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Inequality, redistribution and the allocation of public spending in education: a political-economy approach.

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Abstract. The incidence of public expenditure in education appears to be skewed in favour of the middle and upper classes. This paper inquires into the determinants of this bias using a political economy approach. We develop a model with two time periods with an election occurring between the two. In the first period, agents differ in their initial wealth; in the second period, differences in wealth are combined with differences in income. In the first period, the incumbent government issues debt to finance public spending in education and decides how to allocate available resources between primary and tertiary education. Both increase aggregate income, but while investment in primary education reduces income inequality, investment in tertiary education increases it. At the beginning of the second period, a two-party electoral competition is held and probabilistic voting decides the winner. By varying the parameters of the linear income tax, the elected policy-maker can redistribute resources between low and high income individuals, while by choosing a debt default rate she can renege on the promise to fully repay public obligations, redistributing resources from bond-holders to tax-payers. We show that the investment in primary education might not be (politically) viable. Intuitively, investment in primary education, by reducing income inequality with respect to wealth inequality, might increase the desired debt default rate of future policy makers, making issuing debt to finance primary education unfeasible.

Keywords: policy choices in representative democracies, public investment in education, redistribution, government debt repayment
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1. Introduction

Public spending in education is a pervasive feature of modern economies. It accounts, on average, for more than 4.5% of GNP and more than 14% of total government expenditure[1].

Public provision of education is usually justified as a (politically acceptable) mean of redistributing income. However, demand for education is not homogeneously distributed across social groups. Specifically, data on university attendance show a persistent gap between attendance by the better-off and by the less well-off [2]. This implies that the redistributive effects of education expenditure strongly depend on which education level is funded.

By disaggregating spending over educational levels, Zhang (2002) shows that more unequal societies tend to spend proportionately more on high levels of education[3]. Furthermore, regression results reveal that countries spending more on tertiary education today tend to experience more unequal income distribution in the future. Thus, the allocation of public education spending might be responsible of persistent inequality.

The purpose of this paper is to provide a political economy model capable of accounting for these stylized facts.

We develop a two-period dynamic model of representative democracy, which incorporates public investment in education and redistribution, *à la* Besley and Coate (1998 and 2000). In the first period, there is no production and agents differ in their initial endowment of a consumption good. The incumbent government issues debt to finance public spending in education. Each individual divides his endowment between consumption and the acquisition of government bonds. Aggregate savings determine the amount of resources which can be spent in education. The government can choose the type of investment: it can either invest in "primary" education or in "tertiary" education.

In the second period, the consumption good is produced using labour and differences in agents'wealth are combined with differences in income deriving from different levels of productivity. First period's spending in education affects second period's labour productivity. Investment in primary education benefits low productivity individuals thus reducing income inequality. Tertiary education benefits high productivity individuals, thus increasing inequality.

At the beginning of the second period a two-party electoral competition is held. Each party chooses a citizen-candidate by majority voting and probabilistic voting decides the winner[4]. According to her preferences, the elected policymaker decides the parameters of a linear income tax (fiscal

[1] Data source: various issues of the UNESCO Statistical Yearbook.
[2] Se De Fraja (2005) for a discussion of this point.
[3] See also Gradstein (2003).
[4] See Besley and Coate (2000) for a similar description of the political process

policy) and sets the debt default rate (debt redemption policy) [5]. By varying the parameters of the linear income tax, resources can be redistributed between low and high income individuals. By increasing the level of the debt default rate, the policymaker can redistribute resources from bond-holders to tax-payers.

Although each party chooses a citizen-candidate by majority voting, the bi-dimensionality of the second period policy choice, together with the fact that individuals have only one vote, causes that political outcomes on specific issues might not be congruent with the preferences of the majority of the winning party's members[6]. Specifically, we show that, even if the majority of the two parties' members, as well as the majority of the population, prefer to renege on the promise to fully repay debt, if this issue is *salient* (i.e benefits deriving from the preferred debt redemption policy exceed benefits deriving from the preferred fiscal policy) only for a minority of individuals, who prefer full debt repayment, the political equilibrium will feature no default with probability one[7]. Consequently, in order to exclude a political equilibrium featuring debt default, individuals who are pro-default should care more about fiscal policy than debt redemption policy. In these circumstances, the investment in primary education, which reduces income inequality, might be unfeasible. In fact, since reduced income inequality causes the debt redemption policy to become more relevant for voters (i.e. gains from preferred debt redemption policy increase relative to gains from preferred fiscal policy), if a sufficient fraction of the population regards this issue as the *salient* dimension, then, with probability one, the elected policymaker will share the preference of the majority, which we assume to favour repudiation. Thus, in the first period, nobody would buy goverment bonds.

The rest of the paper is organised as follows. In section 2 related literature is discussed. The model is illustrated in section 3. In section 4 the political process is presented and then the political equilibrium is characterised. Section 5 concludes.

