The Political Economy of Tertiary Education

- Work in Progress -

Guenther Fink*
Bocconi University, I - 20136 Milan, Italy
guenther.fink@uni-bocconi.it

June 16, 2005

Abstract

This paper develops a positive theory of policies towards higher education. Agents, heterogeneous in talent and wealth, endogenously determine the skill premium earned in the labor market as well as the level of government expenditure on general redistribution and higher education. Raising wages for the unskilled, lowering redistributive pressures faced by the rich, and providing access to higher education for the credit constrained, subsidies to higher education always receive support in the political equilibrium. The smaller the fraction of agents able to access higher education without public subsidization, and the more unequal the distribution of wealth in the economy, the larger the subsidy emerging in the political equilibrium. We use data from the OECD and the World Bank to empirically support the theoretical model presented. Both subsidies to higher education and redistributive transfers increase with inequality. While subsidies to higher education decrease, redistributive transfers increase with national income.

Keywords: Higher education, political economics, redistribution, legislative bargaining.

JEL Classification: P16, O10.

*I am very grateful to Jim Alt, Alessandra Casarico, Giuseppe Cappelletti, Silvia Console Battilana, Eliana La Ferrara, Lucas Ferrero, Matthias Messner, Roberto Perotti, and, most of all, Guido Tabellini for the many useful comments and discussions. All remaining erros are mine.

1 Introduction

The degree of higher education subsidization is impressive. In 2000, the US government spent more than US$ 6,900 for each student in tertiary education. In the same year, the corresponding expenditure of members of the European Union on average came close to US$ 10,000. Relative to income, subsidies to higher education are even more pronounced in the rest of the world: on average, annual government expenditure per student in higher education amounted to more than 115% of national per capita income in the period from 1991 to 2000[1].

From a political viewpoint, the simple existence and, even more so, the dimension of higher education subsidies is intriguing. Subsidies to higher education constitute a transfer to a relatively small, and generally rather wealthy part of the population. How a policy large in size, regressive in design, and directly benefiting only a minority of the population can receive majority support is an interesting question, and the one we try to provide an answer for in this paper.

For this purpose, we develop a model, where agents are heterogeneous in wealth and talent, and access to the credit market is restricted. Higher education enrollment is associated with financial and effort cost. If agents decide to enroll into higher education, they earn a skill premium endogenously determined in the labor market. In the political domain, agents determine the public levels of higher education subsidies and general redistributive transfers. Both policies can be financed with taxes on wealth or labor income. Given this setup, agents group themselves into three categories: Agents endowed with both the wealth and human capital required to enroll into higher education, agents with the necessary human capital but without the necessary wealth, and, last, agents with low human capital never enrolling in higher education. For simplicity we denote agents of the first group as "rich and talented", agents of the second group as "poor and talented", and agents of the last group as "unskilled".

Rich and talented agents strive to earn the highest possible labor market premium, and therefore oppose higher education subsidies in order to

[1]Source: World Bank Development Indicators (WDI) 2002.

exclude the poor and talented from the market. The poor and talented, on the other hand, want the highest subsidy possible, and to finance this subsidy by taxing the wealth of the rich. Unskilled agents try to maximize income tax revenues, but partially support higher education subsidies since an increased supply of skilled labor raises the unskilled wage they earn in the labor market.

In the political sphere, agents are represented by legislators, who shape the policy outcome in a process of legislative bargaining. As both rich and poor talented agents seek a coalition with the unskilled, large degrees of higher education subsidies and relatively moderate degrees of general redistribution emerge in the political equilibrium. The larger the group of credit constrained agents, the larger the expected degree of subsidization and redistribution. As the wealth stock grows, dependency on higher education subsidies, and therefore also the relative degree of subsidization decreases over time. The same is not necessarily true for redistributive transfers. Although a larger share of rich and talented agents implies lower expected tax rates in the political equilibrium, the total effect on the size of the redistributive transfer is uncertain since the increase in the tax rate may be more than compensated by the simultaneous increase in the taxable wealth stock.

In the second part of the paper, we use data from the OECD and the World Bank to test the empirical validity of our model. We use two different measures to proxy for the relevant group sizes of our model: the Gini coefficient of income inequality, and educational attainment shares from the Barro-Lee dataset. The main implications of our model appear well supported in the data. The wealthier a country, and the larger the group with high income (the more equal wealth distribution), the smaller government expenditure per student. Similarly, the overall size of redistributive transfers increases with wealth levels and decreases with the fraction of highly educated agents.

The model we present follows a series of papers linking the political economy of education to general redistributive politics, pioneered by Perotti (1993). Perotti uses a setup where human capital generates a positive externality for all agents, but the access to education depends on the posttax income of agents. As a consequence, redistribution leads to more educational investment in relatively rich countries, and to less investment in relatively poor ones. Along the same lines, Glomm/Ravikumar (1998) and Epple/Romano (1995) stress the redistributive character of public education, while Fernandez and Rogerson (1995) demonstrate that public subsidies for education may be regressive, if rich and middle income agents opt for lower degrees of subsidization in order to bar access to the poor. Easterly and Rebelo (1993) and James (1993) provide two empirical studies which indicate a strong and positive effect of income inequality on public educational expenditure. Similarly, Sylwester (2000) finds that higher levels of initial income inequality are associated with higher public expenditure on education. Although our study exclusively focuses on expenditure on tertiary education, our results are highly consistent with these previous studies, and the theory presented here is likely to provide at least partial explanation for the overall patterns observed in public educational expenditure.

As to the general trade-off between redistribution and other policy dimensions, the basic argument laid out in this paper is in line with recent work by Austen-Smith and Wallerstein (2003), who show that conflict among the poor with respect to affirmative action policies may be the cause for the low degrees of redistribution observed. The work closest to the model presented here is Levy (2004), who demonstrates that in a static framework the trade-off between redistribution and a targeted public good like higher education leads to lower rates of redistribution and the provision of the public good as long as those who profit are a minority. As opposed to Levy's work, incomes are endogenously determined in our model, so that the targeted public good has income effects for all agents, and will always be provided to some extend in the political equilibrium.

2 The Model

2.1 General Setup

We consider a non overlapping generation model, where in each period a generation t consisting of a continuum of heterogeneous agents of size 1 is born. Agents are mildly altruistic, and derive utility from their own consumption and from leaving bequests to their single descendant. The utility function of an agent i in period t is given by

$$U_t^i = \frac{(c_t^i)^{1-\beta}(b_{t+1}^i)^{\beta}}{\beta^{\beta}(1-\beta)^{1-\beta}}, \tag{1}$$

where c_t^i is the consumption of agent i in period t, b_{t+1}^i is the bequest left to the descendant who will live in period $t+1$, and $\beta \in (0,1)$ is a measure of altruism. Given the utility function, the fraction of income left to descendants is constant across agents and given by β. Correspondingly, b_{t+1}^i, the bequest left by an agent i in period t is given by

$$b_{t+1}^i = \beta I_t^i, \tag{2}$$

where I_t^i is the total income of agent i in period t defined in further detail below. In addition to the bequest received, agents are endowed with some level of talent $\theta_t^i \in \{\theta^h, \theta^l\}$. We denote the probability of agents being of high talent by $\overline{\theta}$, and assume it to be independent of wealth. Before entering the labor market, agents decide whether or not to enroll into higher education. Higher education is associated with a pecuniary cost T (tuition), a talent dependent effort cost $\phi(\theta^i)$, and a premium π earned by providing high skilled labor to the production sector. Access to the credit market is restricted, so that agents cannot borrow to finance higher education[2]. Any agent i decides to enroll into higher education in period t if and only if the following two conditions are satisfied:

$$\begin{aligned} T_t = C_t - S_t &\leq b_t^i. && \text{(credit constraint)} \\ \pi_t(1-\tau_t^I) &\geq T_t + \phi(\theta^i). && \text{(incentive compatibility constraint)} \end{aligned} \tag{3}$$

T_t is the net tuition payment required, C_t is the actual cost of higher education, and S_t is the public subsidy provided to each student enrolling into higher education. τ_t^I is the tax rate charged on labor income. For simplicity we assume that the effort cost is such that agents with low talent will never

[2] In reality, students loans pay an important role in some countries, most noteably in the US. However, asymmetric information and problems of moral hazard usually limit the scope of such loans, so that students always depend to some degree on the support from their parents or the government when accessing higher education.

enroll into higher education[3]. We denote agents with sufficient wealth to enroll into higher education without public subsidies ($b^i \geq C$) as rich, and, correspondingly, agents with wealth below this level as poor.

