equilibrium the marginal product of capital should be su¢cient to cover both the return to capital and the replacement of depreciated capital ($f' = r + \pm$). However income net of depreciation may be a better measure of capital's bargaining power. We thank Samuel Bowles for bringing this issue to our attention.

[28] Wacziarg's results could be due to the fact that freer and more democratic societies are more e¢cient at converting a given amount of resources into higher stocks of human capital - not that they actually devote more resources to human capital accumulation.Such an interpretation would be consistent with other evidence regarding the links between civil liberties and the transmission of information. For example, Rodríguez and Wilson 1999 …nd evidence that societies with greater protection of civil liberties experienced higher rates of adoption of information technologies during the early nineties.

e¤ects. Investment in secondary and higher education in very poor countries is likely to bene…t only urban elites; only in advanced economies will it bene…t the poorer sectors of the population. If our explanation is correct, we would expect that as economies become richer and the average level of education of the economy improves, investment in secondary and higher schooling will start to take on a redistributive nature and the e¤ect of capital shares on educational expenditures will become strongly negative. The results in Table 6 con…rm this: an interaction term between the level of GDP per capita and the capital share is strongly negative, indicating that as incomes per capita rise the e¤ect of capital shares on spending on all levels of education goes from being positive to being strongly negative. The level of per capita GDP at which the e¤ect of the capital share on education spending becomes negative is smallest for primary schooling (110 US$), higher for secondary schooling (1808 US$) and highest for higher education (9533 US$). Only 5 (0.5%) of our 842 observations correspond to countries that were below the lower threshold for primary schooling. We would argue that this means that primary schooling has a redistributive nature for nearly all countries in our sample. Spending on secondary schooling would appear to be redistributive for the richest 40.5% of economies in the sample, while spending on higher education is redistributive only for the richest 15.4% of economies in the sample. According to our estimates, spending on secondary schooling becomes progressive when an economy surpasses the level of income attained by Thailand in 1995. Spending on higher education becomes progressive when an economy attains the level of income attained by Finland in 1965 and the Bahamas in 1995.

4.1 Reverse Causation

An alternative explanation for our results is that they are due not to the e¤ect of capital shares on human capital accumulation but rather to the e¤ect that human capital accumulation has on capital shares. Higher spending on human capital accumulation could lead to higher stocks of human capital and lower shares of income in physical capital.[29] We do not deny that such a link is part of the story. Indeed, our theoretical model of an open economy presented in Section 2 explicitly recognizes the endogeneity of capital shares. As we point out there, estimation of our model should take into account the fact that capital shares are an endogenous variable which is a¤ected by changes in factor prices[30]. In this section we reestimate our model taking into account this possible endogeneity and show that the source of our correlation cannot be attributed to reverse causation but rather appears to come from the e¤ect of capital shares on government spending.

[29] Note that this is strictly true only if the elasticity of substitution between capital and labor is greater than one. If it is smaller than one, then investment in human capital accumulation would cause higher capital shares.

[30] This problem is of course ameliorated if the economy is closed and the elasticity of substitution between capital and labor is unity. In that case, capital shares become a parameter of the system that can only be a¤ected by policies if they change the form of the production function.

We do this in two ways. First, we perform Granger causality tests on the relationship between the spending variables and investment in human capital[31]. The results of these tests are in Tables 7.1 and 7.2. The results show that in all …ve cases studied (lack of su¢cient time variation in the data made it impossible to carry out these tests for public spending on health) capital shares Granger cause the spending variables. In three of the …ve cases (public spending on education, social security taxes and total public spending) capital shares are not Granger caused by the spending variables. And even though in two of the remaining cases (spending on primary schooling and government consumption) capital shares are Granger caused by the spending variables, the coe¢cient on the spending variable in both these cases is actually positive not negative. We conclude that in none of the …ve cases studied can the negative correlation between capital shares and spending be attributed to reverse Granger causation.

The second way we can address the issue of endogeneity is by estimating the equation for the capital share as a function of wages and the returns to capital. This poses two problems. First, in the real world wages and returns to capital are unlikely to be completely exogenous, as we have postulated in our open economy model. As a matter of fact, the real world probably lies somewhere between the model with endogenous factor returns of Section 2 and the model with exogenous factor shares of Section 3.2. Both factor returns and factor shares are likely to be in‡uenced by economic policies. Second, even if we were willing to treat factor returns as exogenous, data on wages and returns to capital are scant, making estimation of the capital share equation di¢cult in practice.

However, neoclassical trade theory suggests a natural solution for this problem. According to the Stolper-Samuelson theorem, there should be a relationship in equilibrium between factor returns and a country's terms of trade.[32] In relatively labor abundant economies, positive shocks to the terms of trade will cause increases in the wage rate and decreases in the real return to capital. In relatively capital abundant economies, the opposite should happen: increases in the terms of trade should cause increases in the return to capital and decreases in the wage rate. Therefore changes in the terms of trade should be correlated with changes in factor shares. Unless countries are large, their terms of trade should be exogenous to the level and composition of their government's spending. Therefore a natural instrument for the capital share would be an interaction between a measure of the country's capital abundance vis-a-vis the rest of the world and shocks to the terms of trade:

$$TOTKI_t = (TOT_t - TOT_{t-1}) * (LGDP_t / \overline{LGDP}_t)$$

where TOT_t denotes the level of the terms of trade, LGDP refers to the log of per capita GDP - our measure of a country's capital abundance -, overbar

[31] Because of data limitations, we use just one (…ve-year average) lag of the dependent variable in our speci…cations.

[32] See Stolper and Samuelson (1941). Contemporary expositions can be found in Bhagwati, Srinivasan and Panagariya (1998) and Dixit and Norman (1980).

denotes a world average and t is a time sub-index. Countries with positive TOTKI have either experienced a positive terms of trade shock and are capital abundant or have experienced a negative terms of trade shock and are labor abundant. In both cases capital shares should rise. A similar reasoning leads to the conclusion that negative values of TOTKI should be associated with falls in the capital share. As terms of trade shocks can be reasonably said to be exogenous in a sample of predominantly small economies and the log of per capita GDP is already introduced as an alternative explanatory variable in our regressions, TOTKI should be uncorrelated with the residual from our equation.

One drawback of this approach is that trade theory tells us that TOTKI should be correlated with changes in capital shares but not with their level. Indeed, given that TOTKI is simply a ratio of price indices, it is unclear that its level has any economic meaning. Therefore estimation by instrumental variables techniques requires that we …rst-di¤erence our data, running the danger of losing great part of our source of variation.

We show these results in Table 8. Column 1 reproduces our baseline estimation, whereas column 2 shows the results of estimation in …rst di¤erences. Although the statistical signi…cance of the relation is weakened, capital shares are still negatively related to the spending variables. The third and fourth columns of Table 8 show the results of estimating our equations using two alternative instrumental variables techniques. The …rst one is simple 2SLS, and the second one is 3SLS system estimation, with one equation corresponding to each time period. The superiority of 3SLS in this case comes from the fact that …rst-di¤erencing causes the residuals to be correlated over time. Regrettably, we cannot estimate the public health equation with either method because of lack of observations, nor can we estimate the education spending equation with 3SLS. However, the pattern that emerges from the estimated equations is encouraging. All coe¢cients have the correct sign and in …ve out of nine cases, they are statistically signi…cant (two of these at 10%). Table 9 shows that TOTKI is indeed a strong instrument, with its t-statistic in the …rst stage regression between 2.05 and 2.22. Although it is apparent that signi…cant information has been sacri…ced in order to carry out IV estimation, the results from it remain consistent with our story. These results, combined with those of Table 7, support the hypothesis that at least part of the observed direction of causation comes from the e¤ect of capital shares on investment in human capital accumulation and redistribution.

