

Inequality, redistribution and the allocation of public spending in education: a political-economy approach¹

Debora Di Gioacchino

University of Rome "La Sapienza" (debora.digioacchino@uniroma1.it)

Sergio Ginebri

University of Molise (ginebri@unimol.it)

Laura Sabani

University of Florence (lsabani@unifi.it)

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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 to default on debt 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 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.

JEL: D78; H63; H42 I28

1. Introduction

Public provision of education is usually justified as a (politically acceptable) mean of redistributing income². However, access to education is not homogeneously distributed across social groups. World Bank reports that children from poor households have much less access to schooling, at progressively higher levels, than children from richer families³. Thus 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. His sample includes most of countries with democratic political institutions⁴. 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 facts⁵. We develop a two-period dynamic model of a representative democracy, which incorporates public investment and redistribution, *à la* Besley and Coate (1998 and 2000). In the first period, the incumbent government issues nominal debt to finance a public investment in education and decides how to allocate the expenditure between different education levels. In the second period, differences in agents' bond-holdings (wealth inequality) are combined with differences in income deriving from different levels of productivity (income inequality). Productivity is determined by innate talent and by first period public spending in education. Investment in lower education levels (primary) benefits only low talented individuals, thus reducing income inequality. Investment in higher education levels (tertiary) benefits only high talented individuals, thus increasing inequality.

At the beginning of the second period, a two-party electoral competition is held and probabilistic voting decides the winner⁶. According to her preferences, the elected policymaker decides the parameters of a linear income tax (fiscal policy) which redistributes resources between low and high income individuals and sets the level of debt default (debt redemption policy) which redistributes resources from bond-holders to tax-payers. We show that the credibility of the government's promise to repay the debt strictly depends on which economic issue catalyses the political conflict. Specifically, 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, an equilibrium featuring no default might be observed, with probability one, if the fiscal policy issue is *salient* (i.e. gains from preferred fiscal policy are greater than gains from preferred debt redemption policy) for all but a minority of rich individuals who oppose debt default. Since the investment in primary education reduces income inequality, with respect to wealth inequality, the debt redemption policy might become the *salient* issue for the poorest individuals (in terms of bond-holdings), who are pro-

² Cross-country analyses show that public spending in education accounts, on average, for more than 4.5% of GNP and more than 14% of total government expenditure (data source: various issues of UNESCO Statistical Yearbook).

³ World Development Report, 2003 chs. 2 and 7; see also De Fraja (2004) for a discussion of this point.

⁴ 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.

⁵ For a survey of the related literature refer to the extended version of the paper (Di Gioacchino et al. (2005))

⁶ See Besley and Coate (2000) for a similar description of the political process.

default. In this case the equilibrium might feature, under certain conditions, default with probability one. Thus, in the first period, nobody would buy government bonds and the investment in primary education would not be feasible. The rest of the paper is organised as follows. The model is illustrated in section 2. In section 3 the political process is presented and then the political equilibrium is characterised. Section 4 concludes.

2. The Model⁷

Consider a two-period economy with a continuum of individuals of measure one, indexed by i .⁸ In the first period, agents receive an 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. Let γ^P be the fraction of poor citizens, that is those with $a^i < a$, and $\gamma^R = 1 - \gamma^P$ the fraction of rich citizens, that is those with $a^i \geq a$. Furthermore, according to their talent, individuals can be distinguished into two types- high talented (H) and low talented (L) - of measure $0 < \gamma_k < 1$ with $k = H, L$ and $\gamma_L + \gamma_H = 1$. In the second period each individual supplies one unit of physical labour and talent affects labour productivity. Individuals of type k have a labour productivity equal to e^k with $e^H > e^L$ and $e = \gamma_L e^L + \gamma_H e^H$ is the average productivity. Individuals like only second period consumption, thus, in the first period, they have to save⁹. For analytical tractability the preferences over consumption are described by a linear utility function and for simplicity we posit $U(c) = c$. There are two saving instruments: a sure-return storage technology which earns a gross return $1+r$ for each unit of initial endowment invested and interest-bearing public bonds whose future repayment, however, cannot be guaranteed by the issuing government. We posit that individuals, when facing the same expected yield, have a bias in favour of government bonds and that the government issues bonds so as to satisfy demand. This has the following implications: first, whenever public bonds are issued their expected interest rate (r^e) has to be greater or equal to the storage technology sure interest rate ($r^e \geq r$)¹⁰; second, public debt b is identically equal to aggregate savings a and $a^i \equiv b^i$, where b^i is individual's debt holdings.