As for the production sector, we exclusively focus on human capital[4], and assume that high and low skilled labor are the only inputs for production. Denoting the exogenously determined technology employed in the economy at time t by A_t, total output Y_t is given by:

$$Y_t = A_t H_t^{\alpha} L_t^{1-\alpha} \tag{4}$$

where H_t and L_t are the total stock of high and low skilled labor respectively, and $\alpha \in (0.5, 1)$ measures the relative productivity of the high skilled. The production sector is perfectly competitive and the wages paid equal the marginal products of labor. Therefore, the wages of the skilled w_t^s and unskilled w_t^u in period t are given by

$$w_t^s = \alpha A_t (\frac{L_t}{H_t})^{1-\alpha} \tag{5}$$

$$w_t^u = (1-\alpha) A_t (\frac{H_t}{L_t})^{\alpha} \tag{6}$$

and the resulting wage premium π_t is given by

$$\pi_t = w_t^s - w_t^u. \tag{7}$$

Noting that by assumption $L_t = 1 - H_t$, and assuming for simplicity that $A_t = 1$, the premium for higher education can be expressed as

$$\pi_t = \alpha(\frac{1-H_t}{H_t})^{1-\alpha} + (\alpha - 1)(\frac{H_t}{1-H_t})^{\alpha}, \tag{8}$$

which simplifies to

$$\pi_t = \frac{\alpha - H_t}{H_t^{1-\alpha}(1-H_t)^{\alpha}}. \tag{9}$$

[3] This corresponds to assuming $\phi(\theta^h) = 0$ and $\phi(\theta^l) = \infty$. Another way to interpret this is that agents marked with θ^h have a positive return to higher education, while all other agents face negative returns on human capital investment.

[4] Assuming a small and open economy with exogenously given interest rates leads to identical results.

2.2 Policy Space and Social Optimum

In each period, agents decide[5] upon the size of the subsidy for higher education S_t and size of a generic (redistributive) transfer R_t. To finance these expenditures, agents can tax wealth (τ_t^b) and income (τ_t^I). Dropping time subscripts for notational convenience, the government's budget constraint in each period is given by

$$R + H(S)S = \tau^b \bar{b} + \tau^I \overline{w} \tag{10}$$

where $\bar{b}$ and $\overline{w} = w^u + H(S)\pi(S)$ are the mean levels of bequest and labor income, respectively, and $H(S)$ is the subsidy-dependent share of agents enrolling into higher education. Agents can hide their wealth at some given cost ξ; the maximum feasible tax rate on wealth $\tau_{\max}^b$ thus equals $\xi < 1$. Using (10) we reduce the policy space to three dimensions, and focus on taxation and subsidies in the rest of our analysis.

The decision sequence is as follows:

1. Each agent gets endowed with some talent θ^i and an inheritance b^i.
2. Legislature sets the policies S, R, τ^I, τ^b
3. The wealth tax τ^b is raised.
4. Agents take their enrollment decision based on θ^i, b^i and the legislature's policy choices.
5. Wages are determined in the labor market and workers get paid.
6. Agents pay income taxes and receive the redistributive transfer R.
7. Agents consume and leave bequests to their descendants.

Before going into the analysis of individual agents' preferences, it is useful to briefly elaborate the socially optimal choices. A social planner achieves the efficient level of human capital by maximizing

$$Max_H \; H^\alpha (1-H)^{1-\alpha} - HC. \tag{11}$$

The first order condition implies

$$\alpha\left(\frac{1-H}{H}\right)^{1-\alpha} - (1-\alpha)\left(\frac{H}{1-H}\right)^{\alpha} - C = 0 \tag{12}$$

[5] The political process will be discussed in further detail in the following section.

which, by(8), can be written as

$$\pi(H^*) = C. \tag{13}$$

The result is intuitive; the social planner wants agents to enroll until the market premium for high skilled workers is just equal to the full (unsubsidized) cost of higher education. If the socially optimal level of higher education enrollment H^* is smaller than the share of the population that are rich and talented, there is no social benefit of subsidization, and the optimal level of subsidization $S^* = 0$. We abstract from this rather unlikely case, and assume that enrollment without subsidization is suboptimal. In this case, it is easy to see that the socially optimal subsidy S^* is given by $C - b^{i*}$, where b^{i*} is the wealth of the poorest high talent agent who should enroll into higher education in the social optimum. That is, b^{i*} is such that

$$\overline{\theta} \int_{b^{i*}}^{\infty} F(b^i) di = H^*. \tag{14}$$

where $F(b^i)$ is the cumulative distribution function of individual bequests, and $\overline{\theta}$ is the fraction of highly talented among the total population as described before. Assuming that wealth is uniformly distributed in the interval $[b^{\min}, b^{\max}]$, with $0 < b^{\min} < C < b^{\max}$, the socially optimal subsidy S^* is such that

$$H^* = \overline{\theta} f(b)[b^{\max} - C + S^*] \tag{15}$$

which implies

$$S^* = \frac{H^* + \overline{\theta} f(b)[C - b^{\max}]}{\overline{\theta} f(b)} \tag{16}$$

where $f(b) = \frac{1}{b^{\max} - b^{\min}}$ is the density of the wealth distribution function $F(b)$. The maximum feasible income tax rate at the socially optimal level of human capital can easily be derived. Plugging (13) into the incentive constraint (3) we get $C(1 - \tau^I) = C - S^*$, which implies a maximum feasible income tax of

$$\tau^I_{\max} = \frac{S^*}{C}. \tag{17}$$

Note that in the social optimum the total cost of the subsidy is exactly identical to the net tax contribution of all agents enrolled at $\tau^I_{\max}$:

$$H^* S^* = H^* \tau^I_{\max} \pi^* = H^* \frac{S^*}{C} C = H^* S^* \tag{18}$$

To see why this is the case note that in the absence of taxes, subsidies and credit constraints all agents are just indifferent between enrolling and not enrolling at the point H^* where $\pi = C$. Any increase in the income tax burden not fully compensated by additional subsidies violates the individual incentive constraint (3). Therefore, the socially optimal level of human capital can only be reached with net income redistribution smaller or equal to zero. Any utilitarian social planner who wants to achieve the socially efficient level of output can thus use only wealth taxation for redistributive purposes. With wealth taxation limited from above to ξ, the maximum feasible redistributive transfer at the socially optimal level H^* is given by

$$R^{\max}(H^*) = \xi\overline{b}. \tag{19}$$

Since wealth taxation does not affect the wealth ordering of agents, the poorest individual enrolling into higher education in the social optimum remains unchanged. However, given that redistributive transfers are paid out after the enrollment decision, the socially optimal subsidy levels need to be adjusted in the presence of wealth taxation. It is easy to see that the optimal subsidy $S^{*'}$ with the maximum level of wealth redistribution is given by:

$$S^{*'} = C - b^{i*}(1 - \tau^b_{\max}) = C - b^{i*}(1 - \xi). \tag{20}$$

2.2.1 Agents' Preferences I - The Unskilled

Unskilled agents are those characterized by θ^l, i.e. those who do not enroll into higher education independent of the degree of subsidization. One may interpret members of this group as agents with relatively low human capital or, alternatively, as agents not directly interested in higher education[6]. The policy preferences of this group can be derived from the life time income maximization given by:

$$Max_{\tau^b,\tau^I,S}\ b^i(1-\tau^b) + w^u(1-\tau^I) + R \tag{21}$$

subject to the constraints given in (3). Plugging in from (7) and (10), we get

$$Max_{\tau^b,\tau^I,S}\ b^i(1-\tau^b) + \tau^b\overline{b} + w^u(S) + H(S)(\tau^I\pi(S) - S). \tag{22}$$

[6] In the second case, θ^l would mark preferences rather than talent.