5 Conclusions

We have presented a variety of political economy models in an attempt to understand investment in human capital accumulation as well as the composition and level of government spending. We have evaluated these models in terms of their capacity to predict the strong relationship existent in the data between most spending variables and capital shares. We have shown that such relationships

can be accounted for within the context of a common agency model in which organized labor and capital groups try to in‡uence policies through money contributions. If money is not important for politics and policies are decided by the decisive (median) voter, then a positive relationship between human capital accumulation and capital shares or between redistribution and capital shares should be present. However, the correlations we …nd are strongly negative. Empirically, we have shown that the correlation between capital shares and investment in human capital and redistribution is robust to alternative functional speci…cation and controls, and is not due to the existence of outliers. We also show that both Granger causality tests and instrumental variables estimation support the hypothesis that the direction of causation goes from capital shares to government spending and not the other way around.

The recent surge of political economy literature has seen a proliferation of models of politics, many of which are not complementary. Rather, these models often re‡ect radically di¤erent visions of the political process. The divide between median voter and interest groups models is a case in point. Median voter models are inspired by a vision of politics as a reasonably well-working democratic process in which the preferences of the majority of individuals determine the policies implemented. Models of lobbying and interest groups, in contrast, re‡ect a vision of politics in which what matters is the capacity of di¤erent groups to organize politically and mobilize resources into the political arena. The schism between these two views goes back to the contemporaneous publication of Anthony Downs' An Economic Theory of Democracy (1957) and Mancur Olson's A Theory of Collective Action (1965). Despite the different implications of these visions, there has been little work addressing their comparative power in accounting for existing political realities. In fact, work attempting to disentangle the explanatory power of these hypotheses in explaining cross-country variations in policies is to the best of our knowledge nonexistent. In this paper we have attempted to carry out such a comparison. It has come out decisively in favor of models of interest groups.

As is always the case with empirical tests, our exercises test not only the median voter and interest groups hypotheses, but also a set of other auxiliary hypotheses. This is a well-known problem in the social sciences - one is never actually able to test a hypothesis by itself but is only able to test combinations of hypotheses.[33] In particular, this paper has tested the combination of two alternative political economy models with a speci…cation of the politico-economic setting in which the salient con‡ict of interests is between the owners of human capital (workers) and the owners of physical capital (capitalists). The failure of median voter models to account for variations in the data could be attributed to the inappropriateness of the labor-capital con‡ict as a description of the key politico-economic divide underlying human capital accumulation. Further research is necessary to ascertain whether combinations of the median voter model with other plausible characterizations of the basic political economy are able to account for the patterns in the data.

[33] For a discussion, see Lakatos (1978) and Kuhn (1962).

On the other hand, the fact that an interest groups model and a vision of the politico-economic process where the con‡ict between capital and labor is salient are jointly successful at explaining cross-country patterns can also be seen as a con…rmation of the signi…cant explanatory power that the capital-labor con‡ict has for understanding the relationship between politics and economics. The tradition of understanding political economy with reference to the con‡ict between capital and labor is among the oldest in the study of politics.[34] Models based on the capital-labor divide have often been rightly criticized as simplistic and reductionist. Although these criticisms have appropriately pointed out the failure of class cleavages in explaining a number of political outcomes, our research shows that they can still do quite well in terms of explaining general di¤erences across countries and over time.

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[34] Obvious references are Marx (1887), Lukacs (1971), Gramsci (1992), Jessop (1990), Baran and Sweezy (1996) and Kalecki (1990).

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7 Appendix: Description of Data Sources

Capital Share (KSHARE). Equals the ratio of operating surplus plus depreciation to GDP at factor cost. KSHARE13 and KSHARE23 assign, respectively, 1/3 and 2/3 of the income from unincorporated enterprises to labor's share. Source: United Nations Statistical O¢ce.

Per Capita GDP (PPP). Source: World Bank (1999)

Total Population. Source: World Bank (1999)

Population aged over 65. Source: World Bank (1999)

Population aged under 15. Source: World Bank (1999)

Life Expectancy at Birth (in years). Source: World Bank (1999)

Total Spending on Pubic Education: The percentage of GNP accounted for by public spending on public education plus subsidies to private education at the primary, secondary, and tertiary levels. Source: World Bank (1999). Primary Source: UNESCO.

Expenditure per Student on Primary, Secondary and Higher Education: The percentage of GNP per capita accounted for by public spending on public education plus subsidies to private education at each level. Source: World Bank (1999). Primary Source: UNESCO.

Public Health Spending: Consists of recurrent and capital spending from government (central and local) budgets, external borrowings and grants (including donations from international agencies and nongovernmental organizations), and social (or compulsory) health insurance funds. Expressed as a Percentage of GDP.

Private Health Spending: Includes direct household (out-of-pocket) spending, private insurance, charitable donations, and direct service payments by private corporations. Expressed as a percentage of GDP.

Social security taxes: Include employer and employee social security contributions and those of self-employed and unemployed people. Expressed as a percentage of GNP.

General government consumption: Includes all current expenditures for purchases of goods and services by all levels of government, excluding most government enterprises. It also includes capital expenditure on national defense and security. Expressed as a percentage of GDP.

Government Investment (Capital Expenditure): Spending to acquire …xed capital assets, land, intangible assets, government stocks, and nonmilitary, non-…nancial assets. Also included are capital grants. Data are shown for central government only. Expressed as a percentage of GNP.

Total Expenditure: Includes nonrepayable current and capital (development) expenditure. It includes expenditures …nanced by grants in kind and other cash adjustments, but does not include government lending or repayments to the government or government acquisition of equity for public policy purposes. Data are shown for central government only. Expressed as a percentage of GDP.

Openness: The sum of exports and imports of goods and services measured as a share of GDP.Source: World Bank (1999)

Civil Liberties: Indicator of Civil Liberties constructed by Freedom House. See Freedom House (various years). The indicator rates countries on a scale of 1-7 from most free to least free. Civil liberties are de…ned as the freedoms to develop views, institutions, and personal autonomy apart from the state. Freedom House researchers rate countries based on their assessment of the state of the following civil liberties: freedom and expression of belief, association and organizational rights, rule of law and human rights, and personal autonomy and human rights. Data taken from Wacziarg, Romain (1999), "Human Capital and Democracy," mimeo, Stanford University.

Democracy : Indicator of Political Rights constructed by Freedom House. See Freedom House (various years). The indicator rates countries on a scale of 1-7 from most free to least free. Political rights are de…ned as those rights that enable people to participate freely in the political process. This represents the right of all adults to vote and compete for public o¢ce, and for elected representatives to have a decisive vote on public policies. Freedom House researchers rate countries according to their assesment of how widely respected these political rights are. Data taken from Wacziarg, Romain (1999), "Human Capital and Democracy," mimeo, Stanford University.

Terms of Trade/ Capital Abundance Interaction (TOTKI):

$$TOTKI_t = (TOT_t - TOT_{t-1}) * (LGDP_t / \overline{LGDP}_t)$$

Terms of Trade changes are the growth rate of export prices minus growth rate of export prices. Source: Barro and Lee (1994).