There are two parties: party A and party B . All members of party A are low talented and all members of party B are high talented. Both parties contain a mixture of poor and rich individuals. The first period incumbent government recognizes as its constituency one of these two parties and political decisions are taken by the leader of the party in power according to her preferences. Each party chooses the leader that a majority of its members prefer.

We assume that the incumbent government is constitutionally obliged to spend the proceeds of the bonds 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 exclusive¹¹. Public spending in education affects productivity. Specifically, investing in primary education (E_1) raises the productivity of low talented individuals, but has no effect on high talented so that $e^L(E_1) > e^L$ and $e^H(E_1) = e^H$, with

⁷ This is a simplified version of the model in Di Gioacchino et al. (2005).

⁸ This implies that aggregate and average values coincide.

⁹ In the working paper's version of this paper we consider both first and second period consumption decisions.

¹⁰ We assume that the government might renege only on the promise to service the debt. However, qualitative results do not depend on this assumption.

¹¹ For the sake of simplicity, we focus on this extreme case.

$e^L(E_1) < e^H$; on the contrary investing in tertiary education (E_3) raises the productivity of high ability individuals, that is $e^H(E_3) > e^H$ and has no effect on low talented $e^L(E_3) = e^L$. Let $e(E_l)$, denote average income when public investment in education is E_l , for $l=1,3$. In the following, we assume that investment in education is potentially Pareto improving (given available redistributive instruments), that is:

ASSUMPTION 1. $e(E_l) - e > (1+r)b$ for $l=1,3$.

Assumption 1 guarantees *a fortiori* the sustainability of government debt¹² when r is the interest rate promised and actually paid on debt¹³.

At the beginning of the second period, Party A and Party B face an electoral competition. The winning party's leader sets the debt redemption policy and the fiscal policy. The debt redemption policy is described by the choice of a (level of) debt service default $\pi \in [0, q]$ where q is the nominal interest rate promised by the first period (issuing) government. 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 constraint is given by:¹⁵

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

Given the government budget constraint, consumption of the i -th individual of type k is given by:

$$c^{ik}(\tau, \pi) = (1 - \tau) \cdot e^k(E_l) + \tau \cdot e(E_l) + (1 + q - \pi) \cdot (b^i - b) \quad (1)$$

2.1 Political preferences

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. To determine voters' preferences about fiscal policy and about the debt redemption policy, we look at the impact of these policies on individuals' consumption¹⁶:

$$\frac{\partial c^{ik}}{\partial \tau} = e(E_l) - e^k(E_l) \quad \text{and} \quad \frac{\partial c^{ik}}{\partial \pi} = b - b^i \quad (2)$$

From (2) it is immediate to verify that the i -th individual's preferred fiscal policy is $\tau^L = 1$ associated to a lump sum transfer equal to $g = e(E_l) - (1 + q - \pi)b$ if he is low talented, and $\tau^H = 0$ associated to a lump sum tax (negative transfer) equal to $g = -(1 + q - \pi)b$ if she is high talented. Moreover, (2) shows that individual's preferences about debt default depend on the amount of government debt holdings. Those with $b^i \geq b$ (rich citizens) prefer full repayment ($\pi = 0$). On the

¹² Government debt is sustainable when $e(E_l) > (1+r)b$ where r is the interest rate promised and actually paid on debt.

¹³ Below we will show that this is the equilibrium result.

¹⁴ With tax system (τ, g) an individual with pre-tax income $e^k(E_l)$ has a tax bill of $\tau e^k(E_l) - g$.

¹⁵ The interest rate paid on bonds will be zero when $\pi = q$ and equal to q when $\pi = 0$.