The maximization with respect to the wealth tax τ^b is straightforward. Any agent with $b^i < \overline{b}$ wants the highest feasible wealth tax rate $\tau^b_{\max}$, while any agent with $b^i > \overline{b}$ strictly opposes wealth taxation. Preferences with respect to income taxation and higher education subsidies are homogeneous within the group and defined as follows:

Proposition 1 *The optimal level of subsidies for higher education for any unskilled agent always coincides with the socially optimal level S^*. The optimal level of income taxation for unskilled agents is given by $\tau^I_{\max} = \frac{S^*}{C}$.*

Proof. Unskilled agents always set an income tax rate such that the talented are just indifferent between enrolling and not enrolling into higher education. Thus, $\tau^I = \frac{\pi - C + S}{\pi}$ for all S. Plugging this expression into the maximization problem and substituting π with $w^s - w^u$, the unskilled maximize $w^u + H(w^s - w^u - C)$. Rearranging the terms we get $(1-H)w^u + Hw^s - HC$, which, by (5) and (6), corresponds to $Y(H) - HC$. This is exactly the expression maximized by the social planner, and yields $H^*$and S^* as solution. As shown in (17), the maximum feasible tax rate at this level is given by $\tau^{IU} = \frac{S^*}{C}$. ■

The intuition for *Proposition 1* is the straightforward. Since the unskilled can use redistributive taxation to equalize net labor incomes across groups, they select the subsidy level which maximizes the average income net of educational costs and then impose the maximum feasible tax rate τ^*. Any enrollment level beyond the socially optimal level directly implies negative redistribution, and is strictly opposed by the unskilled.

Given that the distributions of talent and wealth are independent, the average[7] unskilled agent has a private wealth of $\overline{b}$, and is indifferent with respect to redistribution based on wealth taxation. Thus, any feasible τ^b combined with the socially optimal level of S^* and $\tau^I_{\max}$ is optimal for the median unskilled agent.

2.2.2 Agents' Preferences II: The Rich and Talented

Disposing of labor income and wealth above the mean, rich and talented agents strictly oppose any redistributive transfer. Subsidies to higher education imply a net transfer from the unskilled to the skilled, but lower the

[7] Due to our distributional assumptions, median and mean always coincide in our analysis.

wage premium earned with higher education. Assuming that the rich choose to finance higher education with an income tax, the rich and talented maximize $w^s(S)(1-\tau^I)+S$. Since high skilled labor always pays a share α of the tax burden , the maximization problem of the rich can be re-written as

$$\max w^s(S)+S(1-\alpha). \tag{23}$$

The first order condition implies

$$-\frac{\partial w^s}{\partial H}\frac{\partial H}{\partial S}=1-\alpha. \tag{24}$$

The partial derivative of the skilled wage with respect to high skill labor $\frac{\partial w^s}{\partial H}=\frac{\alpha^2-\alpha}{H^2(\frac{1}{H}(1-H))^{\alpha}}$ is strictly negative and convex ($w'<0, w">0$). $\frac{\partial H}{\partial S}$ is the density of the wealth distribution function $f(b)$ and is constant. With constant marginal benefits and decreasing marginal cost the optimal level of subsidization for a rich and talented agent must always coincide with a corner solution, that is $S\in\{0,C\}$. The rich will strictly prefer a subsidy of zero to any other policy bundle as long as the unsubsidized skilled wage is larger than the high skill wage under full subsidization plus the net transfer generated by the higher education subsidy, that is

$$\alpha(\frac{1-\gamma^{RT}}{\gamma^{RT}})^{1-\alpha}>\alpha(\frac{1-\overline{\theta}}{\overline{\theta}})^{1-\alpha}+C(1-\alpha), \tag{25}$$

where $\gamma^{RT}=\overline{\theta}f(b)(b^{\max}-C)$ is the group size of the rich and talented. Rearranging this expression we get

$$\gamma^{RT}<\frac{1}{\chi+1}, \tag{26}$$

where χ is a constant given by $[(\frac{1-\overline{\theta}}{\overline{\theta}})^{1-\alpha}+C\frac{(1-\alpha)}{\alpha}]^{\frac{1}{1-\alpha}}$.

The larger the group of the poor and talented, the more the rich and talented lose by subsidization. The rich and talented will support full subsidization only if there are few poor and talented agents so that the negative wage effects are small. We exclude this and focus on the more interesting case where the fraction of the poor and talented agents is relatively large, so that the rich and talented always strictly prefer zero to full subsidization. Therefore, all rich and talented strictly prefer the policy bundle

$S = \tau^b = \tau^I = 0$ to any other feasible policy combination. Further, we impose that the average rich and talented agent strictly prefers income to wealth taxation, which requires wealth inequality to be sufficiently large to satisfy

$$\frac{b^{\max} + C}{2\overline{b}} > \frac{w^s}{w^u}. \tag{27}$$

2.2.3 Agents' Preferences III - The Poor and Talented:

The group of the poor and talented comprises those agents whose access to higher enrollment hinges upon the level of public subsidization. Agents within this group differ with respect to their wealth endowment. Given the credit constraint, each agent i with wealth b^i needs at least a subsidy $S_{\min}^{i*} = C - b^{i*}$ to access higher education. Any further increase in the subsidy implies - similar to the case of the rich and talented - a decreasing marginal cost of $\frac{\partial w^s}{\partial H}\frac{\partial H}{\partial S}$ and a constant marginal benefit. As a consequence, the optimal subsidy will again be a corner solution: the agent will either choose the minimum level of subsidization allowing herself to access higher education ($S_{\min}^i$), or a full subsidization $S^{\max} = C$. Denoting the share of talented agents with wealth at least as large as b^i by $H^i = \overline{\theta} f(b)[b^{\max} - b^i]$ any poor and talented agent's optimal level will be given by $S^{\max} = C$ as long as

$$\alpha(\frac{1 - H^i}{H^i})^{1-\alpha} - \alpha(\frac{1 - \overline{\theta}}{\overline{\theta}})^{1-\alpha} < C - S_{\min}^i(1 - \alpha) = b^i(1 - \alpha), \tag{28}$$

and by $S_{\min}^i$ otherwise[8]. Since the left hand side of inequality (28) goes to zero and $b^{\min} > 0$, there are at least some agents that strictly prefer full subsidization. We assume that (28) is not necessarily satisfied for all agents, but that it always holds for the median member of this group. Since the median agent of this group must by definition have wealth below the mean level, he will always demand the maximum feasible degree of wealth taxation.

Although the preferences of the poor and talented are not necessarily aligned, we the policy preferences of the median voter follow directly from

[8] $1-\alpha$ is the the lower bound for the net benefit, that is, the case where the subsidy has to be financed by income taxation. If the subsidy can be financed with wealth taxation, the net benefit is higher than this, and given by $1 - H\frac{b^i}{\overline{b}}$.

the previous exhibition. The utility of median agent in this group strictly increases with subsidies and wealth taxation, and strictly decreases with income taxation. The optimal polices for the median agent of this group is thus given by $S = C$, $\tau^b = \xi$, and $\tau^I \geq 0$ such that the government budget constraint (10) is satisfied given S and τ^b.

3 The Political Process - A Model of Legislative Bargaining

3.1 Basic Setup

Following the recent work by Austen-Smith and Wallerstein (2003) we assume that policy outcomes in the economy are shaped in a process of legislative bargaining. Representing the different interest groups in our model, we assume that there are three types of legislators: representatives of the unskilled, representatives of the poor and talented, and representatives of the talented and rich. Legislators are organized in parties, and each party maximizes the utility of the median voter of its constituency[9].

