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Can democracy educate a society?

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Can Democracy Educate a Society?

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July 2005

Forschungsinstitut
zur Zukunft der Arbeit
Institute for the Study
of Labor

Can Democracy Educate a Society?

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ABSTRACT

Can Democracy Educate a Society?*

We examine whether democratic societies can escape poverty traps. Unrestricted agenda setting with simple majority rules fail to educate a society, because education-enhancing redistribution will not occur. We show that a combination of suitable constitutional rules overcomes this impossibility result: rotating agenda setting and agenda repetition in combination with flexible majority rules or with a tax protection rule.

JEL Classification: D72, H20, H52, I20, O10, O40

Keywords: constitutional design, claims on deductions, flexible majority rules, agenda repetition, poverty traps, child labor

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1 Introduction

Since the fall of the Berlin Wall and the end of the Cold War, there has been ongoing discussion on whether to make democratization and democratic reforms a precondition for foreign aid. Theoretical and empirical investigations have come to contradictory results on the issue of whether democracy pushes growth or not.[1] In this context, we ask whether democracy makes it possible to improve long-term welfare. As an example we use an AK growth model in which human capital accumulation is the source of growth. There exists a poverty trap connected with child labor and, therefore, missing education. Can democracy educate a society that is caught in such a poverty trap? Or is a certain degree of dictatorship necessary to alleviate poverty?

Child labor is a serious problem[2] with adverse consequences not only for the children themselves but for the future of a society as a whole. In many cases, child labor is not due to ignorant parents who do not care about their children. Child labor may very well be in the children's own interests, if the family's survival depends on it. Hence, poverty can be identified as a core cause of child labor. Poverty necessitates child labor, and this child labor prevents the society in question from accumulating human capital, thereby perpetuating the poverty.[3] In principle, such a vicious circle or poverty trap can be overcome. Bell and Gersbach (2001) demonstrate how an adequate, dynamic scheme of taxes and subsidies can lift a society out of such a trap. But a crucial question as yet unanswered is whether such a policy scheme can in fact be implemented in a democracy.

In this paper we address this question and examine the education of a society within a political economy framework. In particular, we ask whether there are constitutional agenda and decision rules that will induce the education of a society over time. Such democratic constitutions are built on two principles (equal voting and agenda rights) and utilize closed voting rules. Our main findings are as follows:

[1] See Petterson (2002), Tavares and Wacziarg (2001), Durham (1999), Barro (1996), Clague et al. (1996), Perotti (1996), Olson (1993), Przeworski and Limongi (1993), Sirowy and Inkeles (1990), or Wittman (1989).

[2] Estimates by the Bureau of Statistics of the International Labor Organization (ILO) say that "in 1995 at least 120 million of the world's children between the ages of five and fourteen years did full-time, paid work". See Basu (1999), p.1083, or, for more details, ILO (1996), ILO (1998), Ashagrie (1998), Ashagrie (1999) or ILO (2000).

[3] Psacharopoulos (1994) found that the potential marginal return of education exceeds the marginal cost in the real world [see also Tilak (1989)]. Thus, developing economies under-investment in education.

(i) A democracy with the simple majority rule and a benevolent but dictatorial agenda setting can educate a society.

(ii) A democracy with equal, unrestricted agenda rights for all citizens and simple majority rules fails to educate the society, and will remain in the poverty trap indefinitely.

(iii) The combination of flexible majority rules, where the size of the required majority depends on tax differences of the redistribution proposal, with a rotating agenda setting and agenda repetition can educate a society. Alternatively, the combination of the simple majority rule with rotating agenda setting, agenda repetition and individual protection from excessive taxation via tax deductions can be applied.

The overall conclusion of our analysis is that there are democratic constitutions that induce literacy and economic welfare. However, there is a variety of political failures that constitutions have to deal with.

The paper is organized as follows. In the next section we survey the related literature. In section 3, we describe the model, which encompasses the technologies of human capital and output production and the behavior of households. In section 4 we explain the tax-and-subsidy scheme for educating a society and develop the political framework. Section 5 demonstrates that a democracy with a dictatorial agenda setting can escape poverty via education. In section 6, we first show that a democracy without constitutional constraints on the agenda setter cannot overcome child labor to escape poverty traps. Subsequently, we offer a variety of constitutional rules that can eliminate political failures, so that societies can, in principle, escape the poverty trap. Finally, we discuss potential political failures in section 7. Section 8 concludes.

2 Literature Review

Our paper draws on different strands of the literature. First, our work is related to the important body of literature on child labor, human capital, and growth. In this field, we refer the reader to Bell and Gersbach (2001), Jafarey and Lahiri (2001), Baland and Robinson (2000), Dessy (2000), Jafarey and Lahiri (2000), Basu (2000), Basu (1999), Swinnerton and Rogers (1999), and Basu and Van (1998). Furthermore, our paper is broadly related

to the political economy literature focusing on redistribution policies. For an overview, see Hochman and Peterson, eds (1974), Drazen (2000), Persson and Tabellini (2000), or Persson and Tabellini (1997). However, most of these investigations deal with transfers from young to old in the social-security context. Gradstein and Justman (1997) offer a political economy for the choice concerning the education system. The agents can choose between subsidies for privately purchased education and free uniform public provision. In contrast to our work, they do not analyze potential sources of political failure and therefore do not offer a *normative* constitutional design proposal, as we do. Additionally, we incorporate the special environment of *developing* economies.[4] Acemoglu and Robinson (2000) propose a "political loser hypothesis", arguing that individuals who have political influence and fear losing it, have an incentive to block changes. They conclude that the nature of political institutions is a crucial element.[5] We examine whether democratic constitutions can induce a society to set up dynamic redistribution schemes in such a way that all individuals are provided at least with basic education and skills.

Grossman and Helpman (1998) argue that, when governments are unable to commit to a course of future redistributive policies, they cannot guarantee to take promises to the young. If the current agenda setter suspects that transfers to the young will be reversed by future politicians, then they will be tempted to cater to the old instead. This might even lead to policies that are detrimental to the young and thus be harmful to growth. They stress that a polity might try to introduce constitutional constraints on the extent of politically motivated redistribution, but that it may be difficult to write a constitution that would distinguish political redistribution from well-intended redistribution. We highlight the fact that appropriate constitutional rules can lead to welfare-enhancing redistribution from the parent generation to the children, and hence to long-term welfare via the accumulation of human capital. But even small deviations from such rules can bring about inefficient redistribution.

Finally, our constructive constitutional economics approach goes back to Buchanan and Tullock (1962). Recent papers on constitutional design focus on optimal majority rules in

[4]See also Bénabou (1996) and Glomm and Ravikumar (1992).

[5]Acemoglu and Robinson (1999) show that asset redistribution such as educational reforms may be used as a strategic decision to consolidate both non-democratic and democratic regimes. Poutvaara (2003) argues that the provision of public education may be of advantage to the middle-aged when they own a fixed factor and the price for this factor will increase due to higher human capital stock.

the context of reforms and public goods provision [see Aghion et al. (2002), Aghion and Bolton (2003), Erlenmaier and Gersbach (1999), Gersbach (2002), Polborn and Messner (2004), Wickström (1986b), Wickström (1984), Young (1995)]. Erlenmaier and Gersbach (1999) propose a so-called flexible majority rule for public good provision where the required majority depends upon the proposal itself. In this paper, we show that flexible majority rules may represent a major institution required for a successful redistribution to attain economic growth and welfare.

3 The Model

We extend Bell and Gersbach (2001) and embed the model in a political-economic setting. In particular, we consider an OLG model in which individuals live for two periods; these periods be labeled childhood and adulthood, respectively. Each generation consists of a continuum of households represented by the interval $[0, 1]$. A household is indexed by i or k, where $i, k \in [0, 1]$. In the basic model, all households are alike and we drop the indices. Each household, or "family", comprises one adult and one child. Hence, we assume that each adult gives birth to one child. Let the portion of childhood devoted to education in period t be denoted by $e_t \in [0, 1]$, the residual portion being allocated to work. Adults spend all their time working.