¹⁶ 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.

contrary, those with $b^i < b$ (poor citizens) prefer total default on debt service ($\pi = q$)¹⁷. To determine preferences over the investment in education, we maintain the hypothesis that $\pi = 0$, 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. We have the following:

PROPOSITION 1. *Assuming $\pi = 0$, if $e(E_1) = e(E_3)$ then low talented individuals (weakly) prefer investment in primary education and high talented individuals (weakly) prefer investment in tertiary education. **Proof.** Since the two investments in education have the same effects on aggregate production ($e(E_1) = e(E_3)$), from (1) it is straightforward to verify that, when $\pi = 0$ and $\tau = \tau^L$ low talented 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) for all individuals when $q = r$ ¹⁸. On the contrary, when $\pi = 0$ and $\tau = \tau^H$ from (1) it is simple to derive that low talented individuals strictly prefer investment in primary education. Again it is easy to verify that the participation constraint is always satisfied when $q = r$. Analogous results apply to high talented 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.*

3. 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.

3.1 Period two election

At the beginning of the second period an election takes place. 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 talented or the tax rate $\tau^H = 0$ if she is high talented and chooses $\pi = q$ if he is poor and $\pi = 0$ if she is rich. 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 holdings 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

¹⁷ On the basis of the preferences over the two policy instruments, four groups of individuals can be distinguished: $LP = \{i, k | e^k = e^L; b^i < b\}$ $HP = \{i, k | e^k = e^H; b^i < b\}$ $LR = \{i, k | e^k = e^L; b^i \geq b\}$ $HR = \{i, k | e^k = e^H; b^i \geq b\}$

¹⁸ When $q > r$ the participation constraint is surely satisfied only for $b^i > b$.

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 $H(\eta)$. Let ω represents 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. Consequently, given ω , the probability that party A wins is given by $\Psi(\omega)$. 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. $\Psi(\gamma_L - \gamma_H) \in (0,1)$.¹⁹ 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 $h_Z = (\tau_Z, \pi_Z)$ with $Z \in \{A, B\}$. A Nash equilibrium is a couple of policy vectors, $h^*_Z = (\tau^*_Z, \pi^*_Z)$, 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.

3.2 Period two policy choices

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 gain from the preferred debt redemption policy and from the preferred fiscal policy are given, respectively by:

$$|c^{ik}(\tau, 0) - c^{ik}(\tau, q)| = q|b^i - b| \quad \text{and} \quad |c^{ik}(\tau^L, \pi) - c^{ik}(\tau^H, \pi)| = |e(E_l) - e^k(E_l)|$$

We make the following

ASSUMPTION 3. (i) $q|b^i - b| > \max_k |e(E_l) - e^k(E_l)| \quad \forall l$,
when $b^i > 2b \quad \forall q \geq r$.

$$(ii) \frac{\min_k |e(E_l) - e^k(E_l)|}{b} > r \quad \forall l$$

From (i) the gain from the preferred debt redemption policy is always greater than the gain from the preferred fiscal policy for those very rich individuals with $b^i > 2b$. This minority cast their vote firstly looking at a candidate attitude towards debt repayment. On the contrary, (ii) implies that when $r < q < \frac{\min_k |e(E_l) - e^k(E_l)|}{b}$ the majority of the population, those with $b^i \leq 2b$, regard fiscal policy as the *salient* issue and they cast their vote firstly looking at a candidate attitude towards this policy.

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. In the following we assume $q = r$ and we will verify afterwards that this is the equilibrium result.

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

ASSUMPTION 4. For $Z \in \{A, B\}$, $k = \begin{cases} L & \text{when } Z = A \\ H & \text{when } Z = B \end{cases}$ and $-k = \begin{cases} L & \text{when } Z = B \\ H & \text{when } Z = A \end{cases}$

(i)

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

$$(ii) [\Psi(\gamma_k - \gamma_{-k}) - \Psi((\gamma_k - \gamma_k^{JR}) - (\gamma_k^{JR} - \gamma_{-k}))] |e(E_l) - e^k(E_l)| > \Psi((\gamma_k - \gamma_k^{JR}) - (\gamma_k^{JR} - \gamma_{-k})) r(b - b_Z^m)$$

where γ_k^{JR} stands for the measure of individuals of type k with $b^i > 2b$. 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 lose 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 candidate²⁰. 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. As for fiscal policy: τ^L is chosen with probability $\Psi(\gamma_L - \gamma_H)$ and τ^H with the complementary probability. **Proof.** (See Di Gioacchino et al., 2005).*