2. Related literature

Standard political-economic theory, based on the median voter approach, predicts a positive association between inequality and redistribution. The proposed explanation is that greater inequality, by reducing the income of the median voter relative to the country's mean income,

[5] As underlined by Dixit and Lodregan (2000) p.1"... if explicit default is rare, governments can easily renege on their promise to repay their debt by devaluing obligations using devices like inflation...". Thus, the debt default rate can be thought as an "inflation tax".

[6] See Besley and Coate (2000). The authors show how the bundling of issues might prevent electoral competition from producing majoritarian outcomes on specific issues.

[7] Di Gioacchino et al (2004) apply Besley and Coate's (2000) arguments to explain why anti-inflationary monetary policies find political support even in an environment where a majority of voters is pro-inflation.

translates, under majority voting, into the adoption of more redistributive policies.[8] Cross country data, however, do not seem to support such prediction. Perotti (1996) does not find any significant relationship between inequality and the share of transfer or public expenditure on GDP and, among advanced countries, Rodriguez (1998) actually finds a negative relationship. [9]

As for public expenditure in education, Zhang (2002), by decomposing aggregate education spending into expenditure shares on different school levels, uncovers a negative and significant relationship between inequality and public education expenditures. His sample includes most of countries with democratic political institutions[10].

Recently, a strand of the literature on income distribution and redistributive policies, departing from the majority voting model, has focused on asymmetries in political influence to explain the negative link between income inequality and redistribution. In Benabou (2000), for example, the pivotal voter is richer than the median, reflecting the fact that richer individuals have more political weight. The same argument is also used by Rodriguez (1998) in a model of lobbying. He shows that greater inequality can be associated to more regressive tax systems. His result depends on having ruled out the possibility of lobbying by the poor. Similarly, Gradstein (2003) argues that since the rich exert more political pressure, through rent seeking, public spending is biased in their favour. Zhang (2002) develops a more complex special interest political economy model in which the asymmetries in political influence are derived from a model of campaign contributions with endogenous lobbies formation. The allocation of public education expenditures is the result of the strategic interaction between the incumbent government and the lobbies. The economy might reach different steady states which exhibit persistent differences in income distribution and redistributive education policy.

This paper joins the last strand of research by taking a new approach. We mantain the hypothesis of symmetric political influence – as in the standard voting models- but, by assuming a multidimensional policy space, we obtain political outcomes which strongly differ from those predicted by the majority voting approach, contributing to bridging the gap between theory and empirical findings.

In our model, first period public investment in education is financed in deficit by selling government bonds. There are no commitment devices and future governments can renege on the

[8] See Alesina Rodrick (1994) and Persson Tabellini (1994). In these works, the positive link between inequality and redistribution, helps explaining the inverse relationship between initial income or wealth inequality and growth (as redistribution generates disincentives for capital accumulation).

[9] See also studies reviewed in Benabou (1996).

[10] For developing countries, Birdsall (1997) notes that spending on primary education is small relative to spending on tertiary education.Taking a sample of 21 developing countries, Gradstein (2003) shows that the bias in the incidence of public spending in education closely mirrors the skewness in income distribution.

promise to repay public debt. The feasibility of the public investment is thus strongly linked to the future political decision about public debt repayment.

In the second period, policymakers redistribute resources using two instruments: a linear income tax, which redistributes resources between low and high income individuals and a tax on bond holdings (debt default rate), which redistributes resources from bond-holders to tax-payers. Education funding, by affecting future income distribution, might change the policy chosen by future policymakers. Specifically, investment in primary education might reduce future income inequality up to the point in which the debt redemption policy catalyses the political conflict. In this case, with probability one, the political outcome on this dimension will be that preferred by the majority of voters, that is, default on public debt. On the contrary, investment in tertiary education, by increasing future income inequality, deflects attention from the debt redemption policy. Fiscal policy catalyses the political conflict, giving greater credibility to debt repayment promises.

The main result of our model is that, in equilibrium, investment in tertiary education might be observed even if the costituency of the incumbent government consists of individuals who would benefit most from primary education. The novelty of our contribution lies on the fact that we explain the bias in the education expenditure without referring to the hypothesis of asymmetric political influence. Our result relies on the recognition that an investment, by altering future individual's productive abilities, might lead to changes in preferences for redistribution, making the investment politically unfeasible.

The last point relates our paper to the strand of literature which emphasizes political failures in representative democracies (Besley and Coate, 1998). Furthermore, the paper is also related to literature concerned with political determinants of public debt credibility (Aghion and Bolton, 1990 and Dixit and Lodregan, 2000).