3.1 The Technologies

Human capital is assumed to be formed in a process that combines child-rearing with formal education in the following way: Let an adult in period t possess λ_t efficiency units of labor, where $\lambda_t \geq 1$ is a natural measure of her human capital. The condition $\lambda = 1$ for the society as a whole can be thought of as state of backwardness. In the course of rearing a child, an activity that is assumed to claim a fixed amount of time, the adult gives the child a certain capacity to build human capital for adulthood. The amount of this contributing factor is assumed to be a fixed fraction, $z \in (0, 1]$, of the adult's own endowment of efficiency units of labor.[6] The adult's gift will not preserve the child from the state of $\lambda = 1$ as an adult, however, unless it is complemented by some formal

[6]The empirical significance of parental human capital was, for instance, documented by Becker and Tomes (1986) or Coleman et al. (1966).

education, in which the basic cultural skills of reading, writing and arithmetic can be learned. On these assumptions, the child's endowment of efficiency units of labor on reaching adulthood at time $t+1$ is given by

$$\lambda_{t+1} = h(e_t)(z\lambda_t) + 1. \tag{1}$$

$h(\cdot)$ is assumed to be a continuous, increasing and differentiable function on $[0,1]$, with $h(0) = 0$.[7] Equation (1) implies that rearing and formal education are both necessary if human capital is to be formed at all in the next generation, i.e., if $\lambda_{t+1} > 1$.

We turn now to the technology for producing output. We consider an aggregate consumption good. Let there be a proportional relationship between output and inputs of labor, measured in efficiency units. Wages are paid according to marginal productivity, wherefore all output will accrue to the household as income.

The child's contribution to the household's income is given as follows: Without any education, the child will supply one efficiency unit of labor at the most, because of the complementarity between the gift received during child-rearing and formal education. It is plausible to assume that the child's efficiency will be somewhat lower on grounds of age alone. To reflect these considerations, let the child be able to supply γ efficiency units of labor at best, $\gamma \in (0,1)$; this upper limit is reached when the child works full-time. The household therefore supplies a total of $[\lambda_t + (1-e_t)\gamma]$ efficiency units of labor to the production of the aggregate good. Hence, the level of output produced by a household that has an endowment of $\lambda_t + \gamma$ and chooses e_t is

$$y_t = \alpha[\lambda_t + (1-e_t)\gamma], \tag{2}$$

where $\alpha \in (0,\infty)$ is the (constant) productivity of an efficiency unit of labor.

[7] Plug and Vijverberg (2001) estimate that 0.65 of the ability effects relevant for school achievements can be attributed to genetic effects like IQ. Of course, in reality the parameter z and the functional form of $h(\cdot)$ will depend both on the IQ and the quality of child rearing and the schooling system.

3.2 The Household's Behavior

Following Basu and Van (1998), we assume that all allocative decisions lie in the adults' hands. We rule out any bequests at death and the possibility of debts,[8] so that (2) is the current real income and is consumed completely. The gift of factor $z\lambda_t$ through rearing is one form of transfer *inter vivos*. A second form is sending the child to school at least part of the time ($e_t > 0$), which is necessary if the child is to enjoy $\lambda_{t+1} > 1$ as an adult. Since current consumption is maximized by choosing $e_t = 0$, it follows that the adult's sense of altruism towards her child must be sufficiently strong for her to choose $e_t > 0$.

For the sake of simplicity, let the child's consumption be a fixed fraction $\beta \in (0, 1)$ of the adult's, the latter denoted by c_t. From (2) we then obtain the family's budget line in the space of (c_t, e_t):[9]

$$(1 + \beta)c_t + \alpha\gamma e_t = \alpha(\lambda_t + \gamma). \tag{3}$$

It will also be useful to define

$$\overline{c}_t(\lambda_t) \equiv \frac{\alpha(\lambda_t + \gamma)}{1 + \beta} \tag{4}$$

and

$$\underline{c}_t(\lambda_t) \equiv \frac{\alpha \cdot \lambda_t}{1 + \beta}\ , \tag{5}$$

which correspond to the adult choosing $e_t = 0$ and $e_t = 1$, respectively. With this preliminary settled, the adult's preferences for consumption and education can be summarized by the optimal choices of e and c, denoted by $e^o(\lambda_t)$ and $c^o(\lambda_t)$, which are continuous in λ_t. Since an increase in λ_t shifts the budget line but leaves the relative price between e_t and c_t unchanged, the solution $e^o(\lambda_t)$ of the adult's problem is the adult's Engel function and its image is the income expansion path. There are two threshold values, λ^S and λ^a, which depend on the preferences of the households. As long as $\lambda_t \leq \lambda^S$, $e_t^o(\lambda_t) = 0$, and as long as $\lambda_t \geq \lambda^a$, $e_t^o(\lambda_t) = 1$. We assume that both goods are non-inferior and therefore that $\frac{\partial e^o}{\partial \lambda_t} > 0$ and $\frac{\partial c^o}{\partial \lambda_t} > 0$ for $\lambda_t \in [\lambda^S, \lambda^a]$.

[8] We assume that it is impossible for an adult to borrow against the future income of the child and thus leave capital markets aside. This can be justified by the lack of knowledge of banks about the ability of the child and associated enforcement problems (adverse selection problem, moral hazard). Furthermore, especially in rural areas, there are no opportunities for adequate borrowing. Hence, our model represents an extreme form of the imperfect capital market in the real developing world. Cf. also Galor and Zeira (1993).

[9] Note that $e \in [0, 1]$. Therefore the budget line has a kink.

Our central assumption is that the "income expansion path" curve, as induced by changes in λ_t, takes the following form:

$$(c_t, e_t) = \begin{cases} (\overline{c}(\lambda_t), 0) & \forall\ \lambda_t \leq \lambda^S; \\ (c_t^o, e_t^o) & \forall\ \lambda_t \in (\lambda^S \lambda^a); \\ (\underline{c}(\lambda_t), 1) & \forall\ \lambda_t \geq \lambda^a. \end{cases} \tag{6}$$

where the locus (c_t^o, e_t^o) is monotonically increasing in λ_t or in adult's income for all $\lambda_t \in (\lambda^S, \lambda^a)$. A deeper foundation of such expansion paths (in terms of preferences of adults) is given in Bell and Gersbach (2001).

3.3 Dynamics

We now return to (1) in the light of (6). We obtain

$$\lambda_{t+1} = \begin{cases} 1 & \forall\ \lambda_t \leq \lambda^S; \\ zh(e_t^o(\lambda_t))\lambda_t + 1 & \forall\ \lambda_t \in (\lambda^S, \lambda^a); \\ zh(1)\lambda_t + 1 & \forall\ \lambda_t \geq \lambda^a. \end{cases} \tag{7}$$

The following qualitative results are immediately obtained: In view of the (plausible) assumption that $\lambda^S > 1$, it follows from the first part of (7) that the state of backwardness ($\lambda = 1$) is a locally stable equilibrium (poverty trap). The dynamic system in (7) may exhibit different patterns.[10] However, the specific pattern is not decisive for our results. Therefore we concentrate on the growth case, where $zh(1) > 1$ and $h(e_t^o(\lambda_t))\lambda_t$ is convex in λ_t within $[\lambda^S, \lambda^a]$.[11] This establishes an AK model.[12] Thus, in this case, the dynamic system has exactly two steady states, namely $(\lambda^*, e^o(\lambda^*))$ and $(1, 0)$, where the former is unstable. The assumptions imply $\lambda^a > \lambda^*$. The dynamics of our model are illustrated in figure 1.

[10] Cf. Bell and Gersbach (2001).

[11] Our analysis is the same if $h(e)\lambda_t$ is concave in $[\lambda^S, \lambda^a]$ and the function for λ_{t+1}, equation (1), intersects just once with the 45°line. In all other cases, the results can easily be transferred from our analysis with small supplements, so that our analysis is robust.

[12] Assuming $zh(1) < 1$ would establish a growth model with a neoclassical frame where, for high enough levels of human capital, the per household income tends to a high level steady state instead of long-term growth. In this setting our constitutional design findings are the same.