To avoid a trivial solution, we assume that no single party, but any coalition of two parties forms a majority. As it is usually the case in a multidimensional policy space, the majority core is empty in our setup. To see why this is the case start by considering the lower bound, the policy preferred by the rich and talented (RT). The RT want zero subsidies and taxation. Since the coalition of the poor and talented (PT) and the unskilled (U) strictly favors any policy with $S > 0$ to this policy, any policy bundle with $S = 0$ can never be the core. The same is true for any policy with $0 < S < S^*$. The optimal policy of U cannot be in the core either, since the coalition of the RT and PT will favor any feasible bundle with lower income tax rates to the one proposed by PT. Any combination of S^* with $\tau^b > 0$ cannot be in the core either, since a coalition of RT and U would a similar bundle with lower wealth and higher income taxes. Similarly, no combination of S^*, $\tau^b = 0$, and $\tau^I_{\text{min}} < \tau^I < \tau^I_{\text{max}}$ can be in the core, since a coalition of U and PT would strictly any policy with τ^b_{max} and $\tau^I + \epsilon$ to

[9] Following Austen-Smith and Wallerstein, we abstract from the electoral stage in our setup, and assume the distribution of legislators to be exogenously given.

such a bundle. The same logic applies to all policies with $S > S^*$, so that the majority core is always empty.

Given this, we follow Austen-Smith and Wallerstein (2003) and previous work by Baron/Ferejohn (1989) and Banks/Duggan (2000), and assume that legislators engage in an infinite horizon bargaining process, where in each period a randomly selected legislator can make a policy proposal. If the proposal gets the support of any other party, the game ends and the policy is implemented, otherwise a new proposer is randomly selected. The solution concept to this setup is a no delay stationary subgame perfect Nash equilibrium, which consists of a probability distribution over the strategy set and an acceptance set for each of the parties involved. Each party will accept a proposal of the other parties if and only if the value of the proposal is at least as large as the continuation value of the game.

Let us denote the group sizes of the three groups by γ_U, γ_{PT} and γ_{RT} respectively. To capture the relative political influence of each group, we assume that the probability to be selected as proposal maker in each period is proportional to the relative group size; that is, the larger the fraction of a certain group, the more likely the group is to make the proposal in each round of the bargaining process. In each period, a party is selected as proposer with probability γ_j, and makes a proposal $(S_j, \tau_j^b, \tau_j^I)$ with $j = U, PT, R$. If the proposal is accepted, the policy bundle is imposed, otherwise a new policy proposer is randomly drawn. In a stationary (history independent) subgame perfect equilibrium, each party will accept a proposal of the other party if the utility of such a proposal is equal to the continuation value of the bargaining process. Denoting this continuation value by v_j, a party j will accept the proposal $(S_k, \tau_k^b, \tau_k^I)$ of party $k \neq j$ if and only if

$$u_j(S_k, \tau_k^b, \tau_k^I) \geq v_j \tag{29}$$

Thus, in the stationary equilibrium each party j will make a proposal that maximizes its utility subject to the constraint which is less binding, that is

$$\max_{S,\tau_b,\tau_I} \; u_j(S_j, \tau_j^b, \tau_j^I) \text{ subject to either } u_k(S_j, \tau_j^b, \tau_j^I) \geq v_k \text{ or } u_l(S_j, \tau_j^b, \tau_j^I) \geq v_l \tag{30}$$

where j is the proposing, and k, l represent the two remaining parties, and

v_j is given by

$$v_j = \delta[\gamma_j u_j(S_j, \tau_j^b, \tau_j^I) + \gamma_k u_j(S_k, \tau_k^b, \tau_k^I) + \gamma_l u_j(S_l, \tau_l^b, \tau_l^I)] \qquad (31)$$

where $\delta \in (0, 1)$ is the common discount factor between bargaining periods, and ν_j is the continuation value for party j. Treating the policy proposals of the other two players as exogenous, we can derive a best response function for each party, which is nothing else than the bundle that maximizes (30). Solving the system of best response functions with respect to the tax rate and subsidy proposals, we get the set of optimal proposal given by $\{(\tau_U^I, \tau_U^b, S_U), (\tau_{PT}^I, \tau_{PT}^b, S_{PT}), (\tau_{RT}^I, \tau_{RT}^b, S_{RT})\}$. The expected levels of subsidization $\widehat{S}$ and taxation $\widehat{\tau}$ are nothing else than the weighted sums of the individually optimal proposals, and given by

$$\widehat{S} = \gamma_U S_U + \gamma_{PT} S_{PT} + \gamma_{RT} S_{RT}, \qquad (32)$$

and

$$\widehat{\tau}^i = \gamma_U \widehat{\tau}_U + \gamma_{PT} \widehat{\tau}_{PT} + \gamma_{RT} \widehat{\tau}_{RT} \qquad (33)$$

for $i = I, b$. Analogously, the expected rate of redistribution $\widehat{R}$ in the political equilibrium is given by

$$\widehat{R} = \widehat{\tau}^b \overline{b} + \widehat{\tau}^I \overline{w}(\widehat{S}) - H(\widehat{S})\widehat{S}. \qquad (34)$$

3.2 Characterization of the Bargaining Equilibrium

In the bargaining process legislators choose policies to maximize the average utility of their constituency[10], subject to at least one other party accepting the proposal. The *RT* try to minimize subsidies and redistribution. Preferring income to wealth taxation and low subsidies to high ones, the preferences of the *RT* are nearly orthogonal to the preferences of the *PT*. Thus, the *RT* will always seek a coalition with the *U*. Since the *RT* are willing to accept positive levels of S and τ^I to keep wealth taxation low, the coalition *RT*- *U* is characterized by relatively low wealth taxation, and a level of higher education subsidies and income taxation below the optimal point of the *U*.

[10] In our setup, the policies maximizing the mean welfare are identical to the ones preferred by the median.

If the PT get to propose, they try to maximize wealth taxation and higher education subsidies, and will thus always try to find a coalition with the U. In this coalition, the U can offer the PT maximum degree of wealth taxation in exchange for some additional income taxation, and some $S < C$. Thus, the coalition PT-U agrees on relatively high levels of wealth taxation and higher education subsidies, and moderate degrees of income taxation.

If the U get to propose, they can choose either alliance. The RT want lower degrees of higher education subsidies and income taxation relative to the U's bliss point. The PT want less income taxation, but more subsidies and more wealth taxation. Clearly, both coalitions U-RT and U-PT will be characterized by subsidy and income tax levels very close to the optimum S^*. If the coalition is formed with the PT, subsidies will be higher than S^*, otherwise they will be lower. The bigger the wealth stock, the more both PT and RT care about wealth taxation, the better is the bargaining position of the U, and the closer will be the bargaining outcome to U's optimal point independent of the coalition formed. Given these coalitions, we can state the following regarding the expected bargaining outcome:

Proposition 2 *For any initial distribution of private wealth $F(b^i)$, the expected levels of higher education subsidization $\widehat{S}$ and redistribution $\widehat{R}$ emerging from the bargaining equilibrium can be characterized as follows:*
(i) $\widehat{S} > 0, \frac{\partial \widehat{S}}{\partial \gamma_{PT}} > 0, \frac{\partial \widehat{S}}{\partial \gamma_{RT}} < 0, \frac{\partial \widehat{S}}{\partial \bar{b}} < 0.$
(ii) $\widehat{R} \geq 0, \frac{\partial \widehat{R}}{\partial \gamma_{PT}} > 0, \frac{\partial \widehat{R}}{\partial \gamma_{RT}} < 0, \frac{\partial \widehat{R}}{\partial \bar{b}} > 0.$

Lemma 3 $\frac{\partial \widehat{S}}{\partial t} < 0, \frac{\partial \widehat{R}}{\partial t} \lesseqgtr 0.$

The first part of Proposition 2 follows directly from the previous exhibition. All possible coalition in the bargaining process include the unskilled and are characterized by strictly positive levels of higher education slightly above or below the social optimum S^*. The more (less) likely the rich (poor) and talented agents are to propose, the smaller (larger) the expected level of higher education subsidies. A higher stock of private wealth implies that the marginal agent enrolling in the social optimum requires less subsidies, so that the optimal subsidy S^* for U declines. Since the U are always in the coalition and the the optimal points for the two other groups do not change, $\frac{\partial \widehat{S}}{\partial \bar{b}}$ must be strictly negative.