3 The Model

3.1 The Economic Environment

Consider a two-period open economy with a continuum of individuals of measure one.[11] In the first period, there is no production and agents differ in their exogenous initial endowment a^i, which is distributed in the population according to a known distribution Φ, with mean a and support $(0, A)$, where A is a parameter. In the second period, production comes from labour. All individuals are endowed with one unit of labour but differ in their ability e^i to produce (productivity). If individual i supplies one unit of labour he produces $y^i = e^i$ units of consumption good. Differences in income are thus determined by differences in abilities. For simplicity, we assume that the population is

[11] This implies that aggregate and average values coincide.

divided into two ability types, low and high. Let e^L denote the first period productivity of low ability individuals and $e^H (> e^L)$ that of high ability individuals. We assume that e^i is distributed in the population according to a known distribution function: γ_L is the fraction of low productivity while $\gamma_H = 1 - \gamma_L$ is the fraction of high productivity citizens and *e* is the average productivity.

At the beginning of the first period, the incumbent government issues bonds to finance a public investment equal to *b* in per capita terms (in the first period endowments cannot be taxed). The government is constitutionally binded to spend *b* in education, but it is free to choose whether to invest in primary (E_1) or tertiary education (E_3). The two investments are mutually exclusive[12]. Public spending in education is productive raising individual's second period abilities. Specifically, investing in primary education (E_1) raises the productivity of low ability individuals, so that $e^L(E_1) > e^L$ and $e^H(E_1) = e^H$; investing in tertiary education (E_3) raises the productivity of high ability individuals, that is $e^H(E_3) > e^H$ and $e^L(E_3) = e^L$.

At the beginning of the second period an election takes place. The elected policymaker sets the debt redemption policy and the fiscal policy. The debt redemption policy is described by the choice of a debt default rate $\pi \in [0, q]$, where *q* is the promised interest rate on government's bonds[13]. Fiscal policy involves the choice of the parameters of a linear income tax, i.e. the tax rate $\tau \in [0,1]$ and the per capita guarantee $g \in \Re$ [14]. Government budget constraints (in average terms) for the first and second period, respectively, are given by :

$$b = s$$

and

$$(1+r)b = \tau e(E_l) - g$$

where *s* is the average per-capita demand for government bonds, *r* is the interest rate paid on government bonds[15] and $e(E_l)$ is average income, which depends on public investment E_l with $l = 1,3$.

In the following, we assume that public investment in education is potentially Pareto improving (given available redistributive instruments).

[12] For the sake of simplicity, we focus on this extreme case.

[13] We assume that the government might renege only on the promise to service the debt. However, qualitative results do not depend on this assumption.

[14] With tax system (τ , g) an individual with pre-tax income e^i has a tax bill of τe^i-g .

[15] The interest rate *r* paid on bonds will be zero when $\pi = q$ and equal to *q* when $\pi = 0$: $r \in [0, q]$.

Assumption 1. $e(E_l) - e > (1+\delta)b$ for $l = 1{,}3$.

where δ is the individuals' rate of time preference. Assumption 1 guarantees also the sustainability of government debt when $\delta = r$[16].

Let c_1^i and c_2^i be individual's consumption at time one and two respectively and let

$$W^i = U(c_1^i) + \frac{1}{1+\delta}\left(c_2^i\right), \qquad (1)$$

be the individual's intertemporal utility function, where, $U(\cdot)$ is twice continuously differentiable and concave.

Utility is maximized under the two budget constraints:

$$c_1^i + s^i = a^i$$

$$c_2^i = (1-\tau)e^i(E_l) + g + (1+r^e)s^i;$$

where, s^i stands for savings, r^e is the expected interest rate on savings and $e^i(E_l)$ is second period income.

There is a world capital market where borrowing and lending take place at the given real world interest rate r^w which, for simplicity, is assumed to be equal to the rate of time preference δ. We exclude private borrowing referring to financial markets imperfections which prevent individuals, who are consumption constrained in the first period, from borrowing. If individual i desires to save, he can either buy foreign bonds (f^i) or domestic government's bonds (b^i). We assume that the exchange rate (with the rest of the world) is fixed and equal to one and the two bonds are perfect substitutes. This means that the expected interest rate on public debt (r^e) must be equal, in equilibrium, to the world interest rate: ($r^e = r^w$) and government issues bonds at the nominal rate $q = r^w + \pi^e$, where π^e is the expected rate of default.

3.2 Economic equilibrium

In this section individuals are considered as economic agents who take current and expected future policies as given. We assume that in period 1 individuals know their future productivity level. Solving the *i*-th individual optimisation problem , we obtain:

$$\hat{c}_1^i = \begin{cases} U_c^{-1}(1) & \text{if} \quad U_c^{-1}(1) < a^i \\ a^i & \text{otherwise} \end{cases} \qquad (2)$$

and

$$\hat{s}^i\left(a^i\right) = \begin{cases} a^i - U_c^{-1}(1) & \text{if} \quad U_c^{-1}(1) < a^i \\ 0 & \text{otherwise} \end{cases} \qquad (3)$$

[16] As we will show in the following sections, this is actually the equilibrium outcome.

Optimal consumption in the first period is equal to $U_c^{-1}(1)$. However, if the individual is wealth-constrained, he cannot consume more than a^i and his savings will be nil.