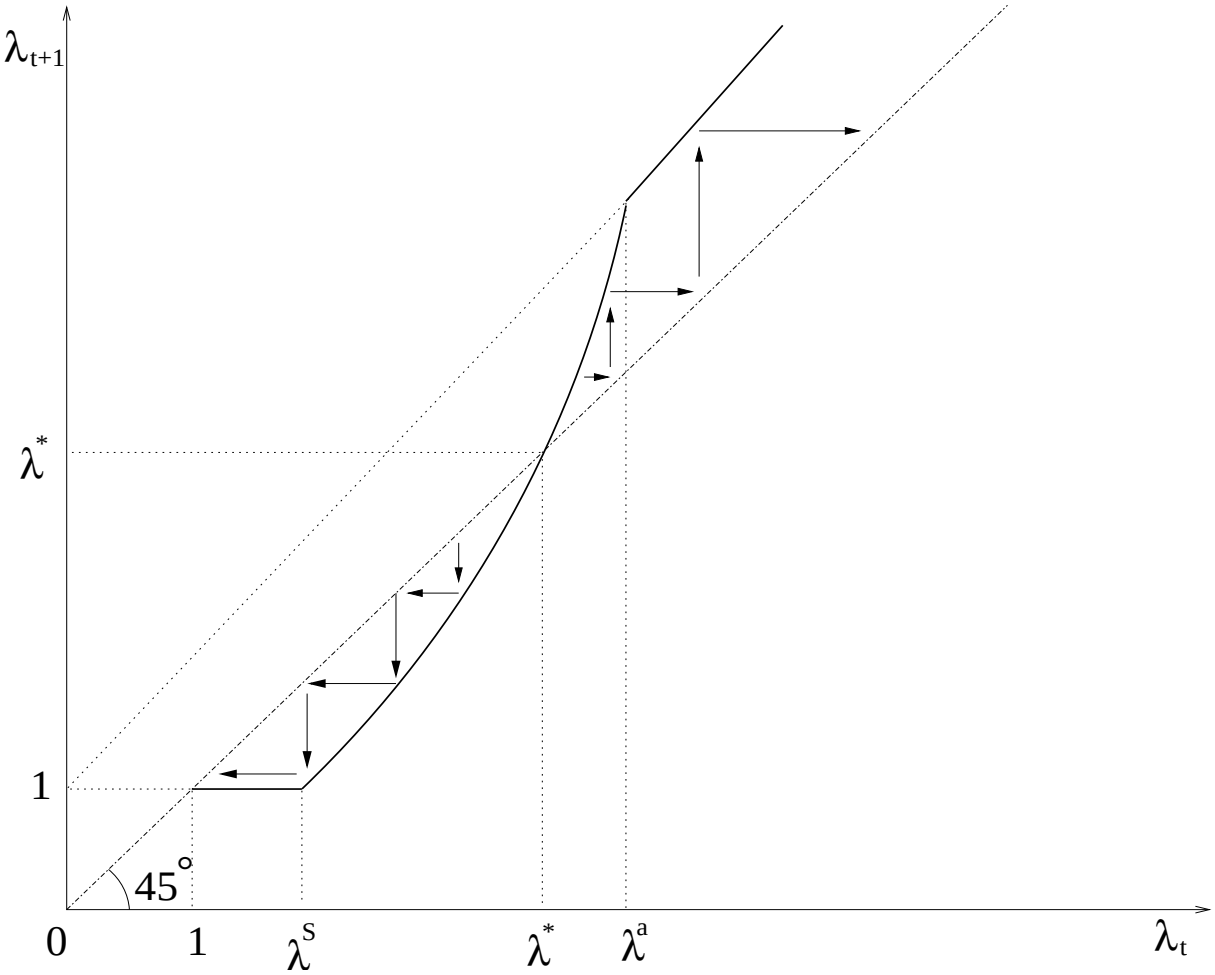

Figure 1: Human capital technology

4 Politics and Democracy

4.1 Redistribution via Taxation and Subsidization

We assume that the whole society is initially ($t = 0$) in a state of poverty, i.e. $\lambda_0 = 1,\ e = 0$ and $c = \overline{c}(1) = \alpha\frac{1+\gamma}{1+\beta}$. The broad objective of policy is to educate the whole society to enable all its members to escape from this backwardness.

The instruments for this purpose are taxation and subsidization. We assume that only the income of adults is subject to taxation.[13] Alternatively, the government could levy taxes on household income $\alpha(\lambda + (1-e)\gamma)$ but as child labor is largely unofficial taxation

[13]This can be justified by the ease of tax evasion in connection with child labor income. It is unlikely that allowing for taxation of household income would change the main results of the paper. Restricting taxation on adult's income makes child labor more attractive, however.

is *de facto* impossible. As only the adult's income determines the education choice of the household, our results shall be robust. So let $\tau_t^i(\alpha\lambda_t^i)$ denote the tax levied in period t on the income $\alpha\lambda_t^i$ of the adult in household i. At the beginning of each period t, some fraction δ_t of the population, $\delta_t \in [0,1]$, will be subsidized from the ensuing tax revenue. We use $s_t^i(\alpha\lambda_t^i)$ to denote the subsidy a household i will receive in period t if the adult has income $\alpha\lambda_t^i$. We define s^a as the subsidy a household in a state of backwardness needs in order to achieve a human capital level of λ^a in the following period. Hence, for a household that is not taxed s^a is given by the implicit equation:

$$zh(e^o(\alpha + s^a)) + 1 = \lambda^a. \tag{8}$$

Note that s^a only exists if $zh(1) + 1 \geq \lambda^a$. We denote the net income of household i in period t, measured in units of output, by w_t^i.

$$w_t^i = \alpha\lambda_t^i + \alpha(1 - e_t^i)\gamma + s_t^i(\alpha\lambda_t^i) - \tau(\alpha\lambda_t^i) \equiv w_t^{ia} + \alpha(1 - e_t^i)\gamma, \tag{9}$$

where w_t^{ia} denotes the net disposable income generated by the adult of household i in period t. The tax burden (or negative subsidy transfer) is defined by

$$\upsilon_t^i(\alpha\lambda_t^i) \equiv \tau(\alpha\lambda_t^i) - s_t^i(\alpha\lambda_t^i). \tag{10}$$

Since the adult chooses e_t^i based on the household's potential full income $\alpha\lambda_t^i - \upsilon_t^i(\alpha\lambda_t^i) + \alpha\gamma$, or, equivalently, since $\alpha\gamma$ is constant, based on w_t^{ia}, the evolution of human capital accumulation and educational choice follows the same logic as in equation (7) and is given by

$$\lambda_{t+1}^i = \begin{cases} 1 & \forall\ w_t^{ia} \leq \alpha\lambda^S; \\ zh(e_t^{io}(w_t^{ia}))\lambda_t^i + 1 & \forall\ w_t^{ia} \in (\alpha\lambda^S, \alpha\lambda^a); \\ zh(1)\lambda_t^i + 1 & \forall\ w_t^{ia} \geq \alpha\lambda^a. \end{cases} \tag{11}$$

Moreover, the optimal educational choice $e_t^{io}(w_t^{ia})$ is monotonically increasing in adult income w_t^{ia}, with $e_t^{io}(\alpha\lambda^S) = 0$ and $e_t^{io}(\alpha\lambda^a) = 1$.

Although, in the end, only the net tax $\upsilon_t^i(\alpha\lambda_t^i)$ is relevant for household i, the distinction between taxation and subsidization will be essential in illustrating the workings of different policies.[14] For reasons of efficiency, we assume that a household is either taxed or subsidized.

[14] Using the definition of υ_t^i, human capital accumulation in (11) can be rewritten as:

$$\lambda_{t+1}^i = \begin{cases} 1 & \forall\ \lambda_t^i \leq \lambda^S + \frac{\upsilon_t^i}{\alpha} \\ zh(e_t^{io})\lambda_t^i + 1 & \forall\ \lambda_t^i \in (\lambda^S + \frac{\upsilon_t^i}{\alpha}, \lambda^a + \frac{\upsilon_t^i}{\alpha}) \\ zh(1)\lambda_t^i + 1 & \forall\ \lambda_t^i \geq \lambda^a + \frac{\upsilon_t^i}{\alpha} \end{cases}$$

Since households in a state of backwardness have few resources, we assume that there is a subsistence level $(1+\beta)c^{sub}$ for an adult-child household which must be ensured under all circumstances. Otherwise there is the risk that severe problems of morbidity and even mortality will result from taxation. The taxation of a household i living in a state of backwardness is therefore assumed to be constrained by:

$$\alpha\lambda_t^i - \tau_t(\alpha\lambda_t^i) + \alpha\gamma \geq (1+\beta)c^{sub}.$$

In particular, the tax must fulfill the following condition:

$$\tau_t(\alpha) \leq \alpha(1+\gamma) - (1+\beta)c^{sub} \equiv \tau^{sub}, \tag{12}$$

where it is plausible that τ^{sub} is small, since households with $\lambda_t = 1$ may already be close to the subsistence level c^{sub}. To formulate the budget constraints of the society as a whole, we reinterpret the indexation of households as a real valued function on $[0,1]$, assigning every household its human capital in a particular period. Then total government revenues in period t are denoted by R_t. The budget constraint in a period t is given by:

$$R_t = \int_0^1 \tau_t(\alpha\lambda_t(i), i)\, di \;\geq\; \int_0^1 s_t(\alpha\lambda_t(i), i)\, di\ . \tag{13}$$

Requiring a balanced budget in each period, we exclude capital market-financed subsidies for education. It is obvious that a society that can definitely be educated without access to capital markets can be educated with access to them. So we analyze a worst-case scenario.