The analysis for redistributive transfers follows analogously. The more likely the coalition between the U and the PT, the higher the expected degree of redistribution. Thus, the smaller γ_{RT} and the larger γ_{PT} the higher the expected degree of redistribution $\widehat{R}$. More accumulated wealth ($\bar{b}$) implies a larger tax base, so that the redistributive transfer observed in equilibrium is larger keeping everything else constant.

Lemma 1 summarizes the dynamic implications of the model. Since all agents leave a constant fraction β of their wealth to their descendants, wealth levels increase over time, which does not only imply that $\frac{\partial \bar{b}}{\partial t} > 0$, but also that the group size of the PT decreases relative to the size of the RT. Both effects decrease the equilibrium degree of higher education subsidization $\widehat{S}$, so that $\frac{\partial \widehat{S}}{\partial t}$ must always be negative. The same is not true for redistribution. The gradual shift from PT to RT implies a lower equilibrium tax rate $\widehat{\tau}_b$. However, this effect is contrasted by a larger tax base ($\bar{b}$) so that the change in the total size of the redistributive transfer over time $\frac{\partial \widehat{R}}{\partial t}$ cannot be determined.

4 Empirical Findings

4.1 Interpretation and Testability

In the previous sections, we have presented a relatively complex economic framework to closely track the forces driving the political support for higher education subsidies and redistribution. We have demonstrated that higher education subsidies are in the interest of the unskilled population, even though they limit the scope of redistribution, and even though they are partially consumed by the wealthiest of the population. It is the group of the poor and talented who mostly profits from and demands higher education subsidies and wealth redistribution, and the group of the rich and talented strongly opposing both of these policies.

How should one interpret these groups from a socioeconomic and political perspective? The rich and talented somewhat fit the general idea of members of upper class - agents wealthy enough to privately afford tuition payments, and strictly opposing any kind of government policy. The group of the poor and talented are those with low wealth and high potential income, the group whose upward social mobility crucially depends on the policies selected by the government. One may more generally think about this group as the "Bourgeois", the middle class or the new rich. The group of the unskilled is the remainder of the population, and contains all those agents who for reasons of taste or talent are not directly interested in enrolling into higher education. One should not necessarily think of this group as working class - it simply contains descendants from all classes not willing to invest time or effort to become highly educated.

Despite the broad alignment of model groups with socioeconomic classes, the three groups in our model should not necessarily be interpreted as political parties. While one may be tempted to denominate the rich and talented as members of a conservative party, such a classification turns out more problematic for the remaining two groups. The PT can neither be placed left nor right, since they oppose income taxation but favor high wealth taxes and subsidies. The unskilled cannot be the left party either since they are indifferent with respect to wealth taxation and want only moderate degrees of redistribution.

Rather than mapping the model groups directly into the domain of political parties, we find it more appropriate to interpret the three types of agents as basic interest groups in the overall population, present in all constituencies of a given legislature. Correspondingly, the bargaining process should not be interpreted as the process of government formation. We assume governments to be exogenously given. The legislative bargaining we presented directly captures the policy making process, where governments try to maximize the welfare of a constituency divided along the dimensions of wealth and talent.

Empirically, this implies that we do not attempt to measure the strength or impact of certain political parties or coalitions. Rather, we try to gauge how the three main interest groups in some given population shape the equilibrium outcome for redistribution and higher education subsidization. As demonstrated in proposition 2, the equilibrium outcomes for redistribution and higher education subsidies can be derived directly from the underlying distribution of wealth $F(b^i)$. The distribution of wealth does not only define the respective size of the the three groups, but it also directly imposes the policy preferences of each legislator. The higher wealth on average, the larger ceteris paribus the group of the RT, the higher the upper limit for redistribution, and the lower the socially optimal point of higher education subsidies S^*. Similarly, the more unequal wealth is distributed, the smaller is the group size of the RT, and the larger the optimal level of S^* demanded by the U holding everything else constant.

Data on the distribution of wealth is scarce, and international data on intergenerational transfers hardly available. In the absence of direct wealth measures, the most obvious alternative for our purpose is the use of income distribution data. The higher the incomes among the parent's generation, the more young agents inherit, and, more generally, the more support they can receive from their parents for higher education expenditures. Average income levels can be derived from national income data. The simplest way to measure the shape of income distribution is the Gini coefficient, and we will take this measure as the starting point for our empirical analysis. A higher Gini coefficient implies a higher income concentration in the top part of the distribution. In theory, this should imply a smaller size of the RT keeping everything else constant, but the construction of the index does not allow a simple mapping from the index into our model groups. In a second step, we use data from the Barro-Lee data set in order to get a closer measure of the respective group sizes. The Barro and Lee data does not directly measure income distribution, but provides detailed information on the distribution of educational attainment across the population. Using education as proxy for income, we get a direct measure of the various group sizes in the underlying population. As long as agents with completed higher education are those most able to support their descendants' education, the fraction of the adult population with completed higher education calculated by Barro and Lee should be a good proxy for the group size of the rich and talented γ_{RT}.

Since γ_U is fixed, γ_{RT} directly also pins down the size of the poor and talented γ_{PT}, so that we can directly test proposition 2 against the data. The basic reduced form we estimate in our the cross-sectional analysis looks thus as follows:

$$EXP_i^j = \alpha_0^j + \beta_1^j \widetilde{\gamma}_{RT,i} + \beta_2^j GDP_i + \beta_3^j \mathbf{X}_i + \varepsilon_i^j. \tag{35}$$

EXP_i^j is governmental expenditure of country i on policy $j \in \{R, S\}$, α_0 is a constant, and $\widetilde{\gamma}_{RT,i}$ is our proxy for the group size of the rich and talented as described before. GDP_i (GDP per capita) is our control for average income or wealth levels, and $\mathbf{X}_i$ is a matrix of other control variables, which we will discuss in further detail below. The specification for the panel analysis follows analogously:

$$EXP_{it}^{j} = \alpha_0^{*} + \lambda_i^{*} + \lambda_t^{*} + \rho EXP_{it-1}^{j} + \beta_1^{j}\widetilde{\gamma}_{RT,it} + \beta_2^{j} GDP_{it} + \beta_3^{j}\mathbf{X}_{it} + \varepsilon_{it}^{j} \quad (36)$$

λ_i and λ_t are country and time fixed effects[11]. We include a lagged dependent variable EXP_{it-1}^{j} to control for the persistency in the dependent variables, so that ρ can be interpreted as measure of autocorrelation in the data.

The partial effects we expect follow directly from proposition two. Since $\widetilde{\gamma}_{RT,it}$ captures both γ_{RT} and $-\gamma_{PT}$ proposition 2 implies a strongly negative coefficient for both expenditure variables, that is $\beta_1^S, \beta_1^R < 0$. By the same proposition, we expect the coefficient on the marginal effect of average wealths to be positive for redistribution and negative for subsidies, that is $\beta_2^S < 0 < \beta_2^R$.

4.2 The Data

We use two different data sources for our empirical analysis: a small, but relatively rich data set based on OECD data, and a larger, but less data set based on World Bank data. The data in the larger sample is based on the World Development Indicators (2002). Data for the OECD countries stems from the OECD's "Education at a Glance" and the OECD's Social Expenditure Database (SOCX, www.oecd.org/els/social/expenditure).

Table I below summarizes the main variables of interest in these two datasets (see appendix for a complete list of countries:

[11] Variables marked with an asterisk* are included in some, but not necessarily all of the regressions.