From the last expression, optimal aggregate savings can be derived:

$$\hat{s} = \int_{U_c^{-1}(1)}^{A} \left(a^i - U_c^{-1}(1)\right) d\Phi \,. \tag{4}$$

From the second period budget constraint we obtain second period consumption [17]:

$$\hat{c}_2^i = (1-\tau)e^i(E_l) + (1+r^e)\hat{s}^i + g \tag{5}$$

We further assume that individuals, at the world interest rate, have a bias in favour of domestic bonds and that the government issues bonds so as to satisfy desired savings: $\hat{s} = b$. Then $\hat{s}^i \equiv b^i$ and $f^i = 0$. Let γ^P be the fraction of poor citizens, that is those with $b^i < b$, and $\gamma^R = 1 - \gamma^P$ the fraction of rich citizens, that is those with $b^i \geq b$.

3.3 Political preferences

Individual's political preferences can be derived from the indirect utility function. Since the gains from public spending in education depend on the fiscal policy that will be chosen in the second period, we proceed backwards. In the second period, the investment in education E_l and the promised interest rate q are given. Allowing for the government budget constraint, the individual's indirect utility function can be written as[18]

$$\hat{W}^i(\tau,\pi) = (1-\tau)\cdot e^i(E_l) + \tau \cdot e(E_l) + (1+q-\pi)\cdot\left(b^i - b\right) \tag{6}$$

To determine voters' preferences about fiscal policy and about the debt redemption policy, we look at the impact of these policies on individuals' welfare:

$$\begin{aligned} \frac{\partial \hat{W}^i}{\partial \tau} &= e(E_l) - e^i(E_l) \\ \frac{\partial \hat{W}^i}{\partial \pi} &= b - b^i \end{aligned} \tag{7}$$

[17] Non negativity of first period consumption is ensured by non-negativity of initial endowment, a^i. Non-negativity of second period consumption for all individuals, including those who save nothing in the first period, requires $(1-\tau)e^i(E_l) > -g$.

[18] Policy preferences about debt redemption and fiscal policies can be described by the individuals' indirect utility function as a function of π, g and τ. However, given the government's budget constraint, only two of them can be freely set.

From (7) it is immediate to verify that the i-th individual's preferred fiscal policy is $\tau^L = 1$ if his productivity is low and $\tau^H = 0$ if her productivity is high. Thus, less productive individuals prefer a 100% tax rate associated to a lump sum transfer equal to $g = e(E_l) - (1 + q - \pi)b$, whereas more productive individuals prefer zero income taxation associated to a lump sum tax (negative transfer) equal to $g = -(1 + q - \pi)b$.

Moreover, (7) shows that individual's preferences about the debt default rate depend on the amount of government debt holdings. Those with $b^i \geq b$ (rich citizens) prefer full repayment ($\pi = 0$). On the contrary, those with $b^i < b$ (poor citizens) prefer total default on debt service ($\pi = q$).

On the basis of the preferences on the two policy instruments, four groups of individuals can be distinguished:

$$LP = \{i | e^i = e^L; b^i < b\}, \quad HP = \{i | e^i = e^H; b^i < b\}, \quad LR = \{i | e^i = e^L; b^i \geq b\}, \quad HR = \{i | e^i = e^H; b^i \geq b\}.$$

To establish individuals preferences about public spending in education, we compute the value of the indirect utility function distinguishing for the individual's ability, the investment's type and the (second period) fiscal rule. In what follows, we maintain the hypothesis that $\pi = 0$ and $q = r^e = r^w$, otherwise no public debt could be issued. In the next section, we will solve the political game and find the conditions which ensure full repayment of public obligations.

Let $\hat{W}^{ik}(E_l, \tau)$ indicate individual i's indirect utility function in period 1 when his productivity type is k $(k=L,H)$, public spending in education is E_l and income tax is τ. Allowing for the government budget constraints, we obtain:

$$\hat{W}^{ik}(E_1, \tau) = U(\hat{c}^i) + \frac{1}{1+\delta}\{(1-\tau)e^k(E_1) + \tau e(E_l) - (1+r^e)b + (1+r^e)b^i\}$$

Proposition 1. *If* $e(E_1) = e(E_3)$ *then low productivity individuals prefer investment in primary education and high productivity individuals prefer investment in tertiary education, whatever the second period electoral outcome is.*

Proof:

It is easy to work out:

$$\hat{W}^{ik}(E_1, \tau^L) = U(\hat{c}^i) + \frac{1}{1+\delta}\{e(E_1) - (1+r^e)b + (1+r^e)b^i\} = U(\hat{c}^i) + \frac{1}{1+\delta}e(E_1) - b + b^i$$

$$\hat{W}^{ik}(E_3, \tau^L) = U(\hat{c}^i) + \frac{1}{1+\delta}\{e(E_3) - (1+r^e)b + (1+r^e)b^i\} = U(\hat{c}^i) + \frac{1}{1+\delta}e(E_3) - b + b^i$$

$$\hat{W}^{ik}\left(E_1,\tau^H\right)=U(\hat{c}^i)+\frac{1}{1+\delta}\left\{e^k(E_1)-(1+r^e)b+(1+r^e)b^i\right\}=U(\hat{c}^i)+\frac{1}{1+\delta}e^k(E_1)-b+b^i$$

$$\hat{W}^{ik}\left(E_3,\tau^H\right)=U(\hat{c}^i)+\frac{1}{1+\delta}\left\{e^k(E_3)-(1+r^e)b+(1+r^e)b^i\right\}=U(\hat{c}^i)+\frac{1}{1+\delta}e^k(E3)-b+b^i$$

Then, since the two investments in education have the same effects on aggregate production ($e(E_1)=e(E_3)$), it is straightforward to verify that, when $\tau=\tau^L$, low productivity individuals are indifferent to the allocation of public spending between primary and tertiary education. Moreover, assumption 1 guarantees that the participation constraint is satisfied (i.e. public investment is preferred to the no investment alternative). On the contrary, when $\tau=\tau^H$ low productivity individuals strictly prefer investment in primary education. Again it is easy to verify that the participation constraint is satisfied. Analogous results apply to high productivity individuals, that is, they strictly prefer investment in tertiary education when the fiscal rule preferred by high productivity individuals is anticipated and they are indifferent in the complementary case. ■

Thus, we can conclude that low productivity individuals prefer investment in primary education and high productivity individuals prefer investment in tertiary education, independently of the fiscal policy implemented in the second period.

4. The Political Process

This section provides a description of political decision making in both periods. We begin with the second period election and policy choice, taking as given the public investment in education. Then, we analyse first period policy choice, recognizing that the incumbent government and individuals will anticipate the dependence of second period choices on the first period decision on the allocation of public spending in education.

4.1 Period two election

At the beginning of the second period an election takes place. There are two parties: party *A* and party *B*. All members of party *A* are low productivity and all members of party *B* are high productivity. Both parties contain a mixture of poor and rich individuals. Parties select candidates by majority voting and then individuals vote according to their political preferences. As in Besley and Coate's (1997) citizen-candidate model, we assume that no ex-ante commitment is possible: once elected, citizen *i* chooses either the tax rate $\tau^L=1$, if he is low productivity or the tax rate $\tau^H=0$ if she is high productivity and chooses $\pi=q$ if he is poor and $\pi=0$ if she is rich. Parties choose the candidate that a majority of their members prefer.

In what follows we assume:

ASSUMPTION 2

(i) $\gamma^{P} > \gamma^{R}$

(ii) $b_{A}^{m} < b$ *and* $b_{B}^{m} < b$

where b_{z}^{m} with *Z*= *A*,*B* stands for public debt holding of the median member of party Z. Assumption 2 tells us that the majority of population are poor (*i*), as well as the majority of each party's members (*ii*).

There are two types of voters. A fraction μ are *rational voters*: they vote the candidate whose proposed policy maximises their pay-off function. The remaining fraction are *noise voters*. A fraction η of the noise vote goes to the party *A*, where η is a random variable distributed in the interval [0,1] according to the cumulative distribution function $H(\eta)$. *H* is symmetric, so that $\mathrm{H}(\eta) = 1 - H(1-\eta)$.The presence of noise voters makes the electoral outcome probabilistic. Let ω represent the difference between the fraction of voters obtaining a higher utility from the policy chosen by party *A* and the fraction of voters who benefits most from party *B*'s policy. Then, party *A* wins if

$$\mu\omega + (1-\mu)\eta > (1-\mu)(1-\eta)$$

that is,

$$\eta > \frac{-\mu\omega}{2(1-\mu)} + \frac{1}{2}.$$

Consequently, given ω, the probability that party *A* wins is given by:

$$\Psi(\omega) = 1 - \mathrm{H}\left[\frac{-\mu\omega}{2(1-\mu)} + \frac{1}{2}\right].$$

We assume that the fraction of noise voters in the population is sufficiently high so that if fiscal policy were the only issue, both parties would have a positive probability of winning the election, i.e. $\Psi(\gamma_L - \gamma_H) \in (0,1)$. This is verified when $\left|\gamma_L - \gamma_H\right| < \frac{1-\mu}{\mu}$[19].

[19] The description of the noise vote is based on Besley and Coate (2000) .

An election gives rise to a game between the two parties in which each party's strategy has two dimensions and can be represented by a policy vector h_Z = (τ_Z, π_Z) with $Z \in \{A, B\}$. A Nash equilibrium is a couple of policy vectors, h^*_Z= (τ^*_Z,, π^*_Z), one for each party, which are mutual best responses. Party members know the election probabilities associated with different candidate pairs and take them into account when voting for candidate. Thus party $Z \in \{A, B\}$ chooses a citizen-candidate whose preferences about fiscal policy and debt redemption policy maximise the expected median member's payoff .