Note that the education level of a supported household does not necessarily increase after subsidization. This dynamic issue depends crucially on the productivity of the human capital technology. Thus, only if the technology is productive enough will the level of the household's education be weakly monotonically increasing over time, that is, only then we have $e_{t+1} \geq e_t$, for all t after subsidization. Otherwise the subsidy-induced human capital formation of the child cannot substitute for the loss of the transfer. Hence the household's income decreases and brings about a drop in the education level in $t+1$. If this drop is too strong, the household cannot escape the poverty trap and we only observe a temporary improvement. This will definitely happen if $zh(1) + 1 \leq \lambda^*$. The human capital technology is sufficiently productive to generate a non-decreasing choice of schooling if $\alpha zh(1) \geq \overline{s}$.

4.2 The Political Economy Framework

Buchanan and Tullock (1962) view public choice as a two-stage process. At the first, constitutional stage proposed constitutions have to face the Wicksellian unanimity or consensus test [see also Wicksell (1896)]; this unanimity requirement serves as the basis of justification and is the ultimate criterion of efficiency [cf. van den Hauwe (1999), p. 612]. At the second, legislative stage, the individuals decide on actual politics, given the "rules of the game" stated by the constitution agreed upon in the first stage. In this paper, we state constitutions and analyze how society decides on education policy, given the stated constitution.

All constitutional rules which we will propose below warrant that no particular subset of households is systematically favored. *A priori*, all alike adults are fully uncertain about their status in the future and therefore fulfil the characteristic of a *veil of uncertainty*, invented by Buchanan and Tullock (1962). Buchanan and Tullock's work then suggests that the individuals unanimously agree on constitutional principles that ensure the education for the society as a whole. Hence, we assume that the constitutions that we will propose below will be accepted unanimously at the constitutional stage.[15]

At the legislative stage, we consider the case of secret ballots in a *direct democracy* with a voting population consisting of the parent-generation. Within the legislative process behavior is usually constrained by agenda, agenda setting, agenda setter, campaign, decision and voting rules. The totality of all these rules is fixed in a democratic constitution, denoted by C. The project proposal and its financing scheme represent an agenda. *Agenda rules* may restrict the set of admissible agendas. *Agenda setting rules* determine how the agenda setter is to be found, and possible *agenda setter rules* constitute constraints on the agenda setter. *Decision and voting rules* describe how the society decides upon a proposal and when it is adopted. A proposal will be called *constitutional* if none of the rules stated are violated. We assume that each voter has the same voting and agenda rights, i.e., every individual has the same chance of determining the agenda for a given period and the decision depends solely on the number of votes.

For the moment, we consider the simplest democratic process and leave the agenda setting

[15] In practice, the idea of a veil of uncertainty must be modified. The availability of *exit options* in constitutional deliberation can substitute for a veil of uncertainty. Cf. Lowenberg and Yu (1992).

stage unspecified. We assume that setting an agenda does not involve any costs, and that a tax-and-subsidy proposal, denoted by $P_t = \{\tau(\alpha\lambda_t^i), s(\alpha\lambda_t^i)\}_{i=0}^1$ will be approved if at least half of the population support it, i.e., the political process is governed by the simple majority voting rule, labelled MV. In doing so, we apply a closed rule, i.e. amendments are not possible.

- *Majority voting rule* **(MV):** If a proposal receives a majority of $m = \frac{1}{2}$ of the citizens, it passes legislation.[16] Otherwise the status quo prevails.

Helpman (1995) stresses that, although direct democracy is rarely applied, majority voting via direct democracy is a good approximation for outcomes in representative democracy as the results are reasonably close.

Moreover, we restrict the set of allowed proposals to one that satisfies the governmental budget constraint with the agenda rule BB.

- *Balanced budget* **(BB):** A constitutional proposal has to satisfy a balanced budget, i.e.

$$\int_{i=0}^{1} \upsilon_t(i)di = 0, \quad \forall\ t.$$

A weaker condition would be the requirement that aggregate subsidies must not exceed aggregate tax revenues.

Referring to the voting behavior, voter i supports proposal P_t, if $s(\alpha\lambda_t^i) > 0$ and rejects it, if $\tau(\alpha\lambda_t^i) > 0$. However, if $s(\alpha\lambda_t^i) = \tau(\alpha\lambda_t^i) = 0$, then the household will be indifferent between supporting and rejecting the proposal. For simplicity, we assume the following tie-breaking rule to cope with this indifference:

- **TR**: Voter i supports the proposal P_t if

$$s(\alpha\lambda_t^i) = \tau(\alpha\lambda_t^i).$$

The tie-breaking rule represents a standard assumption about voting behavior to break indifferences. Given the tie-breaking rule TR, and since assuming that a proposal either

[16] It is generally assumed that a proposal will be adopted if *more* than half of the citizens support it [see, e.g., Mueller (1979) or Bernholz and Breyer (1994)]. We could replace $m = \frac{1}{2}$ by $m = \frac{1}{2} + \epsilon$. For sufficiently small ϵ, we obtain the same results as with $m = \frac{1}{2}$.

levies taxes on individuals (including a zero tax rate) or provides subsidies, a proposal is accepted[17] if, and only if, the share of individuals not being taxed, denoted by ϕ_t, is at least $\frac{1}{2}$.[18] We use T to denote the number of periods a democratic society needs to educate itself.

5 Democracy with a Benevolent Agenda Setter

We now investigate whether such a simple democratic process will enable the education of a society if the sequence of proposals or agendas is determined by an institution or government with the sole objective of educating the society. The institution is completely informed about technologies and the preferences of households. This institution exists without democratic legitimation and persists indefinitely as a dynasty. Nevertheless, policy needs the required majority stated in the constitution. Such a democracy is called a *democracy with dictatorial agenda setting* (**DA**). Suppose that the government wants to educate the society in T periods. On average, in each period there is a fraction $\frac{1}{T}$ of the society that must be subsidized in such a way that those households will choose full education for their child, i.e. $e^o(\alpha + s_t)$ equals unity. This equation implicitly determines the necessary subsidy level, denoted by $\overline{s}$. $\overline{s}$ can be obtained directly by setting $\overline{s} = \alpha\lambda^a - \alpha$.

We consider the growth case, $zh(1) \geq 1$. Accordingly, we must distinguish three possible cases. The level of human capital an individual possesses in the period immediately after receiving $\overline{s}$, $zh(1)+1$, may be below, above, or equal to λ^*. If it is above λ^* it may be below or above λ^a. We restrict our attention to proposals that either tax or subsidize a single adult. For a proposal to be accepted in period t, the maximum fraction of the society to be taxed is $\frac{1}{2}$ because otherwise a majority would vote against the tax-and-subsidy policy. Thus, $1 - \phi_t \leq \frac{1}{2}$. We construct a sequence of proposals P_t, $(t = 0, 1, ..., T-1)$, such that the whole society can be educated. In the following, the number of subsidized individuals in period 0 is denoted by δ_0. Similarly, δ_t denotes the share of subsidized individuals in a period t. We turn first to the case $zh(1) + 1 > \lambda^a$, and obtain:

[17]Note that we assume independence of political preferences, i.e., the utility of households does not depend on inequality emerging in the society.

[18]Our tie-breaking rule states a worst-case scenario as the alleviation of child labor will reduce the labor supply which, in turn, increases the wages of the adults, i.e., even if $\tau_t^i - s_t^i > 0$ it can be rational to vote in favor of an education program.

Proposition 1

A democracy with a constitution C{BB, DA, MV} can educate a society in finite time, i.e. $T < \infty$, if $zh(1) + 1 > \lambda^a$.

The proof can be found in the appendix. The essential point of Proposition 1 is that a benevolent agenda setter can shift taxation and subsidization over time such that poor parents send their children to school and wealthier parents are protected from excessive taxation. A concrete example of the case $T = 3$ is given in the appendix. It is easy to extend our analysis to the case $\lambda^* < zh(1) + 1 \leq \lambda^a$. Families, once subsidized, pass λ^a in finite time if they are not taxed. We now denote the minimal number of periods by r, so that $\lambda_{t+r} > \lambda^a$ when $\lambda_t = zh(1) + 1$, and households are not taxed in the meantime. Then our argument applies for all periods $0, r, 2r, ..., (N-1)r$,[19] and hence the time needed to educate the society is again finite. We summarize our observation in the following corollary.

Corollary 1

A democracy with a constitution C{BB, DA, MV} can educate a society in finite time, i.e. $T < \infty$, if $zh(1) + 1 > \lambda^*$.