Mean Years of Schooling: Average Years of Schooling in the Total Population. Source: Barro and Lee (1994).

Table 2: Summary Statistics

	Number of Observations	Mean	Standard Deviation	Minimum	Maximum
Total Spending on Public Education	328	4.444	1.890	0.500	10.700
Spending on Primary Public Education	468	14.334	8.921	2.516	96.114
Spending on Secondary Public Education	199	41.364	47.492	2.352	350.365
Spending on Tertiary Public Education	317	200.717	387.155	1.752	3635.035
Social Security Taxes	580	2.564	4.174	0.000	19.717
Private Health Spending	126	2.111	1.267	0.081	7.850
Public Health Spending	172	3.334	2.116	0.598	8.158
Total Public Investment	553	4.996	3.881	0.293	26.642
Government Consumption	906	14.980	5.869	4.696	48.090
Total Public Spending	578	27.660	12.230	0.779	97.015
Percentage of Population over 65	1039	0.052	0.037	0.011	0.177
Percentage of Population under 15	1042	0.365	0.084	0.149	0.499
Life Expectancy at Birth	1048	59.556	12.151	32.015	79.650
Expenditure on Primary Education	345	41.707	10.313	17.214	73.130
Expenditure on Secondary Education	345	30.024	10.344	6.102	60.571
Expenditure on Tertiary Education	388	18.615	7.357	0.222	41.186
Democracy	898	0.528	0.345	0.000	1.000
Civil Liberties	690	3.902	1.864	1.000	7.000
Openness	874	65.013	43.157	6.524	378.224
Capital Share	454	0.530	0.141	0.280	0.968
Capital Share, assigning all of unincorporated enterprises' income to labor	394	0.244	0.144	0.003	0.674
Capital Share, assigning 2/3 of unincorporated enterprises' income to labor	394	0.342	0.144	0.101	0.772
Capital Share assigning 1/3 of unincorporated enterprises' income to labor	394	0.439	0.143	0.200	0.870
Capital Share, excluding depreciation	522	0.484	0.164	0.181	0.935
Capital Share by Region					
OECD	166	0.4240	0.0911	0.2799	0.7741
Latin America	87	0.5411	0.1068	0.2867	0.7986
Eastern Europe	5	0.5559	0.1787	0.4147	0.8673
Asia	54	0.5981	0.0988	0.3867	0.7821
Middle East	56	0.6072	0.1296	0.3856	0.9352
Sub Saharan Africa	79	0.6469	0.1406	0.3832	0.9685

Table 3: Baseline Panel Regressions

	Total Spending on Public Education	Spending on Primary Public Education	Spending on Secondary Public Education	Spending on Tertiary Public Education	Social Security Taxes	Private Health Spending	Public Health Spending	Total Public Investment	Government Consumption	Total Public Spending
Capital Share	-6.89 (-5.55)	-24.82 (-5.44)	7.06 (.167)	488.08 (2.09)	-6.03 (-1.38)	-1.42 (-.761)	-4.97 (-3.11)	34.13 (.187)	-15.43 (-6.11)	-12.00 (-2.25)
LGDP	.504 (2.28)	.107 (.114)	-6.30 (-.888)	-51.34 (-1.23)	1.25 (1.26)	.282 (.802)	.256 (.957)	33.24 (.970)	.789 (1.53)	.729 (.699)
LPOP	-.067 (-.745)	-.466 (-.915)	-4.30 (-1.31)	-34.24 (-1.70)	1.19 (1.67)	.386 (2.91)	-.092 (-.847)	-67.31 (-3.78)	-1.00 (-3.23)	-1.88 (-3.28)
PER65	20.15 (2.55)	90.31 (2.75)	148.33 (.451)	2664.50 (1.58)	93.49 (3.03)	-3.11 (-.377)	17.62 (1.90)	353.72 (.310)	52.80 (3.38)	258.27 (7.39)
PER14	16.35 (4.38)	7.43 (.550)	5.01 (.032)	40.71 (.054)	9.12 (.681)	-1.12 (-.229)	3.43 (.764)	1222.00 (2.35)	46.78 (6.66)	103.37 (6.66)
Life Expent.	.039 (.904)	-.279 (-2.02)	-1.02 (-1.01)	-10.91 (-1.63)	.097 (.671)	-.019 (-.288)	-.025 (-.505)	.252 (.045)	.037 (.506)	.323 (2.01)
# Obs.	170	245	110	196	318	69	71	313	377	320
R-squared	.504	.364	.514	.578	.671	.293	.816	.393	.413	.572
Hausman Test	241.93 (.000)	44.67 (.000)	18.90 (.004)	52.89 (.000)	27.89 (.000)	9.53 (.089)	5.74 (.451)	4.05 (.542)	4.18 (.651)	4.81 (.567)

Note: All (Random Effects) estimations include a constant, time and continental dummies.
T-statistics based on Huber-White heteroskedasticity-consistent standard errors in parentheses. For last row, p-values are in parentheses.

Table 4: Alternative Specifications

	Total Spending on Public Education	Spending on Primary Public Education	Spending on Secondary Public Education	Spending on Tertiary Public Education	Social Security Taxes	Private Health Spending	Public Health Spending	Total Public Investment	Government Consumption	Total Public Spending
1.Baseline	-6.89 (-5.55)	-24.82 (-5.44)	7.06 (.167)	488.08 (2.09)	-6.03 (-1.38)	-1.42 (-.761)	-4.97 (-3.11)	34.13 (.187)	-15.43 (-6.11)	-12.00 (-2.25)
2.Fixed Effects	-7.40 (-1.75)	-28.88 (-4.11)	7.24 (.110)	-412.79 (-1.14)	-2.93 (-2.29)	4.04 (.760)	-27.25 (-2.45)	-15.09 (-.045)	-20.25 (-3.93)	-19.16 (-1.74)
3.All variables in logs	-.897 (-5.08)	-1.21 (-7.71)	-.697 (-2.06)	-.136 (-.440)	-.528 (-1.72)	.062 (.142)	-1.05 (-4.06)	-.035 (-.180)	-.549 (-6.94)	-.296 (-3.09)
4.Tax rate in logs; inverse of GDP	-1.76 (-5.76)	-2.08 (-7.26)	-1.29 (-2.08)	-.125 (-.217)	-2.99 (-3.95)	-.053 (-.063)	-1.77 (-4.00)	-.201 (-.559)	-1.02 (-6.74)	-.558 (-3.13)
5.Outliers excluded	-7.97 (-6.46)	-23.75 (-7.49)	-33.45 (-1.63)	58.20 (.543)	-2.07 (-1.51)	-.024 (-.019)	-8.44 (-4.36)	-89.27 (-.572)	-14.17 (-6.25)	-17.16 (-4.06)
6.Self-Employed Excluded	-4.62 (-5.24)	-17.15 (-5.52)	-3.19 (-.107)	355.48 (2.13)	-1.23 (-1.53)	-2.37 (-1.36)	-2.93 (-2.09)	1.34 (.932)	-9.80 (-5.77)	-7.83 (-2.15)
7.2/3 Adjustment	-6.55 (-5.24)	-24.32 (-5.52)	-4.52 (-.107)	504.08 (2.13)	-1.75 (-1.53)	-3.35 (-1.35)	-4.15 (-2.09)	191.17 (.932)	-13.90 (-5.77)	-11.11 (-2.15)
8.Excluding Depreciation	-6.28 (-6.11)	-20.22 (-4.91)	5.32 (.149)	497.99 (2.42)	-1.98 (-1.84)	-1.32 (-.932)	-3.83 (-3.12)	1.47 (.869)	-15.83 (-7.71)	-12.20 (-2.82)

Note: All (Random Effects) estimations include a constant, time and continental dummies.
Row 1 replicates the results from table 1. Row 2 uses introduces country-specific dummies. In row 3 all variables are in logs. The same is true for row 4 but the inverse of GDP is used instead of its log. Row 5 is the same as row 1 but excluding outliers as described in text. Row 6 uses capital's share with the contribution of unincorporated enterprises (estimated) excluded from capital rent. Row 7 substracts only 2/3 of the contribution of unincorporated enterprises to capital rent. Row 8 excludes depreciation from capital shares. T-statistics based on Huber-White heteroskedasticity-consistent standard errors based on White robust standard errors in parentheses.