4.2 Period two policy choices

In order to analyse the political equilibrium in the second period, the knowledge of the linear income tax and the debt default rate preferred by each citizen is not enough. Assumptions have to be set on the priority given by each citizen to the two policies. Since citizens have only one vote but each party's strategy is bi-dimensional, when voting individuals have to compare the gain from the preferred debt redemption policy with the gain from the preferred fiscal policy.

For the ***i***-th citizen, the welfare gain from the preferred debt redemption policy is given by:

$$\left|\hat{W}^i(\tau,0) - \hat{W}^i(\tau,q)\right| = q\left|b^i - b\right|$$

On the other hand, the gain from the preferred fiscal policy is given by:

$$\left|\hat{W}^i\left(\tau^L,\pi\right) - \hat{W}^i\left(\tau^H,\pi\right)\right| = \left|e(E_l) - e^i(E_l)\right|$$

In what follows, we assume that the gain from the preferred debt redemption policy is so big as to overcome the gain from the preferred fiscal policy only for very rich individuals, those with $b^i > 2b$. This minority casts their vote firstly looking at a candidate attitude towards debt repayment. On the contrary, for the majority of the population, those with $b^i \le 2b$, fiscal policy is the *salient* issue and they cast their vote firstly looking at a candidate attitude towards this policy.

ASSUMPTION 3:

(i) $q\left|b^i - b\right| > \max\left|e(E_l) - e^i(E_l)\right|$ when $b^i > 2b$

(ii) $qb < \min\left|e(E_l) - e^i(E_l)\right|$

The last expression, which is obtained for the poorest individuals, i.e. those who do not hold bonds, implies that fiscal policy is the *salient* issue,- i.e. the gain from the preferred debt redemption policy is smaller than the gain from the preferred fiscal policy- for all individuals with $b^i \le 2b$.

The next assumption gives the conditions under which the equilibrium involves both parties selecting candidates who share the fiscal policy preferences of their members, but have non-majoritarian debt redemption policy preferences.

ASSUMPTION 4:

For $Z \in \{A, B\},\ k = \begin{cases} L & when\ Z = A \\ H & when\ Z = B \end{cases}$ *and* $-k = \begin{cases} L & when\ Z = B \\ H & when\ Z = A \end{cases}$

(i) $\Psi\left(\gamma_k - \gamma_{-k}\right)\left|e(E_l) - e^k(E_l)\right| > \Psi\left(\gamma^P - \gamma^R\right) q \left(b - b_Z^m\right)$

(ii) $\left[\Psi\left(\gamma_k - \gamma_{-k}\right) - \Psi\left((\gamma_k - \gamma_k^{VR}) - (\gamma_k^{VR} + \gamma_{-k})\right)\right]\left|e(E_l) - e^k(E_l)\right| > \Psi\left((\gamma_k - \gamma_k^{VR}) - (\gamma_k^{VR} + \gamma_{-k})\right) q \left(b - b_Z^m\right)$

where $\Psi\left((\gamma_k - \gamma_k^{VR}) - (\gamma_k^{VR} + \gamma_{-k})\right)$ is the probability that party Z wins when choosing (τ^k, 0) while the opponent party is choosing (τ^{-k}, q) and debt policy is *salient* for a fraction γ_k^{VR} of very rich individuals, whose productivity is of type k (the same as party Z members). In this circumstances, party Z obtains the support of voters who share its members' preferences about fiscal policy and for whom debt policy is not salient (a fraction $\gamma_k - \gamma_k^{VR}$ of the population). At the same time, the opponent party attains the support of voters with preferences about fiscal policy different from those of party Z members plus the support of voters with the same preferences about fiscal policy but for whom debt policy is salient (a fraction $\gamma_k^{VR} + \gamma_{-k}$ of the population).

If *(i)* is satisfied, the gain from choosing the preferred fiscal policy is greater than the gain from compromising on the fiscal policy and choosing the majoritarian debt redemption policy ($\pi = q$), while the opponent chooses the policy preferred by the very rich ($\pi = 0$). If *(ii)* is satisfied, when both parties are choosing the non-majoritarian debt redemption policy, preferred by the individuals for whom monetary policy is *salient,* switching to the one which maximises the party pay-off is not convenient. In fact, the gain from switching to the preferred debt policy (RHS) does not compensate the loss due to the reduced probability of winning the election (LHS).

Thus, even if the majority of the two parties members, as well as the majority of the population, prefer to default on debt service, the best choice for each party is a rich candidate. Intuitively, if party *B* is choosing a rich candidate then, under the conditions stated in assumption 4, the best-reply for party *A* is to make the same choice. In fact, if party *A* were to choose a poor candidate it would loose the votes of very rich low-productivity individuals, for whom debt policy is *salient*. A symmetric reasoning ensures that party *B* will choose a rich candidate. Therefore, the equilibrium policy vectors will be $h^*_A= (\tau^L, 0)$ and $h^*_B= (\tau^H, 0)$ and party A will win with probability $\Psi(\gamma_L - \gamma_H)$. This result is proved in the next proposition.