If we only consider one-time subsidization of a single household, and $\lambda^* \geq zh(1) + 1$, then the society is caught in the poverty trap or in the medium steady state at λ^*. Since the growth-rate of human capital is non-positive after one-off subsidization, the human capital of a lineage will decline toward backwardness over time, or –without the possibility of taxing these households– remain at λ^*. Multiple subsidizing of a single lineage, however, will accumulate the household's human capital to a level higher than λ^* in, say, l periods. After l periods, a single household crosses the threshold value λ^*, and Corollary 1 applies for all periods $0, l, 2l, ..., (N-1)l$. We obtain

Corollary 2

A democracy with a constitution C{BB, DA, MV} can educate a society in finite time, i.e. $T < \infty$, even if $zh(1) + 1 \leq \lambda^*$.

Summarizing, a benevolent agenda setter can educate the society in any case.

[19] Here, N means the number of periods needed to educate a society in the case where $zh(1) + 1 > \lambda^a$.

6 Democratic Agenda Setting

We now turn to democratic agenda setting. The first step is to determine the rule by which the agenda setter is chosen. We do not consider electoral competition in the Downsian sense of probabilistic voting. We are interested in the situation where there is an agenda setter who makes a proposal that requires the constitutionally stated majority to pass legislation. Hence we specify a simple agenda setter selection:

- *Random Agenda Setting* (**RA**): In each period, every single adult has the same chance to make a proposal. Hence, the agenda setter of a period t is selected randomly from the population of adults.

Though random selection might appear unusual today, this kind of democracy goes back to the historical roots of Athenian democracy.[20] Random selection is commonly seen as a decision rule that is generally accepted by individuals.[21] Selecting the agenda setter by a lot represents a *neutral* recognition rule, that is, a rule that does not bias the result in favor of any member of society.[22]

6.1 The Impossibility Result

The only agenda setting restriction we impose in this subsection is that the agenda setter has to respect the subsistence level, the balanced budget rule, and the requirement of a simple majority.

Proposition 2
A democracy with C{BB,RA,MV} can ***not*** *educate a society in finite time, i.e.* $T = \infty$.

Proof : If individual i is recognized as agenda setter in a particular period t, he will tax half of the population as highly as possible in order to create the highest possible subsidies for himself. Then a winning majority is still ensured. Since there are no restrictions other

[20] See Parkinson (1958) and Rousseau (1762), Book IV, Chapter III (cf. Mueller et al. (1972), p. 60). Aristotle emphasized that it lies in the nature of democracy that decision makers are chosen by lot (cf. Bleicken (1991), pp. 183-184, 187, 192).

[21] Recent literature in political science and political economy also apply random selection of agenda setter (see, for instance, Baron and Ferejohn (1989); Harrington (1986)). See also Mueller et al. (1972, 1973); Dahl (1970); Bohm (1971); Ward (1969).

[22] Cf. Baron and Ferejohn (1989), p. 1183.

than retaining a consumption level $(1+\beta)c^{sub}$, half of the population entitled to vote is taxed: $\tau_t(\alpha\lambda_t) = \alpha\lambda_t - (1+\beta)c^{sub}$. It is rational to tax former subsidized households most heavily because they can pay the highest taxes. Therefore, children of taxed households will not be educated at all, no matter how well-educated the parents were. Thus, in *each* single period t for all time, half of the children do not attend school, i.e. $T = \infty$.

□

Proposition 2 is a dynamic variant of the general characteristic of majority voting rules to the effect that majorities can expropriate minorities ("tyranny of the majority"). Bernholz and Breyer (1994), for example, show that the majority voting rule fails to produce just income distribution since the resulting majority exploits the rest of the society.[23] Mueller (1979) deals with Riker's hypothesis that, in a zero-sum redistribution game, the majority voting rule implies one minimum-winning coalition, and another, one vote smaller, that is used as a losing coalition that pays.[24]

In our context, this generates a large degree of dynamic inefficiency, since in the future every educated household will belong to a minority and therefore the society cannot be educated.[25] Accordingly, Hayek (1960) and Buchanan and Tullock (1962) already deal with the necessity of super-majority rules to prevent excessive social costs.

6.2 Democratic Constitutions

In the last subsection, we saw that constraints on redistribution proposals are necessary to fully educate a society under random agenda setting. In the following subsections, we show how these problems can be solved in democracies.

One constitutional principle suitable for overcoming the problem of excessive taxation could be to establish a *taxpayer protection rule*. Such protection has been broadly discussed in constitutional law in the context of the protection of property rights. Moreover,

[23] See Bernholz and Breyer (1994) subsection 11.3.

[24] See Mueller (1979), chapter 6, section E, pp. 116-117; Riker (1962).

[25] One might ask whether it is our OLG set-up of $u(c_t, e_t)$ that causes the impossibility. In an infinite living dynasty, an agenda setter might pursue a strategy of educating households so as to be able to tax them more heavily in the future. Such a strategy requires, first, that the adult in office cares about potential revenues that can be earned by descendants in the far distant future. Second, it requires that this household stays in office for generations or expects to be in office when the returns from this strategy are realized. This is not very plausible.

such taxpayer protection is ubiquitously provided by the existence of exemption levels and upper limits on marginal tax rates.[26] In our context, the educated citizens must be protected to ensure that an income of $\alpha\lambda^a$ is guaranteed. Therefore, we have to add a second[27] exemption to ensure full-time schooling of former beneficiaries. In our model, this allowance must be contingent on the education level of the household. We define[28]

- *Claim on Education Allowance* $(\mathbf{CEA}[\mathcal{E}])$: Each household that can prove that it has completed basic education, that is $\lambda_t^i \geq \lambda^a$, has a claim on an education allowance amounting to $\mathcal{E} > 0$.

An alternative instrument is the *flexible majority rule*, introduced by Erlenmaier and Gersbach (1999) and Gersbach (2004) for the provision of public goods. Under flexible majority rules the required majority depends on the proposal itself.[29] In our context, we will use flexible majority rules to limit the taxation of educated households so that they do not relapse into poverty. We define

$$\tau_t^{max} = \max_{i \in [0,1]} \tau_t^i.$$

- *Threshold flexible majority rule* $\left(\mathbf{TFM}[\tau_t^{max}, \overline{\tau}]\right)$: The required majority $m(\tau_t^{max}, \overline{\tau})$ jumps from $\frac{1}{2}$ to 1 if any household i is taxed higher than threshold tax $\overline{\tau}$ stated in the constitution:

$$m_t(\tau_t^{max}, \overline{\tau}) = \begin{cases} \frac{1}{2} & \text{if} \quad \tau_t^{max} \leq \overline{\tau}; \\ 1 & \text{if} \quad \tau_t^{max} > \overline{\tau}. \end{cases}$$

I.e., as soon as a citizen is adversely taxed (i.e., taxation prevents full-time basic schooling) the constitution demands a super-majority, if $\overline{\tau}$ is set correspondingly. To ensure that

[26] In Germany, for instance, the so-called "Halbteilungsgrundsatz" says that at most half of the income can be taken away by governmental policy as a whole. In 1983, the German Constitutional Court (Bundesverfassungsgericht) declared tax burdens that are excessive and would basically impair wealth to be unconstitutional because of Article 14 of the German Basic Law [see Grundgesetz (1949) or Basic Law (1949)]. Cf. Reding and Müller (1999), chapter 14. For public finance issues see also Rosen (2002).

[27] The first exemption guarantees the subsistence level.

[28] At the constitutional stage, the taxpayer protection is only abstract in practice, while the detailed size of allowance is written in specific laws. For laws are much easier to change, the protection from excessive taxation is weaker. Therefore, the constitutional rule ought to be stated more precisely in constitutions than it is the case today.

[29] Flexible majority rules can be used for achieving at least two targets. First, it can be utilized for applying the result of Wickström (1986b), which is that decisions of varying importance establish varying optimal majorities (see also Wickström (1986a) and Tullock (1986)). Second, they can be utilized for protecting certain groups like minorities. Thus the proposal seizes the idea of super-majority rules.

not a single household is taxed adversely and falls back into poverty, we must demand unanimity. Thus, our TFM rule combines the advantages of the majority rule and the unanimity rule and, at the same time, alleviates their difficulties in finding collective decisions.[30]

Moreover, we introduce agenda setting by coalitions representing interest groups or parties, for instance. For simplicity, suppose that Δ is equal to $\frac{1}{N}$ for some natural number N. We define

- *Rotating agenda setting* (**RoA**): A fraction $\Delta > 0$ of the adult society has the power to set the agenda once within $N = \frac{1}{\Delta}$ periods.