Table 5: Sensitivity to Alternative Controls

	Total Spending on Public Education					Spending on Primary Public Education				
Capital Share	-6.89 (-5.55)	-6.89 (-5.50)	-6.45 (-5.03)	-6.12 (-4.83)	-5.18 (-3.91)	-24.82 (-5.44)	-21.26 (-4.61)	-24.91 (-5.42)	-24.58 (-5.39)	-24.51 (-5.34)
OPEN		.001 (.489)					-.046 (-2.39)			
DEMO			.704 (1.33)					-.327 (-.178)		
Civil Liberty				-.257 (-2.35)					-.384 (-.360)	
Human Capital					.104 (1.27)					.033 (.094)
R-squared (# Obs.)	.504 (170)	.511 (165)	.510 (170)	.524 (170)	.517 (153)	.364 (245)	.442 (240)	.366 (245)	.360 (245)	.361 (226)
	Spending on Secondary Public Education					Spending on Tertiary Public Education				
Capital Share	7.06 (.167)	-5.01 (-.108)	15.07 (.338)	12.55 (.291)	-18.58 (-.421)	488.08 (2.09)	505.26 (2.08)	465.07 (1.95)	542.90 (2.29)	253.97 (1.51)
OPEN		-.251 (-1.19)					-.919 (-.811)			
DEMO			10.61 (.549)					-56.53 (-.557)		
Civil Liberty				-2.35 (-.680)					-29.28 (-1.47)	
Human Capital					.881 (.308)					4.40 (.405)
R-squared (# Obs.)	.514 (110)	.519 (109)	.518 (110)	.516 (110)	.456 (97)	.578 (196)	.582 (193)	.578 (196)	.579 (196)	.689 (184)

	Social Security Taxes					Total Public Investment				
Capital Share	-6.03 (-1.38)	-5.02 (-1.13)	-5.64 (-1.34)	-5.26 (-1.24)	-2.17 (-1.48)	34.13 (.187)	236.26 (1.21)	92.25 (.474)	78.42 (.402)	25.61 (.129)
OPEN		-.004 (-.190)					2.34 (3.40)			
DEMO			-3.46 (-2.26)					74.44 (.992)		
Civil Liberty				.612 (1.97)					2.84 (.220)	
Human Capital					-.155 (-1.29)					-30.31 (-2.25)
R-squared (# Obs.)	.671 (318)	.533 (280)	.545 (287)	.543 (287)	.567 (258)	.393 (313)	.437 (272)	.381 (280)	.383 (280)	.465 (255)
	Government Consumption					Total Public Spending				
Capital Share	-15.43 (-6.11)	-11.51 (-5.02)	-15.58 (-5.93)	-16.44 (-5.90)	-15.32 (-5.36)	-12.00 (-2.25)	-7.95 (-1.66)	-13.78 (-2.47)	-13.73 (-2.46)	-12.88 (-2.12)
OPEN		-.015 (-1.49)					.079 (4.04)			
DEMO			-.874 (-.889)					-1.69 (-.772)		
Civil Liberty				.083 (.379)					.352 (.815)	
Human Capital					.001 (.006)					.016 (.034)
R-squared (# Obs.)	.413 (377)	.356 (332)	.384 (339)	.390 (308)	.445 (304)	.572 (320)	.593 (279)	.558 (287)	.557 (287)	.549 (258)

Note: All (Random Effects) estimations include a constant, time and continental dummies. T-statistics based on Huber-White heteroskedasticity-consistent standard errors in parentheses.

Table 6: Non-Linearities in Education Spending.

	Spending on Primary Public Education	Spending on Secondary Public Education	Spending on Tertiary Public Education
Capital Share	44.73 (2.22)	457.00 (2.46)	2499.09 (2.44)
LGDP	5.71 (3.13)	30.06 (1.85)	99.52 (1.16)
LGDPKS	-9.51 (-3.54)	-60.93 (-2.47)	-272.75 (-2.00)
# Obs.	245	110	196
R-squared	.404	.556	.598

Note: All (Random Effects) estimations include a constant, time and continental dummies.
T-statistics based on Huber-White heteroskedasticity-consistent standard errors in parentheses.

Table 7.1: Granger Causality Tests with Spending Variables as Dependent Variables.

	Total Spending on Public Education	Spending on Primary Public Education	Social Security Taxes	Government Consumption	Total Public Spending
Lag Capital Share	-4.28 (-4.24)	-6.14 (-2.16)	-4.13 (-2.54)	-2.62 (-1.77)	-8.79 (-2.53)
Lag Total Spending on Public Education	.3262 (4.52)				
Lag Spending on Primary Public Education		.638 (13.48)			
Lag Social Security Taxes			.965 (57.43)		
Lag Government Consumption				.686 (20.97)	
Lag Total Public Spending					.725 (19.01)
R-squared (# Obs.)	.548 (112)	.740 (191)	.957 (281)	.763 (374)	.770 (276)

Note: All (Random Effects) estimations include a constant. T-statistics based on Huber-White heteroskedasticity-consistent standard errors in parentheses.

Table 7.2: Granger Causality Tests with Capital Shares as Dependent Variables.

	Dependent Variable: Capital Share				
Lag Capital Share	.831 (20.59)	.893 (25.61)	.841 (25.24)	.898 (34.06)	.866 (27.31)
Lag Total Spending on Public Education	.002 (.962)				
Lag Spending on Primary Public Education		.001 (2.02)			
Lag Social Security Taxes			-.0004 (-1.27)		
Lag Government Consumption				.001 (2.25)	
Lag Total Public Spending					.0001 (.556)
R-squared (# Obs.)	.865 (151)	.858 (226)	.866 (269)	.884 (332)	.867 (264)

Note: All (Random Effects) estimations include a constant. T-statistics based on Huber-White heteroskedasticity-consistent standard errors in parentheses.

Table 8: Instrumental Variables Estimation

Dependent Variable	Baseline	First Differences	2SLS Capital Share (totki)	3SLS Capital Share (totki)	R-squared (# Observations)			
Total Spending on Public Education	-6.89 (-5.55)	-5.43 (-1.42)	-46.76 (-1.09)		.504 (170)	.086 (93)	(90)	
Spending on Primary Public Education	-24.82 (-5.44)	-31.41 (-4.03)	-141.22 (-1.74)	-51.05 (-2.64)	.364 (245)	.195 (163)	(158)	(158)
Social Security Taxes	-6.03 (-1.38)	-5.72 (-1.81)	-14.43 (-.969)	-6.02 (-1.84)	.671 (318)	.033 (240)	(199)	(199)
Government Consumption	-15.43 (-6.11)	-17.42 (-4.89)	-75.75 (-2.29)	-23.73 (-3.28)	.413 (377)	.253 (315)	(270)	(270)
Total Public Spending	-12.00 (-2.25)	-9.17 (-1.50)	-45.75 (-.921)	-14.06 (-.922)	.572 (320)	.228 (234)	(197)	(197)

Note: All estimations are in first differences, except for the baseline regression. They all include a constant and time dummies. T-statistics based on Huber-White heteroskedasticity-consistent standard errors in parentheses.