PROPOSITION 2: *If assumptions 2, 3 and 4 hold, then the non-majoritarian outcome($\pi = 0$) is chosen with probability one.*

Proof: see appendix.

4.3 Politically viable debt and first period choice of education

We now turn to a description of the political equilibrium in period 1 in which a decision has to be taken on how to allocate the investment in education. From proposition 2, we know that in order to exclude a political equilibrium featuring inflation, fiscal policy should be the *salient* issue for all individuals but for the richest segment of population (assumption 3).

Without loss of generality let us assume $\gamma_L > \gamma_H$ then $\left|e(E_l) - e^L(E_l)\right| < \left|e(E_l) - e^H(E_l)\right|$ [20].

Thus, political feasibility of the investment in primary education requires:

$$b < \frac{\left|e(E_1) - e^L\right|}{r^w}$$

where we have used the condition $q = r^w$.

On the other hand, investment in tertiary education is feasible when

$$b < \frac{\left|e(E_3) - e^L\right|}{r^w}$$

Political feasibility increases as r^w decreases and income (productivity) dispersion around its mean increases. Under the conditions stated in assumption 3, the two investments are both feasible; thus, we can derive the following proposition

PROPOSITION 3

If party A (B) is in power, in the first period, public spending will finance primary (tertiary) education.

Now we relax assumption 3 and assume the following:

ASSUMPTION 3 bis

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[20] In fact, $e(E_l) = \gamma_L e^L(E_l) + \gamma_H e^H(E_l)$

$$(i)\ \left|b^i - b\right| > \frac{\left|e(E_l) - e^H(E_l)\right|}{r^w} \qquad \text{when } b^i > 2b \quad \forall l = 1,3$$

$$(ii)\ b > \frac{\left|e(E_1) - e^H\right|}{r^w}$$

and

$$(iii)\ b < \frac{\left|e(E_3) - e^L\right|}{r^w}$$

In other words, political investment in tertiary education, increasing income inequality, guarantees that for the majority of population fiscal policy is the salient issue *(iii)*. The conflict over debt policy is *salient* only for a minority of rich individuals and proposition 2 holds *(i)*. On the contrary, investment in primary education, reducing income dispersion around its mean, lessens the conflict over fiscal policy making debt policy *salient* for the poorest segment of the population that is pro-default *(ii)*. In this case Proposition 3 does not hold and it is not possible to exclude an equilibrium where the default rate is q.

PROPOSITION 4

If $\Psi(\gamma_L - \gamma_H)(e(E_3) - e) \geq (1+\delta)b$ *and given assumption 2, 3bis and 4, public spending will finance tertiary education whatever party is in power in the first period.*

Proof. Spending in primary education will signal that, in the second period, debt could be reneged. Nobody would buy domestic debt in this case. Spending in tertiary education signals that future conflict over fiscal policy will deflect attention from the debt tax and full debt redemption is assured by the existence of an anti-default minority. Party A, whose constituency is composed of low productivity individuals, is better off by spending in tertiary education than spending nothing. The condition $\Psi(\gamma_L - \gamma_H)(e(E_3 - e) \geq (1+\delta)b$, in fact, guarantees the satisfaction of the participation constraint in expected value.

Note that political sustainability of public spending in primary education increases if the initial distribution of wealth is more equitable. This means that the bias in public spending closely mirrors skewness of wealth distribution. Moreover if high ability individuals are concentrated on the richest segment of the population[21] the allocation of public education spending might be responsible of persistent inequality.

5. Concluding remarks

It has frequently been argued that the incidence of public spending in education, far from being uniform, is biased in favour of the rich. This paper has presented a model in which this bias is politically determined.

Recent literature on income inequality and redistribution explains the existence of a negative relationship between inequality and redistribution by appealing to asymmetric political influence. Specifically, assuming richer individuals to be politically more influent causes their preferences to be pivotal in deciding redistribution policies. Differently from this literature, we mantain the hypothesis of symmetric political influence – as in the standard voting models- but, by assuming a multidimensional policy space, we obtain results which fit with empirical findings.

Our model is a two period very simple representation of the interaction between public spending in education and electoral politics. Public investment in education is financed in deficit by selling government bonds. In absence of credible commitment devices the possibility to finance the investment is strongly linked to the future political decision about public debt repayment. We show that education funding, by affecting future income distribution, might change political choice of future policy makers, making issuing debt unfeasible. Specifically, investment in primary education might reduce future income inequality up to the point in which redistribution of resources through a tax on debt becomes more effective than redistributing through a linear income tax. In this case, if the majority of the population is poor, nobody would believe that debt will be eventually repaid. On the contrary, investment in tertiary education, by increasing future income inequality, gives greater credibility to debt repayment promises.