Table I: Descriptive Statistics

	World Bank Sample				OECD Sample			
	Mean	*Min*	*Max*	*Stdev.*	*Mean*	*Min*	*Max*	*Stdev.*
Gross Enrollment in Tertiary Education	21.4	0.6	84.0	18.3	36.6	6.7	84.0	18.6
GDP per capita ('000, 1995 US$)	8.2	0.5	33.7	7.9	15.0	1.8	33.7	8.4
Public Expenditure per Student ('95 US$)	4290	299	13041	3342	5287	299	13041	3452
Public Expenditure per Student (% GDP/cap)	110	6	1180	173	38.6	5.6	107.9	22.3
Total Expenditure per Student ('95 US$)					8242	892	20358	4761
Redistributive Transfers (% of GDP)					8.16	0.96	15.00	3.99

Countries in the OECD sample have on average a GDP per capita about twice as high as the respective World Bank sample. The difference in mean enrollment rates in higher education (measured as a percentage of the respective age cohort) is more or less proportional to the respective income levels; the differences in educational and governmental expenditure per student in higher education are less pronounced[12]. Data on total expenditure on higher education (private plus public) and the size of redistributive transfers are only available for OECD countries.

4.3 Results I - Subsidies to Higher Education

The first basic but very important prediction of the model with respect to higher education subsidies is that subsidies receive majority support independent of the wealth of a country and the size of enrollment. This simple prediction contracts most of the existing literature on the political economics of higher education where support is always linked to majority enrollment (see, e.g. Rogerson/Fernandez), and is strongly documented in the data as shown in the following table:

Table II: GDP, Enrollment and Subsidies

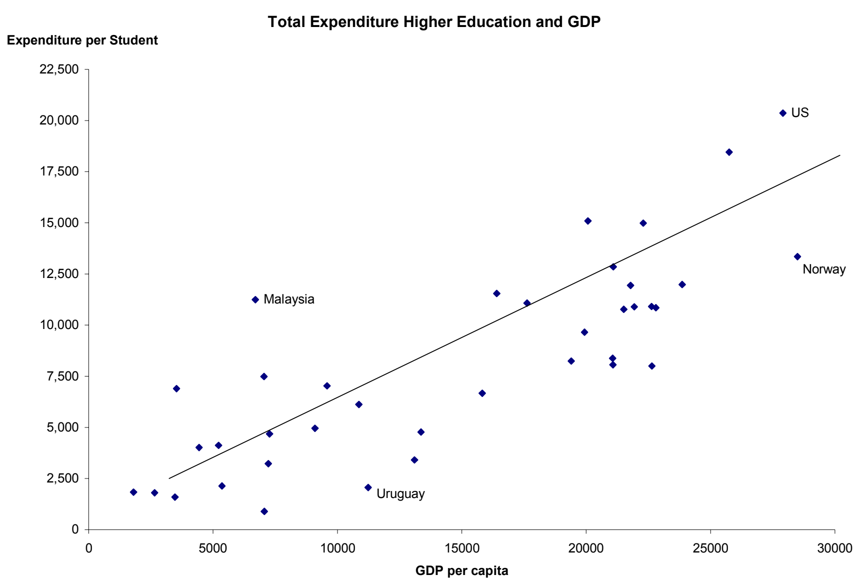
	GDP			Enrollment			Subsidy		
Quintile	*min*	*mean*	*max*	*min*	*mean*	*max*	*min*	*mean*	*max*
I	778	1,621	2,642	1.5	7	30.5	11.3	79	285.6
II	2,778	3,956	5,222	8.2	21	44.5	9.0	46	108.0
III	5,271	6,625	8,669	12.1	22	47.3	15.8	60	161.5
IV	9,095	14,354	20,976	5.5	34	63.6	5.6	40	95.8
V	20,976	23,721	33,740	8.5	46	84.0	14.9	35	54.6

[12] The expenditure data we use to proxy for higher education subsidization is aggregate, and does not allow to distinguish between the various forms of subsidization within higher education. While a more detailed analysis of the channels chosen for the subsidies (loans versus public provision) would be interesting, it goes beyond the scope of this paper.

Table II summarizes average incomes, enrollment rates and subsidies to higher education per income quintile for the 110 countries in the 1990s. Subsidies (measured as expenditure per student relative to GDP per capita) to higher education are very high in poor countries, and close to linearly decline with income levels, while the inverse is true for enrollment rates.

Given the strong and negative correlation between enrollment rates and subsidies one may rightfully ask whether or not lower subsidies in rich countries may simply reflect economies of scale. We judge the answer to be no for several reasons. First, there are microstudies in the US and the UK, which show that economies of scale in providing higher education are close to zero (Cohn et.al., 1989). Second, the price of private college tuition relative to GDP per capita has increased not decreases relative to GDP per capita in the US over the last 20 years[13]. Last, and most importantly, the total expenditure (private plus public) per student relative to GDP appears to be very constant across OECD countries as shown in Graph I below.

Graph I: Total Expenditure for Higher Education and GDP



The correlation between total expenditure (private plus public) per student and GDP per capita is 0.82, and there is no evidence that countries with high enrollment rates spend less per student. Regressing total expenditure per student on GDP per capita explains about two thirds of the total

[13]Source: US College Board, 2004.

variation in expenditure, and the estimated coefficient of 0.49 implies that the average cost of studying per year across countries is roughly one half of the respective GDP per capita.

Since we do not have data on the full cost of higher education for a larger sample of countries, we try to explore the relation between total cost and GDP per capita observed within OECD countries in the larger data set. We perform a first set of regressions by assuming that the cost of higher education as a fraction of GDP per capita is constant, and later relax this assumption. We start with a basic cross-section, where data is aggregated over the period 1990 to 2000, and estimate the reduced from given in (35). The results are reported in Table III below.

Table III: Cross-Sectional Evidence Higher Education Subsidies

Dependent Variable	*Government Expenditure per Student in Tertiary Education (1990 avg., % of GDP per capita)*			
	1	2	3	4
Gini coefficient	*3.23***	*2.4*		
	(1.64)	*(1.90)*		
GDP per capita	*-6.47****	*-1.87*	*2.96*	*0.87*
(1995 '000 US$)	*(1.73)*	*(1.48)*	*(2.66)*	*(0.75)*
Share of population with higher education		-13.94**	-6.13***	-3.16***
(% of population 25-64)		*(5.47)*	*(2.15)*	*(0.95)*
Fertility			52.68*	13.72**
(birth per woman)			*(29.47)*	*(6.45)*
Other controls	const	const	regional dummies, const	
Restrictions	none	none	none	e3exp<300, gdp>1.5k
Stata-Methold	OLS	OLS	OLS	OLS
Option	robust	robust	robust	robust
# of Obs.	81	64	81	67
R squared	0.18	0.25	0.54	0.47

Robust standard errors in brackets.
*,**, *** imply significance at 90, 95 and 99% confidence interval.

In column 1 we test the basic relation between subsidies, GDP per capita and the Gini coefficient as our group size measure. The basic relation is as expected. The higher incomes and the lower inequality, the lower the subsidization observed. In column 2, we test our group size measures against each other. The Gini coefficient is no longer significant. This is what we expected, since the Barro-Lee measure should proxy the relative group sizes of the RT and PT more closely than the basic Gini coefficient. We drop the Gini coefficient, and add controls for fertility and regional dummies in columns 3. The most important of the additional control variables is fertility, which turns out to be significant in all regressions. This makes sense from a theoretical viewpoint. More children per family imply less wealth per infant, and thus a stronger dependency on subsidies. In column 4 we test the robustness of our results, excluding both outliers in terms of income and higher education expenditure.

The overall results are highly consistent with expectations. The higher the share of agents with high education, the lower the equilibrium rate of subsidization. The effect of income is more ambiguous. While income has the expected sign and the very basic estimates, we cannot reject the null of a zero coefficient on income for the more detailed specification. One possible explanation for this result might be our educational cost assumption. If educational costs are not constant as fraction of GDP, the GDP variable may pick up both wealth and cost effects, and thus be hard to interpret. To investigate into this possibility, and to further check the robustness of the previous results, we estimate the reduced form (36) in a panel data set, where we divide the period 1980 to 2000 into five subperiods. Table IV below summarizes the results.