I.e., lineages that have set the agenda in a particular period in time-interval $[0, t]$, are excluded from the agenda setting process in all future periods. In practice, this means that the number of allowed reelections is restricted, possibly to zero.[31] In ancient Athens[32] or the ancient Roman Republic[33], for instance, the constitutive principle of democracy was giving over power from citizen to citizen. Bleicken (1991), p. 192, finds that, due to this rotation rule, more or less all Athenians participated in the town's sense-making process in the course of time. This is exactly the idea we follow. Given the RA rule, the fixed fraction Δ is selected randomly from the set of lineages which still have the right to set the agenda. It follows that the only period in which a household can expect to enjoy a subsidy is the period in which it has been selected to determine the agenda. Basically, it is plausible for a coalition of agenda setters to distribute tax revenues equally among themselves, and we will assume this in the following.[34] We additionally assume that $s_t = \frac{R_t}{\Delta}$ is at least as high as $\overline{s}$. Otherwise, the size of Δ must be reduced.

[30] Cf. Gersbach (2004), p. 2.

[31] Our RoA rule differs from the typical reelection restriction insofar that it prohibits not just reelections of single human beings but of families.

[32] Cf. Bleicken (1991), pp. 183-184

[33] Cf. Bleicken (1989), p. 128, regarding the principle of annuity.

[34] We do not explicitly analyze how the group decides upon an agenda; it suffices to know that they will maximize tax revenues for the group and divide them equally. For instance, one might think of the group as representing a party, an interest group, or simply one person.

6.2.1 When the Technology of Human Capital is Sufficiently Productive

If $zh(1)+1 \geq \lambda^a$ a beneficiary will accumulate human capital at rate $zh(1)-1-1/\lambda_t > 0$. Accordingly we obtain:

Proposition 3
A democracy with C{BB, RA, CEA[$\mathcal{E}$], RoA, MV}, $\mathcal{E} = \alpha\lambda^a$ and $\Delta < \frac{R_t}{s_t}$ can educate a society in finite time, i.e. $T < \infty$, if $zh(1) + 1 \geq \lambda^a$.

Proof : The CEA[$\mathcal{E}$] guarantees a non-taxable income of $\alpha\lambda^a$ as soon as a household has received subsidy $\overline{s}$ in a former period. $\Delta < \frac{R_t}{s_t}$ ensures full-time schooling of coalition members' children. The RoA rule in turn ensures that each single interest group, and hence each household, will be in office (and receives the required transfer $\overline{s}$) within $t = 0, 1, 2, \ldots, T-1$. Because of $zh(1) + 1 \geq \lambda^a$, the education achieved in the period of transfer is sustainable. Given our tie-breaking rule TR, group Δ leaves half of the society untaxed to form a winning coalition. We have $\Delta = \frac{1}{N}$. Hence, after $T = N < \infty$ periods we have $N\Delta = 1$ and the society is educated in finite time.

□

Alternatively, we can utilize the TFM rule instead of the CEA rule and obtain:

Proposition 4
A democracy with C{BB, RA, TFM($\tau_t^{max}, \overline{\tau}$), RoA}, $\overline{\tau} = min\{\tau^{sub}, \alpha(zh(1) + 1 - \lambda^a)\}$ and $\Delta < \frac{R_t}{s_t}$ can educate a society in finite time, i.e. $T < \infty$, if $zh(1) + 1 > \lambda^a$.

The proof is given in the appendix. The upshot of the propositions 3 and 4 is that an allowance or a flexible majority rule both prevent adverse taxation, so that educated lineages cannot fall back into illiteracy. Note that $\mathcal{E}$ and $\overline{\tau}$ are determined by exogenous parameters.[35]

Flexible majority rules can also be more sophisticated. Suppose we define different thresholds for the subsidized households and for those in a state of backwardness. Given $zh(1) + 1 > \lambda^a$ there are solely households with $\lambda_t = 1$ or $\lambda_t > \lambda^a$. Accordingly one

[35] An issue not pursued here is how to determine $\overline{\tau}$ so as to minimize the time T a society needs to educate itself.

can state:

$$\overline{\tau}_t^i = \begin{cases} \overline{\tau}_1^i = \alpha(\lambda_t^i - \lambda^a) & \forall\ i \quad \text{with} \quad \lambda_t^i > \lambda^a; \\ \overline{\tau}_2^i = \tau^{sub} & \forall\ i \quad \text{with} \quad \lambda_t^i = 1; \end{cases} \tag{14}$$

Then the flexible majority rule is given by:

- *Flexible majority rule with multiple thresholds* (**mTFM**$(\tau_t, \overline{\tau}_t^i)$)[36]:

$$m_t(\tau_t^i, \overline{\tau}_t^i) = \begin{cases} \frac{1}{2} & \text{if} \quad \tau_t^i \leq \overline{\tau}_t^i \quad \text{for all} \quad i \in [0,1]; \\ 1 & \text{if} \quad \tau_t^k > \overline{\tau}_t^k \quad \text{for any } k \in [0,1]; \end{cases} \tag{15}$$

  for all $t = \{0, 1, 2, \ldots, T-1\}$.

Under such flexible majority rules, the necessary majority is $\frac{1}{2}$ if the agenda setter does not tax any former subsidized household higher than $\overline{\tau}_2^i = \alpha(\lambda_t^i - \lambda^a)$ and any not-yet-subsidized household higher than $\overline{\tau}_1^i = \tau^{sub}$. Otherwise the constitution levies the unanimity requirement upon the agenda setter. In period 0, the society is poor and there is no major tax potential. But the tax potential is increasing due to education. So far this would only increase the transfer per coalition member. If the size of coalition Δ is increased correspondingly, however, the mTFM rule allows to educate the society faster than the TFM rule.[37] Suppose, for instance, we extend the agenda setting rule mTFM as follows:

$$\Delta_t = \frac{R_t^{max}}{\overline{s}},$$

where R_t^{max} is the maximum tax revenue for the case with no unanimity requirement, i.e., the thresholds $\overline{\tau}^i$ are not crossed for any i. Consequently, the corresponding T will be lower than using the TFM rule, because R_t^{max} should increase with time: the society is educated earlier. This means that the government ought to start with its transfers in small regions, and when the tax revenue augments continue with larger regions.

6.2.2 When the Technology of Human Capital is Not Sufficiently Productive

In the case where $zh(1) + 1 < \lambda^a$, Propositions 3 and 4 do not hold. The schooling technology is not productive enough to generate the required income required for full-time schooling in the period following the subsidy payment, if a subsidy is paid only one-time. As former beneficiaries should be taxed according to formula $zh(1) + 1 - \lambda^a$,

[36] $\tau_t = (\tau_t^i)_{i=0}^1$ and $\overline{\tau}_t = (\overline{\tau}_t^i)_{i=0}^1$.

[37] Note that the inequality within a generation would also be lower.

taxation is impossible. It follows that a yet-subsidized household cannot be taxed as long as it has not crossed λ^a, and the children of the last agenda setting coalition will not be educated full-time, unless $zh(1) + 1 = \lambda^a$.

As long as $zh(1)+1 > \lambda^*$, the once subsidized households do not fall back into the poverty trap, if they are not taxed so strongly that the adult income would fulfill $\alpha\lambda_t^i - \tau_t^i \leq \alpha\lambda^*$. The education allowance would save such households from taxation. In case of TFM, we have $\overline{\tau} < 0$; this could be understood as a claim on subsidies. The modification that negative $\overline{\tau}$ means that taxation is prohibited would also save the household from taxation, without any claim on subsidies via $\overline{\tau} < 0$. In both cases the households would accumulate human capital and cross threshold λ^a over time. Consequently, in principle, our results of the previous section hold. However, as we assume that $e_t^i = 1$ for all households is socially optimal, the policy maker should go on with subsidizing these households.

If $zh(1) + 1 \leq \lambda^*$, full-time schooling in one period does not allow escape from the poverty trap area $[1, \lambda^*]$. Consequently repeated subsidization is required. Therefore the previously derived constitutions do not enable to escape the poverty trap. Hence, we need further constitutional principles. We use r to denote the minimum number of periods a continuously subsidized household needs to accumulate human capital higher than λ^a, when beneficiary households receive subsidy s_t in each period. Suppose $s_t = \overline{s}$. Then, scalar r is given implicitly by:[38]

$$\min_{r>0} \left\{ \lambda_{t+r}^{s_t} = \sum_{k=0}^{r} \{zh[e(\alpha + s_t)]\}^k > \lambda^a \right\},$$

Accordingly, we introduce:

- *Agenda repetition* (**AR(r)**): The agenda adopted in period t has to be repeated r times in the subsequent periods. Therefore, an agenda setting coalition is only selected every r periods.