3.3 Period one policy choices

PROPOSITION 3. *In the first period, given assumption 2, public bonds will be issued at a nominal rate $q = r$ whatever party is in power. Public spending will finance primary (tertiary) education if Party A (Party B) is in power. **Proof.** Given assumption 2 no party has got an interest in promising a nominal rate q greater than r . Then, given proposition 2, bonds will be repaid in equilibrium and so they can be issued; as a result, each party can decide which level of education to finance according to its own preferences.*

Now we relax assumption 3 and we posit the following:

ASSUMPTION 3 bis

$$(i) \quad q |b^i - b| > \max_k |e(E_l) - e^k(E_l)| \quad \forall l, \text{ when } b^i > 2b \quad \forall q \geq r$$

$$(ii) \quad \frac{\max_k |e(E_1) - e^k(E_1)|}{b} < r < \frac{\min_k |e(E_3) - e^k(E_3)|}{b}$$

Now, investment in primary education, by reducing income dispersion around its mean, lessens the conflict over fiscal policy making debt policy salient for the poorest segment of the population that

²⁰ 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 ($\pi = r$), 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).

is pro-default. In this case Proposition 2 does not hold and it is not possible to exclude an equilibrium with total default on debt service.

PROPOSITION 4. *Given assumption 2, 3bis and 4, if $\Psi(\gamma_L - \gamma_H)(e(E_3) - e) \geq (1+r)b$ then, whatever party is in power in period one, bonds are issued with $q=r$. Furthermore, public spending will always finance tertiary education. **Proof.** Available upon request.*

Intuitively, 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. Furthermore, the condition $\Psi(\gamma_L - \gamma_H)(e(E_3) - e) \geq (1+r)b$, guarantees the satisfaction of Party A's participation constraint in expected value.

4. Concluding remarks

The incidence of public spending in education, far from being uniform, appears to be biased in favour of the rich. This paper has presented a model in which this bias is politically determined. The most relevant result is that an equilibrium with investment in tertiary education might be observed even if the constituency of the incumbent government consists of individuals who would benefit most from investment in lower levels of education. This result is based on the recognition that an investment, by altering individual's productive abilities, might lead to changes in preferences for redistribution which make the investment politically unfeasible. Specifically, if investment in primary education lessens income inequality, redistribution through public bonds (wealth) taxation might become an issue politically more relevant than redistribution through income taxation. In this case a poor majority should be expected to implement a large degree of redistribution through bonds taxation. Ultimately, this would destroy the credibility of public bonds repayment whose proceeds, in our model, finance public investment in education. This result helps to explain why the bias in the incidence of public spending in education is more severe in some countries than in others: according to the model, in fact, countries with more unequal distribution of wealth should have a less redistributive manner of spending in education.

References

- Besley, T and S. Coate, 1997, An economic model of representative democracy, *Quarterly Journal of Economics* 112.
- Besley, T. and S. Coate, 1998, Sources of inequality in a representative democracy: a Dynamic Analysis, *American Economic Review* 88(1):139-156.
- Besley, T. and S. Coate, 2000, Issue unbundling via citizens' initiatives, NBER Working Paper Series 8036.
- Birdsall, N., 1997, Public spending on higher education in developing countries too much or too little? *Economic and Education Review* 15.
- De Fraja, G., 2004, Education and redistribution, *Rivista di Politica Economica*, maggio-giugno, pp.3-44.

Di Gioacchino, D., S. Ginebri and L. Sabani, 2005, Inequality, redistribution and the allocation of public spending in education: a political economy approach, Economics and Statistics Discussion Papers 24/05, Università del Molise.

Gradstein, M. 2003, The political economy of public spending in education, inequality and growth, World Bank policy research working paper 3162, November.

Zhang, L. 2002, Income distribution and political economy of allocation of public education spending. Stanford Institute for Economic Policy Research, Discussion paper n. 02-25.