Table IV: Panel Evidence: Higher Education Subsidies

Dependent Variable	*Government Expenditure per Student in Tertiary Education (1995 US$)*			
	1	2	3	4
Lagged Dependent			0.64***	0.65***
			(0.03)	*(0.03)*
GDP per capita	*418.44****	*399.7****	*209.9****	*213.35****
(1995 US$)	*(106.24)*	*(34.00)*	*(62.40)*	*(58.44)*
Share of population with higher education	-89.60**	-75.73***	-57.17**	-52.19**
(% of population 25-64, Barro Lee)	*(41.01)*	*(24.58)*	*(28.13)*	*(25.24)*
Birth per woman	105.72**	84.78***	40.76	35.37
	(50.14)	*(15.48)*	*(37.87)*	*(35.58)*
Stata-Methold	xtpcse	xtgls	xtabond2	xtabond2
Option	corr(ar1)	corr(ar1) p(h)	robust	twostep robust
# of Obs.	345	345	276	276
Other Statistics	R-sq: 0.26	AR(1)=0.75	p(Hansen)=0.64	p(Hansen)=0.64
	rho =0.69			

Robust standard errors in brackets.

*,**, *** imply significance at 90, 95 and 99% confidence interval.

As opposed to the cross-section, we now use absolute rather than relative expenditure per student in higher education as dependent variable. This makes the interpretation of the income coefficient more difficult, but is less restrictive as assumption. Since the Wooldridge statistic indicates a high autocorrelation of order one, we test a series of estimators allowing for such correlation. Column 1 shows the result of a simple OLS regression with panel corrected standard errors and a common AR(1) term. In column 2, we loosen the restriction on the AR(1) term and perform a FGLS estimates allowing for different (panel specific) degrees of autocorrelation across countries. In columns 3 and 4 we perform the system GMM estimators developed by Arellano and Bond (1991), which allows to instrument predetermined or endogenous variables with lagged values or first differences. We treat the Barro-Lee share as exogenous in column 3 and as predetermined in column 4. Both the Arellano-Bond for AR(2) in first differences and the Hansen test of overidentification indicate a correct specification.

The results with respect to the group sizes as measured by our Barro-Lee proxy strongly confirm the findings of the cross-sectional analysis as well as the main implications of our model. The coefficient on GDP per capita is now strictly positive. An increase of GDP per capita of US$ 1000 implies an increase in government expenditure per student in the range of US$ 200-400. Given that the point estimate for the cost per student/GDP per capita ratio within OECD country is around 0.5, this coefficient is relatively low, and might be interpreted as evidence of the negative wealth effect predicted by the model.

Overall, the empirical results for higher education subsidies strongly support our theoretical predictions for our main variables of interest. The larger the group size of the rich and talented (the smaller the group size of the poor and talented), the smaller the equilibrium expenditure per student in higher education. The coefficient on the Barro-Lee proxy we use is highly significant and robust across specification. Given the difficulties associated with identifying the true cost of higher education, the evidence is more mixed with respect to income, but nevertheless weakly supports the predictions derived from our theoretical model.

4.4 Results II - Redistributive Transfers

The limited data we have on redistributive transfers comes from the OECD's Social Expenditure Database (2004). The sample contains 25 countries, and covers the period from 1980 to 2000, which we divide in 5 subperiods. We take total social expenditure excluding health and pension payments as percentage of GDP as our dependent variable[14], and estimate the reduced form (36) of the model as described above. Table V below summarizes the main results.

Table V: OECD Panel - Redistributive Transfers

Dependent Variable	*Total Social Expenditure (% of GDP, OECD 2004, excluding Health and Pension Systems)*			
	1	2	3	4
GDP per capita	0.28***	0.30***	0.09	0.10
(1995 US$)	*(0.10)*	*(0.04)*	*(0.07)*	*(0.09)*
Share of adults with higher education	-0.06*	-0.06***	-0.05*	-0.085**
(Barro Lee)	*(0.03)*	*(0.02)*	*(0.03)*	*(0.03)*
Lagged Dependent	(rho=0.69)		0.73***	0.89***
			(0.09)	*(0.15)*
Other controls	const	const	const	const
Sample	OECD	OECD	OECD	OECD
Stata-Metho1d	xtpcse	xtgls	xtabond2	xtabond2
Option	corr(ar1) pairwise	corr(ar1) p(h)	robust	robust
# of Obs.	113	112	89	89
Other Stats	R sq = 0.17		AR(1) present; AR(2), OID ok.	

Robust standard errors in brackets.
*,**, *** imply significance at 90, 95 and 99% confidence interval.

Given the high degree of serial correlation (the null of zero correlation is rejected at any significance level) we use the same specifications as in the panel for higher education subsidies. Once again, columns 1 and 2 show the OLS and FGLS estimates, while columns 3 and 4 reports the results for Arellano and Bond's system GMM estimator.

Overall, the empirical results strongly confirm our priors. The larger the share of agents with completed higher education (γ_{RT}), the smaller the degree of redistribution observed in equilibrium. This effect is significant, and highly robust across specifications. The effect of income on redistribution is always positive as expected, and significant in the basic specifications.

[14] We test alternative specification where we include health expenditure in the dependent variable - the results do not change.

5 Summary

In this paper we present a positive theory on the political economy of higher education. We demonstrate that higher education subsidies will always emerge together with moderate degrees of redistribution in a legislative bargaining setup. While redistributive transfers may increase, we argue that government expenditure on higher education will always decrease over time. We use data from the OECD and the Worldbank to test our theory and find strong support for the main predictions of our model. The larger the fraction of the population that can afford to enroll into higher education independent of governmental support, the lower the degrees of higher education subsidization and redistribution observed.

Over the last decade, several countries have started to reform the university sector and to cut government expenditure on higher education. If our model is correct, more reforms will follow.

6 Appendix

6.1 Data Description

Country List Cross Section OECD

Australia, Austria, Belgium, Canada, Chile, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, India, Indonesia, Ireland, Israel, Italy, Jamaica, Japan, Korea, Malaysia, Mexico, Netherlands, Norway, Paraguay, Philippines, Poland, Portugal, Spain, Sweden, Switzerland, Thailand, Turkey, UK, United States, Uruguay.

Country list Cross Section Worldbank:

Australia, Austria, Belgium, Botswana, Burkina Faso, Cameroon, Chile, China, Costa Rica, Cote d'Ivoire, Denmark, Ecuador, El Salvador, Estonia, Finland, France, Germany, Greece, Guinea, Hungary, India, Iran, Israel, Italy, Japan, Jordan, Kenya, Korea, Latvia, Lesotho, Madagascar, Malawi, Malaysia, Mexico, Morocco, Namibia, Nepal, Netherlands, New Zealand, Norway, Panama, Paraguay, Peru, Poland, Portugal, Senegal, Slovak Republic, South Africa, Swaziland, Sweden, Switzerland, Trinidad and Tobago, Tunisia, Ukraine, United Kingdom, United States, Uruguay, Venezuela, Vietnam, Zimbabwe.

Country List Panel

Argentina, Australia, Austria, Bangladesh, Barbados, Belgium, Botswana, Bulgaria, Burkina Faso, Canada, Central African Republic, Chile, China, Colombia, Costa Rica, Cote d'Ivoire, Cyprus, Denmark, Dominican Republic, Ecuador, Egypt, Arab Rep., El Salvador, Ethiopia, Finland, France, Greece, Haiti, Honduras, Hungary, India, Iran, Islamic Rep., Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kenya, Korea, Rep., Kuwait, Latvia, Lesotho, Luxembourg, Madagascar, Malawi, Malaysia, Mali, Malta, Mauritius, Mexico, Mongolia, Morocco, Nepal, Netherlands, New Zealand, Norway, Panama, Paraguay, Peru, Philippines, Portugal, Rwanda, Saudi Arabia, Senegal, Singapore, Spain, Swaziland, Sweden, Switzerland, Syrian Arab Republic, Thailand, Togo, Trinidad and Tobago, Tunisia, Turkey, Ukraine, United Kingdom, United States, Uruguay, Zimbabwe.