We obtain:

Corollary 3

A democracy with C{BB, RA, CEA[$\mathcal{E}$], RoA, MV, AR(r)} and $\mathcal{E} = \alpha\lambda^a$ can educate a society in finite time, i.e. $T < \infty$.

[38] Of course, the size of subsidy s_t could be lowered from period to period, because the level of human capital of subsidized households increases. However, such an adjustment is not part of the adopted agenda.

Corollary 4

A democracy with C{BB, RA, TFM($\tau_t^{max}, \overline{\tau}$), RoA, AR(r)} and[39]

$$\overline{\tau} = min\{\tau^{sub}, \alpha(\lambda_{t+r}^{s_t} - \lambda^a)\},$$

can educate a society in finite time, i.e. $T < \infty$.

Note that corollaries 3 and 4 hold irrespective of whether $zh(1) + 1$ is larger or smaller than λ^a.

Proof of corollaries 3 and 4: The constitutional rule AR(r) transplants the idea of multiple subsidization, explained for Corollary 2, into a constitution: the subsidized households receive transfers as long as they do not have an income higher than $\alpha\lambda^a$. Propositions 3 and 4, therefore, apply for all periods $0, r, 2r, \ldots, (T-1)r$.[40, 41]

□

It is clear that agenda setters may propose unconstitutional policies and even find a simple majority. Nevertheless, the application of such a policy is inadmissible. Hence, it is essential that an efficient constitutional court enforces the constitutional rules. Citizens that are excessively taxed must be able to sue for due consideration of their claim on educational allowance or, if rule TFM is violated, for a ruling that the policy has been established unconstitutionally. That is, there has to be a functioning institutional system that forces the agenda setter to accept the democratic principles and the "rules of the game" fixed in the constitution. This leads us to the discussion of potential political failures in the next section.

7 Sources of Political Failure

Our model identifies a variety of causes why the education of a society may fail. In this section, we discuss these and additional potential failures.

[39] Time index t represents the period in which an agenda set has been accepted.

[40] Here T means the number of periods needed to educate a society in the case of $zh(1) + 1 \geq \lambda^a$.

[41] In the case of $\lambda^* < zh(1) + 1 < \lambda^a$, it would be sufficient to introduce a stop-over condition, ensuring that the dynamic agenda setting process is interrupted as long as $\lambda_t^i < \lambda^a$ for any any-time subsidized household.

(i) Expropriation of educated people

Adverse taxation of educated adults may take place, inducing those households to cut back on education; then human capital may revert to a state of backwardness. We have shown that allowances and threshold flexible majority rules solve this problem. As soon as an agenda setter suggests an adverse tax scheme, the constitution requires unanimous agreement which, *de facto*, makes such taxation impossible to implement (case of rule TFM). Alternatively, an educational allowance may protect the required income for schooling from taxation, so that adverse taxation is impossible.

(ii) Ineffective subsidization

The subsidies poor adults receive may be too low to escape from the poverty trap. One reason for this failure is a too unproductive technology of human capital, so that even full-time schooling is not sufficient to escape the locally stable poverty trap. An agenda repetition rule can solve this problem. It ensures that a new agenda must wait until all supported households enjoy full-time schooling of their children; in the meantime, the old agenda is repeated so that the beneficiaries form the required human capital to leave poverty behind sustainably.

If an agenda is set by a coalition of individuals, ineffective subsidization can also occur within the coalition. For instance, there can be asymmetric bargaining power within the coalition. It is also conceivable that ineffective subsidization occurs because the agenda setter tries to buy votes and therefore only pays small subsidies. Finally, ineffective subsidization may occur because the government wants to maximize school attendance rates, neglecting the fact that sustainable success will only be achieved if the quality and the quantity of schooling per pupil is sufficient. Households will only escape poverty if they accumulate human capital of a size $\lambda^* + \epsilon$. In a short-term sense, however, a myopic policy can be advantageous for a politician, since he satisfies more voters (or international donors).

(iii) Incomplete subsidization

There may be households that never enjoy any subsidization. One constitutional rule preventing incomplete subsidization is the rotating agenda setting, which means that each household has the right to set agenda only once in time. In practice, the number

of allowed re-elections of households or interest groups can be limited. Hence, every household will be part of an agenda setting coalition at some point in time and, therefore, enjoy subsidies.

(iv) Taxation is impossible

All citizens may already live at or below the subsistence level, so that there is no taxable capacity to finance subsidies. In this case, the society is dependent upon foreign aid. Otherwise there is no escape from poverty. This foreign aid requirement, however, is only needed for an initial impetus to launch the tax-and-subsidy process.

(v) Quasi-monopolistic agenda setting

There may exist fixed costs for setting an agenda that represent an unsurmountable hurdle for some or even most of the citizens. This means that, although all people have the constitutional right to set an agenda, only a few rich households are actually in a position to do so. As a result, the same households always get subsidized, because they establish agenda setter dynasties. This problem can be explicitly dealt with by rotating agenda setting, i.e., by limiting the number of re-elections allowed. Additionally, the agenda setting costs must be covered by state intervention.[42]

(vi) Inequality Aversion, Fairness, Envy, and Negative Reciprocity

Unequal treatment of equal households can cause conflicts and thereby the failure of the policy. If certain policies are considered as "unfair", then individuals might vote against them. Consequently, required redistributions to escape poverty traps might not be feasible in democracies. Bell and Gersbach (2001) analyzed policy programs where the social planner has the constraint to educate the society subject to an upper bound on the degree of inequality the society is prepared to tolerate. They show that this constraint restricts the redistribution possibilities and thus increases the time needed to educate the society (*inequality-speed dilemma*). If the maximum tolerated inequality of incomes is too small, then the education of the society is impossible, because paying the minimal required subsidy and levying taxes to finance these transfer demands a minimum of inequality. In our political framework, a voter i will reject a proposal P_t if it involves a degree of inequality above individual i's threshold of tolerance. The agenda setter

[42] In the German constitution, for instance, Artikel 48 states, among other things, that all members of parliament receive sufficient payment. Cf. Basic Law (1949) or Grundgesetz (1949).

has to respect this inequality aversion, for otherwise her agenda will not pass legislation. However, for democratic constitutions cannot dictate on citizens how to vote, it is difficult to find constitutional rules that could prevent this source of political failure without being undemocratic. Hence, it might be necessary to implement a certain degree of dictatorship. To cope with the issue of inequality and fairness, single households within one area should not be treated too differently, but all households shall be supported equally within one region, whereas another is taxed.[43] One could also offer a lottery in the following way: the agenda proposal states only the size of the subsidy and tax, contingent to the particular type of household (tariff). Who is taxed or subsidized is determined by a lottery. I.e., one states that the next drawn household have to pay the type-depended tax stated by the proposal or that it receives the type-depended subsidy; for instance, drawing households that are taxed and those that are subsidized could alternate. This procedure repeats until all households are drawn. As long as the lottery is fair,[44] people might accept such a procedure. Accordingly, arising inequality is likely not to be considered as being unfair. However, it is not clear which consequences this rule involves. Hence this issue has to be investigated in future research.

There are a variety of other conceivable sources for political failure that do not directly stem from our model. At the most extreme level, corruption and rent-seeking by powerful clans or other interest groups may make it impossible to subsidize poor people sufficiently. At the other end, overcoming the incidence of child labor and achieving education might be in short-term conflict with other policy objectives. Furthermore, schooling does only generate growth if the quality of schooling is high enough and individuals actually have the opportunity to transform their increasing human capital into an increasing income. That is, the supply side of schooling services has to be developed before subsidization. Moreover, we have, by construction, neglected the demand for human capital in our model. The incomes of the poor will only increase with the level of skills if firms actually demand these higher skills.[45]

[43] Unequal treatment can be justified in practice by using ability tests: the uneducated with the highest potentials obtain subsidies. This would increase the efficiency of the program.

[44] As long as the lottery's probability of drawing a particular name is equal for all names, this lottery will be considered as being fair.

[45] This leads us to the coordination problem described by Dessy and Pallage (2001).

Eventually, ineffective enforcement of constitutional rules can be a source of failure, because of a lack of incentive to behave constitutionally.[46] Hence, it is essential that conformity to each single constitutional rule is monitored by an institution and enforced by courts that function effectively. That is, an efficient working judiciary is imperative. Besides the enforcement of the constitution, the protection of the essential rules is a crucial point. If a majority wants to exploit a minority, this majority might want to change the constitution. Hence, it is important to ensure that constitutional changes require super-majorities.[47]

8 Conclusions

We have shown that even when democracy works well, i.e. without corruption or organized rent-seeking, the design of the constitution is crucial in deciding whether a society can escape poverty traps or not. Unconstrained agenda setting and simple majority rules will leave the society in poverty. However, appropriate democratic rules can enable a society to change things for the better.