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:

$$E_\eta \left[c_A^m \mid h_A = (\tau^L, 0), h_B = (\tau^H, 0) \right] = (1+q)(b_A^m - b) + \Psi(\gamma_L - \gamma_H) e(E_l) + [1 - \Psi(\gamma_L - \gamma_H)] e^L(E_l)$$

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 $\Psi(\tau^L - \tau^H) > 0$. 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:

$$E_\eta \left[c_A^m \mid h_A = (\tau^H, q), h_B = (\tau^H, 0) \right] = \Psi(\gamma^P - \gamma^R) [e^L(E_l) + b_A^m - b] + (1 - \Psi(\gamma^P - \gamma^R)) [e^L(E_l) + (1+q)(b_A^m - b)]$$

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

$$\begin{aligned} & E_\eta \left[c_A^m \mid h_A = (\tau^L, 0), h_B = (\tau^H, 0) \right] - E_\eta \left[c_A^m \mid h_A = (\tau^H, q), h_B = (\tau^H, 0) \right] = \\ & = \Psi(\gamma_L - \gamma_H) [e(E_l) - e^L(E_l)] - \Psi(\gamma^P - \gamma^R) q (b - b_A^m) \end{aligned}$$

When $q = r$, assumption 4.(i) ensures that 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}):

$$\begin{aligned} & E_\eta \left[c_A^m \mid h_A = (\tau^L, q), h_B = (\tau^H, 0) \right] = \Psi((\gamma_L - \gamma_L^{VR}) - (\gamma_L^{VR} + \gamma_H)) \cdot [e(E_l) + b_A^m - b] + \\ & + \{1 - \Psi((\gamma_L - \gamma_L^{VR}) - (\gamma_L^{VR} + \gamma_H))\} \cdot [(1+q)(b_A^m - b) + e^L(E_l)] \end{aligned}$$

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

$$\begin{aligned} & E_\eta \left[c_A^m \mid h_A = (\tau^L, 0), h_B = (\tau^H, 0) \right] - E_\eta \left[c_A^m \mid h_A = (\tau^L, q), h_B = (\tau^H, 0) \right] = \\ & = \{ \Psi(\gamma_L - \gamma_H) - \Psi((\gamma_L - \gamma_L^{VR}) - (\gamma_L^{VR} + \gamma_H)) \} \cdot [e(E_l) - e^L(E_l)] - \Psi((\gamma_L - \gamma_L^{VR}) - (\gamma_L^{VR} + \gamma_H)) q (b - b_A^m) \end{aligned}$$

When $q = r$, assumption 4.(ii) ensures that the above expression is positive and party A prefers the strategy $(\tau_L, 0)$ to (τ_L, q) . This shows that $h^*A = (\tau_L, 0)$ is the best response to $h^*B = (\tau_H, 0)$.

Proof of proposition 4:

First we have to show that whatever party is in power in period one bonds are issued with $q = r$. This is obvious since, by assumption 2, both parties are interested in paying as little interest as possible and r is the lower bound.

Next we have to show that in the first period, since by assumption 3bis investing in primary education is unfeasible, if party A is in power it prefers to invest in tertiary education rather than spending nothing. If party A invests in tertiary education, its median member's expected consumption in the second period, when $q = r$, is given by:

$$\begin{aligned} & \Psi(\gamma_L - \gamma_H) \{e(E_3) + (1+r)(b_A^m - b)\} + (1 - \Psi(\gamma_L - \gamma_H)) \{e^L + (1+r)(b_A^m - b)\} = \\ & = \Psi(\gamma_L - \gamma_H) e(E_3) + (1 - \Psi(\gamma_L - \gamma_H)) e^L + (1+r)(b_A^m - b) \end{aligned}$$

If party A does not invest in education, no public debt is issued and individuals save by acquiring the sure-return storage technology. In this case, party A median member's expected consumption in the second period is given by:

$$\Psi(\gamma_L - \gamma_H) e + (1 - \Psi(\gamma_L - \gamma_H)) e^L + (1+r)b_A^m$$

Straightforward computation shows that party A prefers to invest in tertiary education rather than spending nothing if and only if:

$$\Psi(\gamma_L - \gamma_H)(e(E_3) - e) \geq (1+r)b$$