Description of Variables

- e3exp: Public Expenditure per student in tertiary education (1995 US$, PPP)

- e2exp: Public Expenditure per student in secondary education (1995 US$, PPP)

- e3enrol: Gross enrollment in tertiary education (%).

- e2enrol: Gross enrollment in secondary education (%)

- e1enrol: Gross enrollment in primary education (%)

- epublic: Total public expenditure on education (as % of GDP)

- govexp: Total government expenditure (% of GDP)

- gdp: GDP per capita, constant 1995 US$ (PPP)

- urban: Percentage of population living in urban areas (UN definition)

- pop: Total population (Millions)

Cross Sectional Dataset (Worldbank):

Variable	Obs	Mean	Std. Dev.	Min	Max
pop	60	60.01	194.67	.90	1203.80
govexp	60	29.25	10.70	8.76	50.55
gini	60	40.71	10.76	24.44	70.66
e1exp	60	15.00	7.18	3.09	35.67
3exp	60	125.79	207.31	5.60	1180.05
epublic	60	5.23	2.97	1.92	23.15
e2exp	57	22.50	12.44	1.18	71.26
pop14	60	30.60	10.81	15.08	48.20
urban	60	58.69	22.90	10.19	96.90
e2enrol90	60	73.14	34.98	8.69	138.22
e2enrol80	55	59.08	31.63	3.57	122.84
e2enrol70	53	45.37	29.00	1.67	95.22
e3enrol90s	60	25.80	19.86	.57	79.11
e3enrol80s	56	16.44	12.87	.45	57.85
e3enrol70s	53	10.59	9.82	.13	50.71
gdp90s	60	9.75	8.39	.51	28.49
gdp80s	53	8.98	7.39	.51	24.37
gdp70s	53	8.02	6.48	.54	22.44
relative	60	11.40	23.09	.36	165.31
africa	60	.26	.44	0	1
latinam	60	.18	.39	0	1
asia	60	.08	.27	0	1
oecd	60	.3	.46	0	1

Panel Data Set

Variable		Mean	Std. Dev.	Min	Max	# Obs.
Year	overall	1990	7.07	1980	2000	N = 400
	between		0	1990	1990	n = 80
	within		7.07	1980	2000	T = 5
totpop	overall	45.03	153.24	.24	1241	N = 400
	between		152.98	.25	1099	n = 80
	within		17.76414	-115	209	T = 5
govexp	overall	28.74	12.25	8.08	96.23	N = 380
	between		11.46	9.52	59.79	n = 76
	within		4.47	5.56	71.60	T = 5
e3exp	overall	155.35	284.11	1.84	2938.5	N = 400
	between		256.02	9.13	1269.0	n = 80
	within		125.81	-667	907.65	T = 5
epublic	overall	4.52	1.88	.526	12.29	N = 400
	between		1.69	1.37	9.51	n = 80
	within		.84	-.08	8.40	T = 5
pop14	overall	33.15	10.59	14.51	51.72	N = 400
	between		10.37	18.09	48.81	n = 80
	within		2.35	25.76	41.33	T = 5
urban	overall	56.35	24.44	4.41	100	N = 400
	between		24.19	5.19	100	n = 80
	within		4.22	38.39	73.7	T = 5
e2enrol	overall	62.65	33.06	2.69	154.54	N = 400
	between		31.52	6.43	117.57	n = 80
	within		10.43	25.45	116.81	T = 5
e3enrol	overall	20.22	17.92	.30	94.66	N = 400
	between		16.48	.52	77.03	n = 80
	within		7.24	-5.56	49.10	T = 5
gdpppp	overall	8.65	7.68	.49	41.76	N = 395
	between		7.45	.51	26.55	n = 79
	within		2.01	-.89	23.85	T = 5

References

[1] Acemoglu, D., (2003), ”The Form of Property Rights: Oligarchic vs. Democratic Societies”, *Mimeo.*

[2] Arellano, M. , Bond, S., (1991), "Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations", *Review of Economic Studies,* vol. 58, 277-297.

[3] Arellano, M., Bover, O.,(1995), "Another look at the instrumental variable estimation of error-components models", *Journal of Econometrics*, vol 68, 29-51.

[4] Austen-Smith, D., Wallerstein, M.,(2003), ”Redistribution in a Divided Society”, *Mimeo.*

[5] Baron, D., Ferejohn, J., (1989), ”Bargaining in Legislatures”, *The American Political Science Review*, vol. 83, 1181-1206.

[6] Banks, J., Duggan, J., (2000), ”A Bargaining Model of Collective Choice”, *The American Political Science Review*, vol. 94, 73-88.

[7] Bergh, A., Fink, G., (2004), ”Escaping from Mass Education - Why Harvard Pays”, *Mimeo.*

[8] Cohn, E., Rhine, S.L.W., Santos, M.C., (1989), "Institutions of Higher Education as Multi-Product Firms: Economics of Scale and Scope", *The Review of Economics and Statistics*, vol. 71, 284-290.

[9] DeGregorio, J., Kim, S.J., (2000), “Credit Markets with Differences in Abilities: Education, Distribution and Growth.”, *International Economic Review*, 41, 579-607.

[10] DeGregorio, J., Lee, J.-W., (2002), “Education and Income Distribution: New Evidence from Cross-Country Data.”, *Review of Income and Wealth*, 48, 395-416.

[11] Easterly, W., Rebelo, S., (1993), “Fiscal Policy and Growth: An Empirical Investigation.”, *Journal of Monetary Economics,* 32, 417-458.

[12] Epple, D., Romano, R., (1996), ”Public Provision of Private Goods”, *Journal of Political Economy*, vol. 4, 57-84.

[13] Fernandez, R., Rogerson, R., (1995), "On the Political Economy of Education Subsidies, *Review of Economic Studies*, vol. 62, 249-262.

[14] Flug, K., Spilimbergo, A., Wachtenheim, E., (1998), "Investment in Education: Do Economic Volatility and Credit Constraints Matter?", *Journal of Development Economics*, 55, 165-81.

[15] Glomm, G., Ravikumar, (1998), "Opting out of publicly provided services as majority voting result", S*ocial Choice and Welfare*, vol. 15, 187-193.

[16] James, E., (1993), "Why do Different Countries Choose a Different Public-Private Mix of Educational Services?", *Journal of Human Ressources*, 28, 572-592.

[17] Justman, M., Gradstein, M., (1999), "Industrial Revolution, Political Transition and the Subsequent Decline in Inequality in Nineteenth-Century Britain.", *Explorations in Economic History*, 36, 109-127.

[18] Levy, G. (2004), "Public Education for the Minority, Private Education for the Majority", *Work in progress.*

[19] Meltzer, A., Richard, S., (1981), "A Rational Theory of the Size of Government", *The Journal of Political Economy*, Vol. 89, 914-927.

[20] Perotti, R., (1993), "Political Equilibrium, Income Distribution and Growth", *Review of Economic Studies*, vol. 60, 755-76.

[21] Perotti, R., (1996), "Growth, Income Distribution, and Democracy: What the Data Say.", *Journal of Economic Growth* 1: 149-187.

[22] Psacharopolous, G., (1981), "Returns to Education: Un Updated International Comparision.", C*omparative Education,* 17, 321-341.

[23] Psacharopolous, G., (1994), "Returns to Investment in Education: A global Update.", *World Development*, 22, 1325-1343.

[24] Saint-Paul, G., Verdier, T., (1992), "Education, Democracy and Growth", *CEPR Discussion Paper*, No. 613.

[25] Sylwester, K,.(2000). "Income Inequality, Education Expenditures and Growth.", *Journal of Development Economics*, 63, 379-398.