Table 9: First Stage Regressions

	OLS	SUR
Terms of trade (totki)	.1705388 (2.22)	.136473 (2.05)
LGDP	-.028 (-1.18)	-.030 (-1.42)
LPOP	-.095 (-1.37)	-.139 (-2.15)
PER65	-.818 (-1.63)	-.842 (-1.13)
PER14	.274 (1.39)	.273 (1.21)
Life Expentancy	1.39 (.748)	.004 (1.61)
R-squared (# Obs.)	.064 (291)	(230)

Note: All estimations are in first differences, include a constant and time dummies.
T-statistics based on Huber-White heteroskedasticity-consistent standard errors in parentheses.

Figure 1: Partial Correlation Between Public Spending on Education and Capital Shares

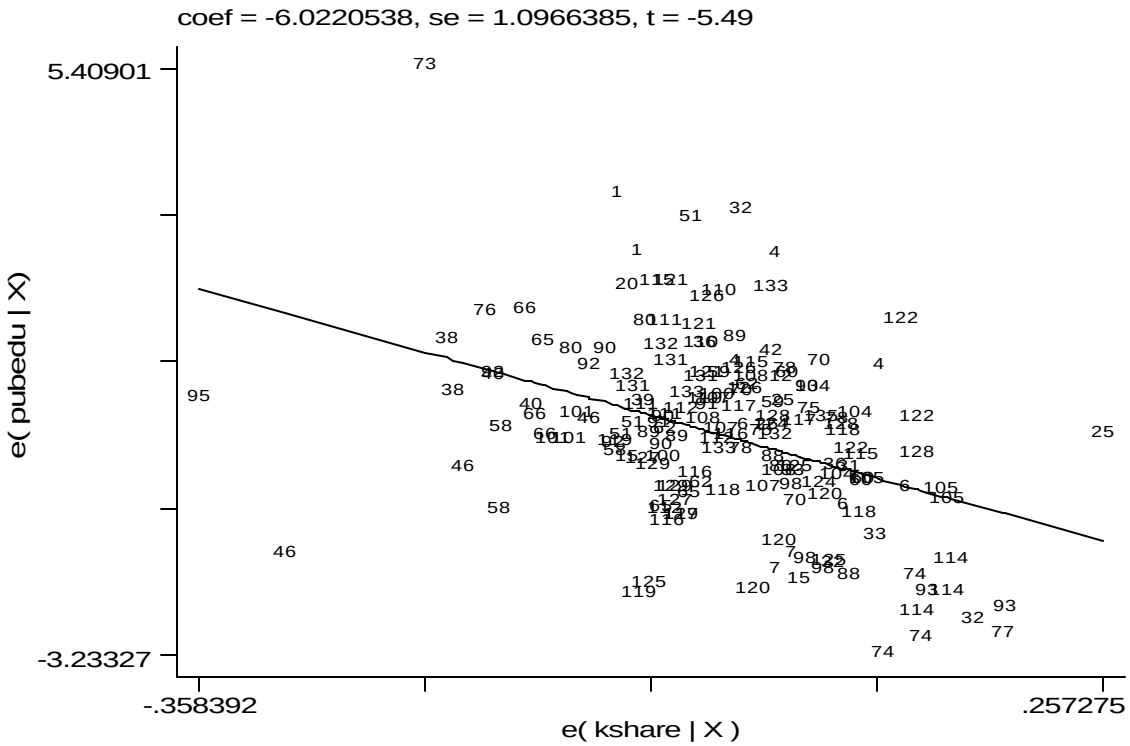

Figure 2: Partial Correlation Between Public Health Spending and Capital Shares

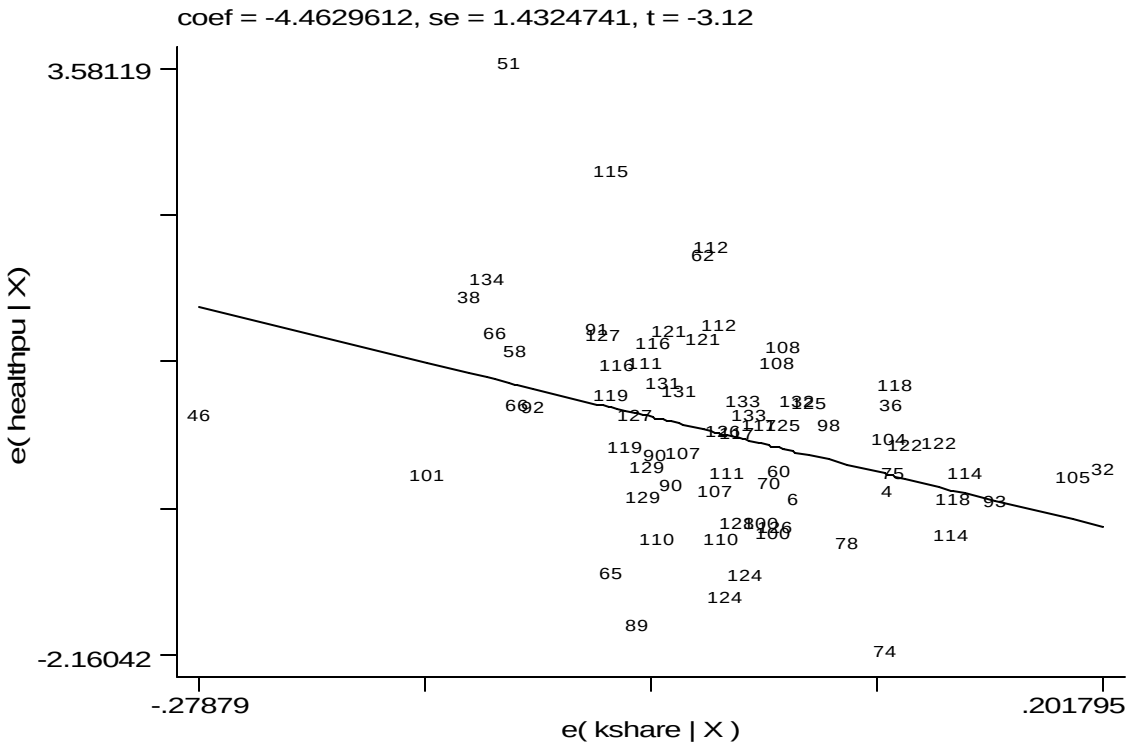

Figure 3: Endogenous Political Mobilization under Alternative Parameters

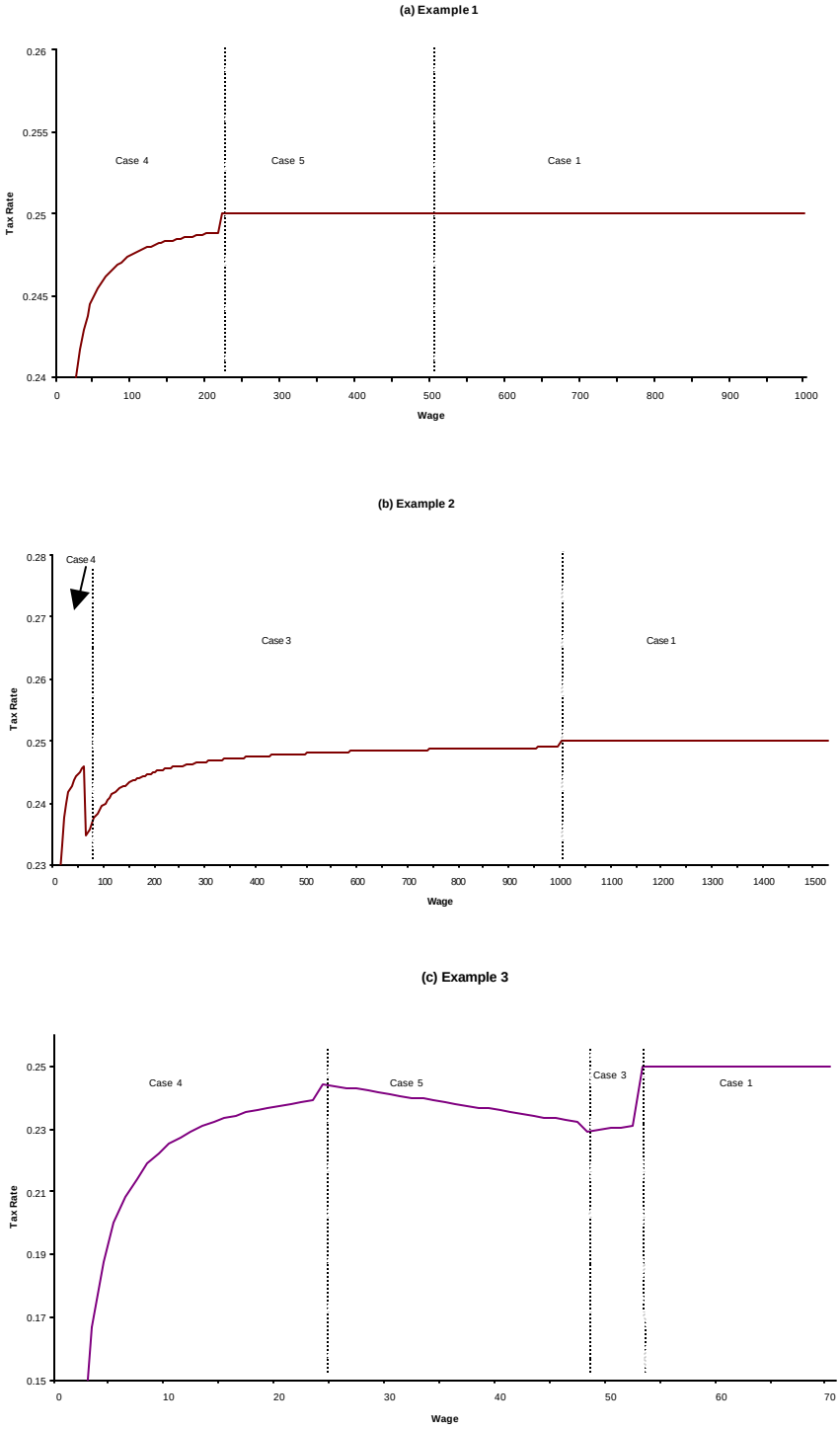

Figure 4: Tax Rates Preferred by Capitalists and Workers in Closed Economy

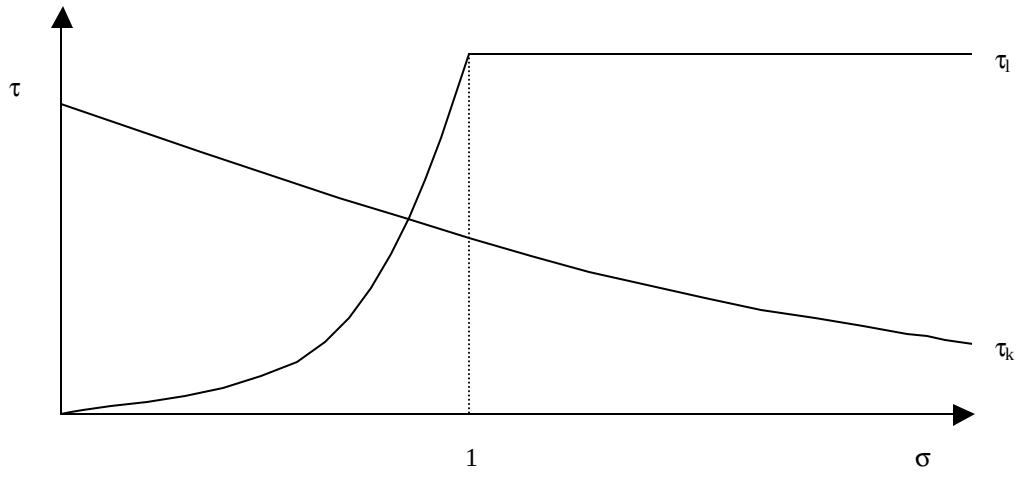

Figure 5: Partial Correlation Between Government Consumption and Capital Shares

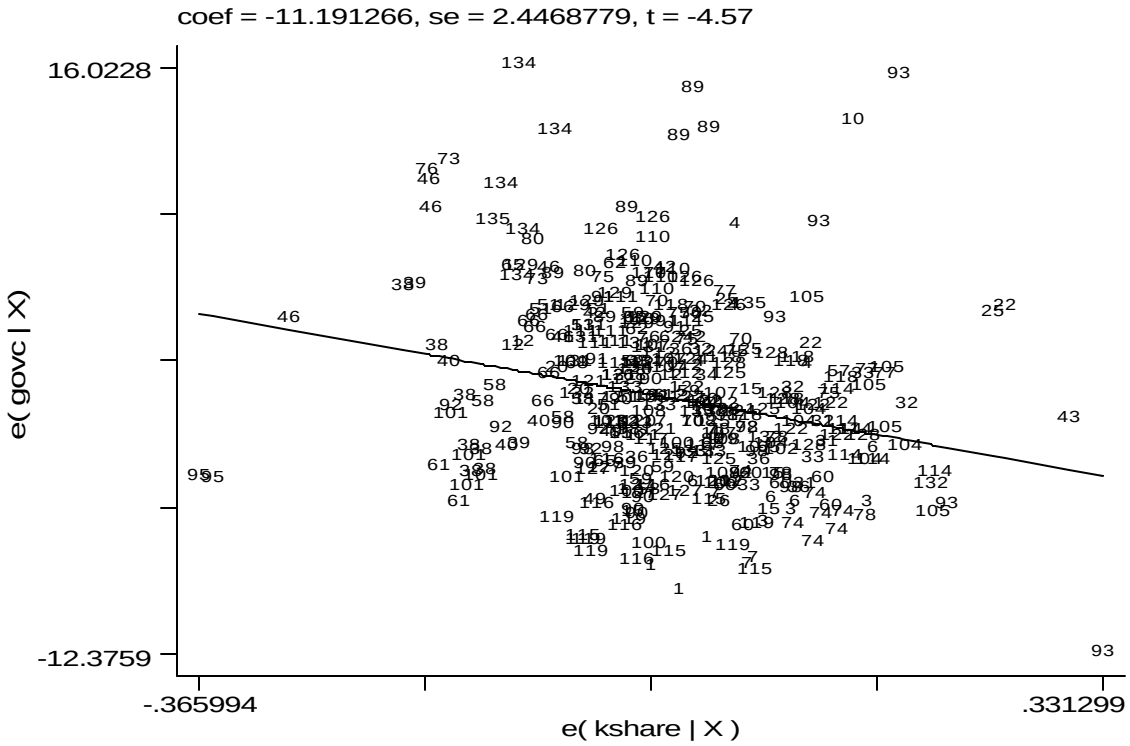

Figure 6: Public Education Equation, Outliers Excluded.