The most relevant result of this paper is that an equilibrium with investment in tertiary education might be observed even if the costituency of the incumbent government consists of individuals who would benefit most from investment in primary education. This result does not rely on asymmetric political influence- i.e. the beneficiaries of tertiary education are also the most influential political group- but on the recognition that an investment, by altering individual's productive abilities, might lead to changes in preferences for redistribution, making the investment politically unfeasible.

[21] See De Nardi (2000) for a theoretical model with human capital links in which children partially inherit the productivity of their parents. In this case more productive parents leave larger bequest to their children who in turn are more productive than average.

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APPENDIX

Proof of proposition 2:

We have to show that, under assumptions 2, 3 and 4 , $h^*_A = (\tau^L, 0)$ and $h^*_B = (\tau^H, 0)$ represent Nash equilibrium strategies of the policy game, that is $h^*_A = (\tau^L, 0)$ is the best response to $h^*_B = (\tau^H, 0)$ and vice versa. We concentrate on the choice of the party *A*. A similar argument applies in the case of the opponent party. The specified strategies bring about the following expected pay-off for party *A*'s median member:

$$E_\eta\left[\hat{W}^m_A \middle| h_A = (\tau^L, 0), h_B = (\tau^H, 0)\right] = (1+q)(b^m_A - b) + \Psi(\gamma_L - \gamma_H)e(b) + [1 - \Psi(\gamma_L - \gamma_H)]e^L(b)$$

.

In order to show that $h_A = (\tau^L, 0)$ is the best response to party *B*'s strategy, we have to compare the previous expected pay-off with the pay-off obtainable by choosing the alternative strategies: (τ^L, q), (τ^H, q), $(\tau^H, 0)$.

$(\tau^L, 0)$ is certainly preferred to $(\tau^H, 0)$ if $\Psi\left(\tau^L - \tau^H\right) > 0$. If party *A* were to choose $h_A = (\tau^H, q)$, then monetary policy would be the unique policy at stake. Therefore, the expected pay-off for the party *A*'s median member would be:

$$E_\eta\left[\hat{W}^m_A \middle| h_A = \left(\tau^H, q\right), h_B = \left(\tau^H, 0\right)\right] = \Psi\left(\gamma^P - \gamma^R\right)\left[e^L(b) + b^m_A - b\right] + \left(1 - \Psi\left(\gamma^P - \gamma^R\right)\right) \cdot \left[e^L(b) + (1+q)\left(b^m_A - b\right)\right]$$

.

The difference between the two expected pay-off can be computed to be equal to:

$$E_\eta\left[\hat{W}^m_A \middle| h_A = \left(\tau^L, 0\right), h_B = \left(\tau^H, 0\right)\right] - E_\eta\left[\hat{W}^m_A \middle| h_A = \left(\tau^H, q\right), h_B = \left(\tau^H, 0\right)\right] =$$
$$= \Psi\left(\gamma_L - \gamma_H\right)\left[e(b) - e^L(b)\right] - \Psi\left(\gamma^P - \gamma^R\right) q\left(b - b^m_A\right).$$

Under assumption 4.*(i)*, the above expression is positive and party *A* prefers the strategy $(\tau^L, 0)$ to (τ^H, q).

Finally, by choosing $h_A = (\tau^L, q)$ party *A* would loose the votes of rational, low-productivity and very-rich voters (which we indicate with γ_L^{VR}):

$$E_\eta\left[\hat{W}_A^m \middle| h_A=\left(\tau^L,q\right),h_B=\left(\tau^H,0\right)\right]=\Psi\left((\gamma_L-\gamma_L^{VR})-(\gamma_L^{VR}+\gamma_H)\right)\cdot\left[e(b)+b_A^m-b\right]+\left\{1-\Psi\left((\gamma_L-\gamma_L^{VR})-(\gamma_L^{VR}+\gamma_H)\right)\right\}\cdot\left[(1+q)\left(b_A^m\right.\right.$$

The difference between the two expected pay-off can be computed to be equal to:

$$E_\eta\left[\hat{W}_A^m \middle| h_A=\left(\tau^L,0\right),h_B=\left(\tau^H,0\right)\right]-E_\eta\left[\hat{W}_A^m \middle| h_A=\left(\tau^L,q\right),h_B=\left(\tau^H,0\right)\right]=$$

$$=\left\{\Psi\left(\gamma_L-\gamma_H\right)-\Psi\left((\gamma_L-\gamma_L^{VR})-(\gamma_L^{VR}+\gamma_H)\right)\right\}\cdot\left[e(b)-e^L(b)\right]-\Psi\left((\gamma_L-\gamma_L^{VR})-(\gamma_L^{VR}+\gamma_H)\right)q\left(b-b_A^m\right).$$

Under assumption 4.*(ii)*, the above expression is positive and party *A* prefers the strategy (τ^L, *0*) to (τ^L, *q*). This shows that h^*_A= (τ^L, 0) is the best response to h^*_B= (τ^H, 0). Q.E.D.