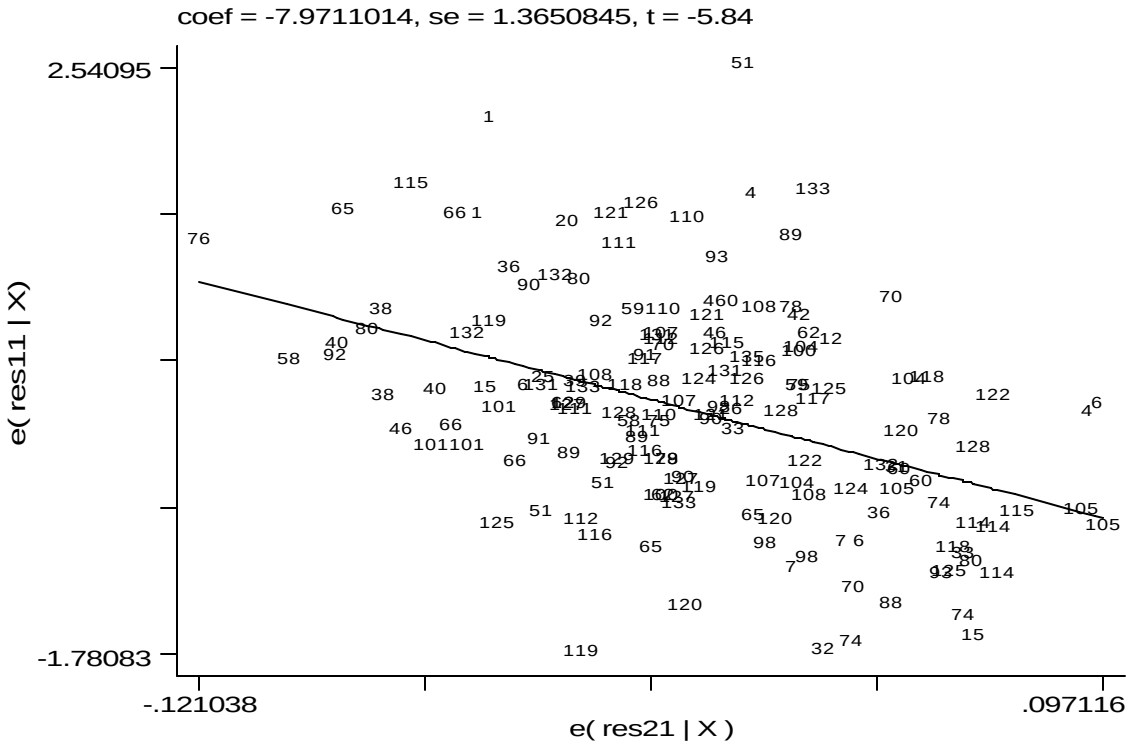

Figure 7: Primary Schooling Equation, Outliers Excluded.

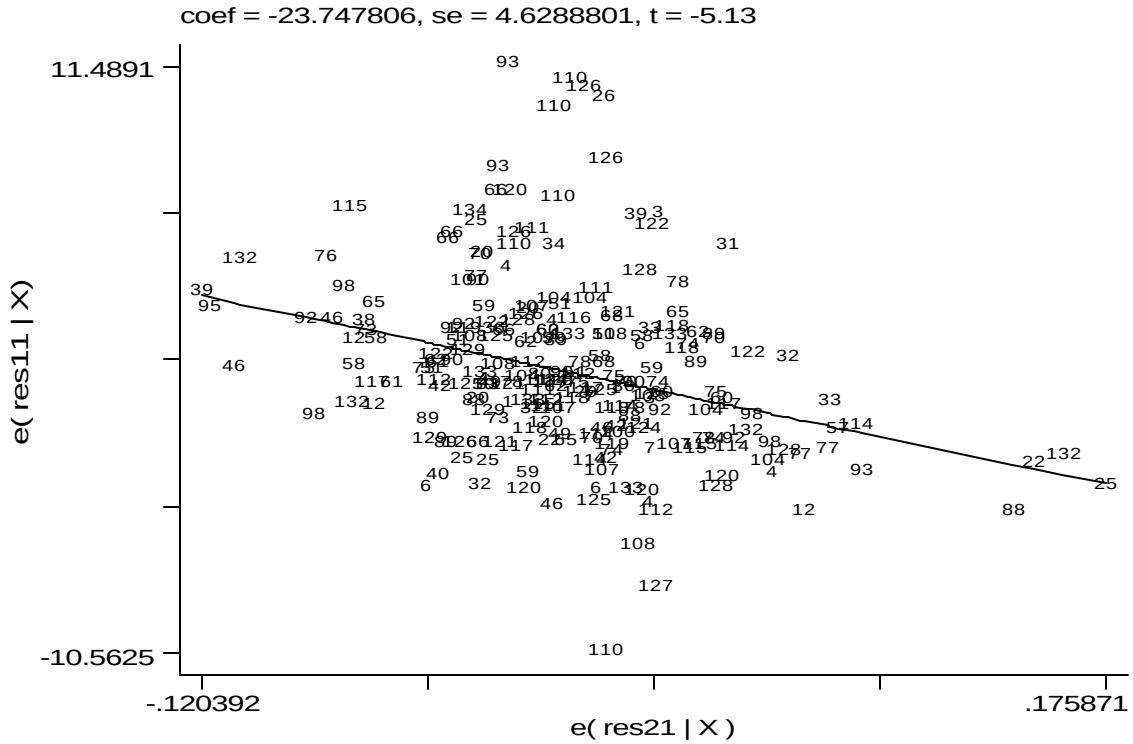

Figure 8: Public Health Equation, Outliers Excluded

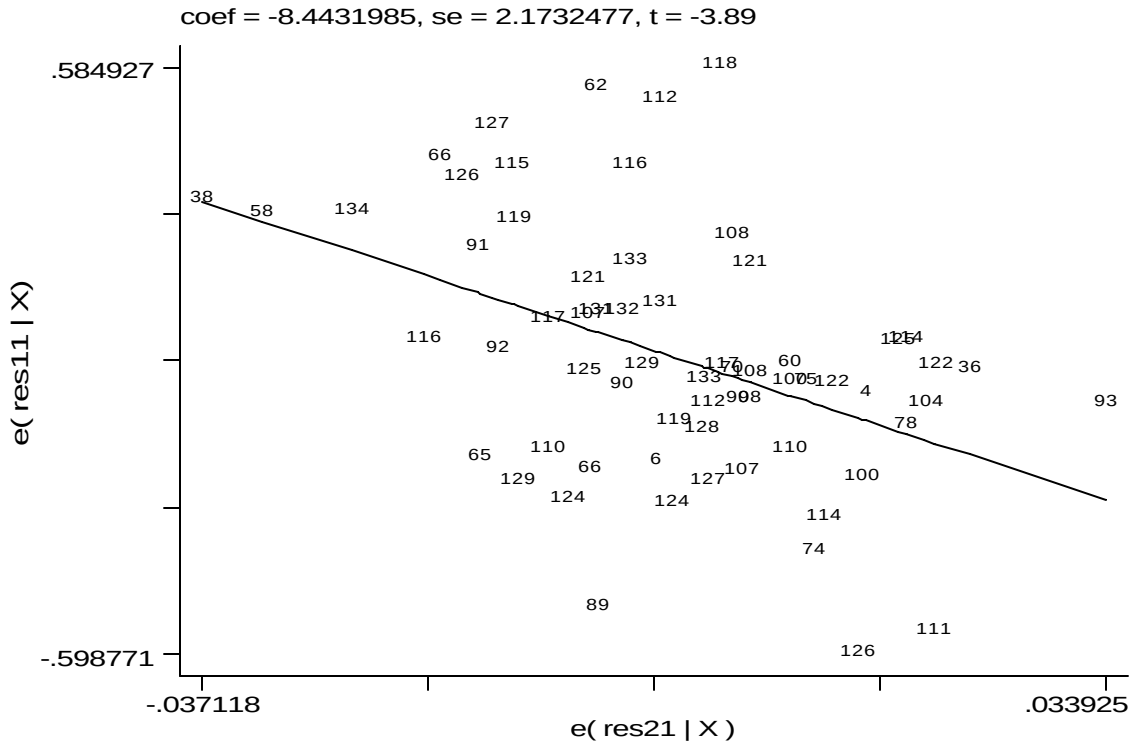

Figure 9: Social Security Equation, Outliers Excluded

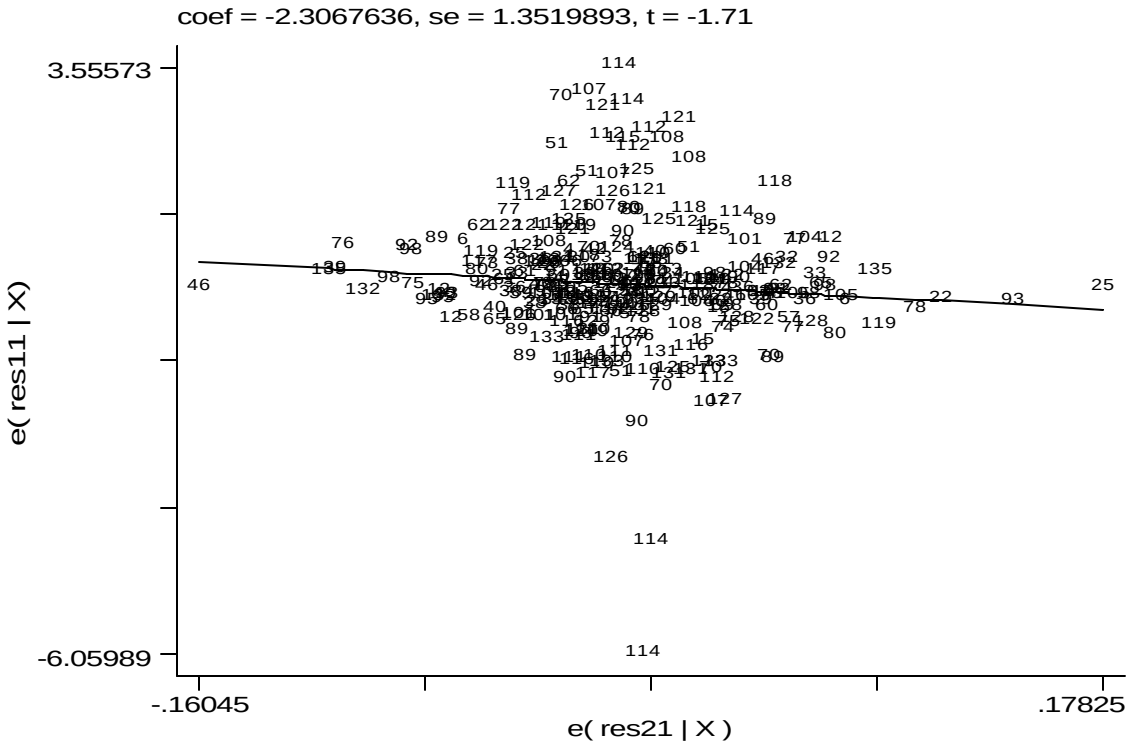

Figure 10: Government Consumption Equation, Outliers Excluded.

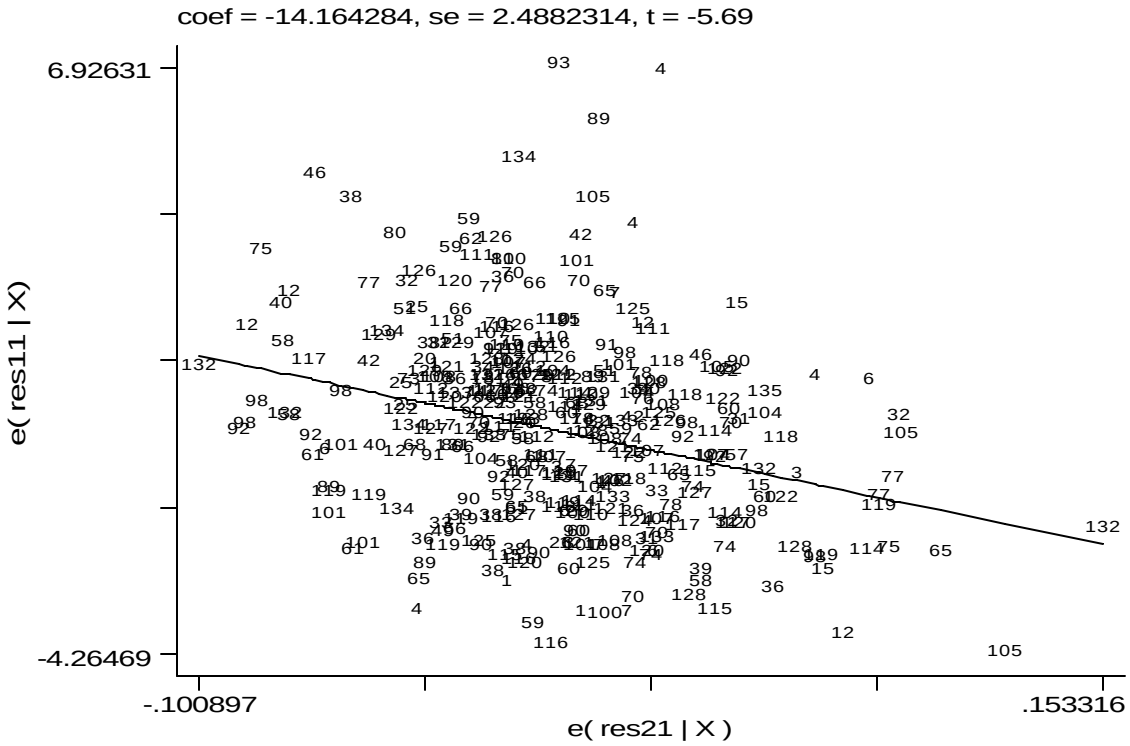

Figure 11: Total Expenditures Equation, Outliers Excluded.