Our model could and should be extended in various directions. For instance, allowing for parties and interest groups more explicitly would bring the model closer to real-world situations. Moreover, we have neglected the fact that a deficient supply of schooling services or a lack of demand for higher skills may be a major barrier to education. These and other extensions, as set out in section 7, could be useful for a better understanding of the way in which democratic institutions need to be constructed to help a society to extricate itself from a state of backwardness. Another interesting point for future research is that many developing countries pass through an interdependent dual process of economic and political transition and transformation: economic success leads to political stability and *vice versa*. However, there also might be certain trade-offs. Eventually, extending human preferences to the possibility of inequality-aversion, reciprocity, social concerns *etc.*, as the results of experimental economics suggest, may also highlight new, interesting sources of the failure that the constitutional design has to cope with.

[46] Grossman and Helpman (1998) stress that, even if a constitution is well written, they fear that politicians will soon become adept at circumventing its constraints in order to foster their political ends.

[47] In the German constitution [see Grundgesetz (1949) and Basic Law (1949)], for instance, Article 79 (2) establishes a protection mechanism and Article 79 (3) even prohibits changes of certain rules.

A Technical Appendix

A.1 Proofs

Proof of Proposition 1: Since all households are at a human capital stage $\lambda = 1$ in period $t = 0$, we consider the following agenda in $t = 0$:

$$P_0 = \begin{cases} s_0^i & = & \overline{s} & \forall & i \in [0, \delta_0]; \\ v_0^i(\alpha\lambda^i) & = & 0 & \forall & i \in (\delta_0, \frac{1}{2}]; \\ \tau_0^i(\alpha\lambda^i) & = & \tau^{sub} & \forall & i \in (\frac{1}{2}, 1]. \end{cases} \tag{16}$$

The tax revenue of the first period, R_0, amounts to:

$$R_0 = \frac{1}{2}\tau^{sub} = \frac{1}{2}[\alpha(1+\gamma) - (1+\beta)c^{sub}]$$

δ_0 is given by $\frac{\tau^{sub}}{2\overline{s}}$, so that the budget is balanced. We denote the share of individuals that has already been subsidized in the past and will be taxed in period t ($t \geq 1$) by f_t^{as}. Taxation of these individuals will be $\tau_t = \alpha\lambda_t - \alpha\lambda^a$, so that they still choose full education for their children. The fraction of the population still in a backward state and taxed by τ^{sub} in period t is denoted by $f_t^{b\tau}$.

In the second, and in all subsequent periods, a proposal will only be accepted if $f_t^{as} + f_t^{b\tau} \leq \frac{1}{2}$. The tax revenue in period t is given by $R_t = f_t^{as}\alpha(\lambda_t - \lambda^a) + f_t^{b\tau}\tau^{sub}$. On our assumption $zh(1) + 1 > \lambda^a$ and given a benevolent agenda setter, it is always possible that the tax revenue from a proposal accepted by the majority will be positive and amount to at least:

$$R_t \geq \frac{1}{2} min\left\{\alpha(zh(1)+1) - \alpha\lambda^a, \tau^{sub}\right\} \tag{17}$$

Therefore, in every period t, the share of subsidized individuals is bounded from below by:

$$\delta_t \geq \frac{min\left\{\alpha(zh(1)+1) - \alpha\lambda^a, \tau^{sub}\right\}}{2\overline{s}} \tag{18}$$

Since the expression on the right hand side is greater than 0, the time required to educate the society is

$$\frac{2\overline{s}}{min\left\{\alpha(zh(1)+1) - \alpha\lambda^a, \tau^{sub}\right\}},$$

at the most, and thus finite.

□

Proof of Proposition 4: Since the impossibility result was caused by adverse taxation of households already having received support, a solution using flexible majority rules must avoid such agendas. Hence, we define the threshold taxation $\overline{\tau}$ in the flexible majority rule as follows:

$$\overline{\tau} = min\{\tau^{sub}, \alpha(zh(1) + 1 - \lambda^a)\}. \tag{19}$$

Recall that τ^{sub} is the highest taxation allowed for households in a state of backwardness, and that $\alpha(zh(1) + 1 - \lambda^a)$ is the highest tax burden for an already subsidized household that does not endanger full-time schooling in the future. Note that, since Δ is comparably small, the agenda setters' subsidy fulfills $zh\big(e^o(\alpha + s_t)\big) = zh(1)$. Hence, under the condition $zh(1) + 1 > \lambda^a$, TFM$(\tau_t^{max}, \overline{\tau})$ will guarantee sustainable, full-time education for the offspring of households that have set an agenda.[48] Knowing the tie-breaking rule TR, the coalition of agenda setters will leave half of the society untaxed in order to form a winning coalition. They will use all tax revenues for themselves. We construct the flexible majority rule as follows:

$$m_t(\tau_t^{max}, \overline{\tau}) = \begin{cases} \frac{1}{2} & \text{if} \quad \tau_t^{max} \leq \overline{\tau}; \\ 1 & \text{if} \quad \tau_t^{max} > \overline{\tau}; \end{cases} \tag{20}$$

where $m_t(\tau_t^{max}, \overline{\tau})$ denotes the required majority depending on the maximum tax rate levied on the households. Since $\Delta = \frac{1}{N}$, after $T = N < \infty$ periods we obtain:

$$N\Delta = 1.$$

As re-nominations are not allowed (rule RoA) the society will be educated in a finite span of time.

□

A.2 The Case T=3

In this section we turn to a concrete example and discuss the agenda setting designed to educate the society within three periods. To speed things up under a democratic regime, it may not be necessary to subsidize households so that they choose full education *immediately*. Therefore, the government may pay lower subsidies: $0 < e_t^o(\alpha + s_t^i) < 1$.

[48] In reality, the fraction Δ could be lowered so that there is just one adult in office.

In the example, we consider the growth case where $zh(e(\alpha + s_t^i)) + 1 > \lambda^*$. Since the minimum coalition forming a majority is $\frac{1}{2}$, $\phi_t \geq \frac{1}{2}$ for all $t \in [0, T-1]$.

We make two simplifications. First, we describe the algorithm with proposals P providing identical subsidizing of households in period 0.[49] A second simplification is the constraint that better-educated individuals will be taxed before taxes are levied on households that are either less well-educated or in a state of backwardness. Then, first-period taxation is given as:

$$\tau_0^i = \begin{cases} 0 & \forall \quad i \in [0, \frac{1}{2}]; \\ \tau^{sub} & \forall \quad i \in (\frac{1}{2}, 1]. \end{cases} \tag{21}$$

The tax revenue in period $t = 0$ amounts to $R_0 = \int_0^1 \tau_0(i)\, di = \frac{1}{2}\tau^{sub}$. The winning coalition allows subsidization for a fraction δ_0 of the population. The subsidy per household in $t = 0$ is given by:

$$s_0^i = \begin{cases} \frac{\tau^{sub}}{2\delta_0} & \forall \quad i \in [0, \delta_0]; \\ 0 & \forall \quad i \in (\delta_0, 1]. \end{cases} \tag{22}$$

The budget is balanced by construction. The program in $t = 0$ causes human capital accumulation:

$$\lambda_1^i = \begin{cases} zh(e(\alpha + s_0^i)) + 1 & \forall \quad i \in [0, \delta_0]; \\ 1 & \forall \quad i \in (\delta_0, 1]. \end{cases} \tag{23}$$

From our assumption that better-educated individuals are taxed before less educated or uneducated individuals it follows that all households subsidized in $t = 0$ are taxed in every period except period 0. Note that these households have to be taxed in such a way that, in spite of the continuous taxation, they will reach full education in $T = 3$ periods. The

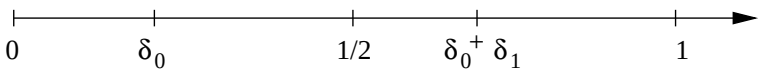

Figure 2: The subsidized fractions of the society

fraction $(1 - \delta_0)$ still remains in a state of backwardness at the end of period $t = 0$. In period $t = 1$ a further portion of the society, δ_1, is subsidized. The situation is illustrated in figure 2. Once again, just half of the households are taxed in order to create a winning majority coalition. Since ϕ_1 equals $\frac{1}{2}$, the sum of x_1 (the part of fraction δ_2 being taxed)

[49] We thus exclude the possibility of paying higher subsidies to some households in period 0 in order to create a potentially higher tax base in the future.

and δ_0 has to be $\frac{1}{2}$, and we obtain:

$$f_1^b(\delta_0) = \frac{1}{2} - \delta_0. \tag{24}$$

Therefore, the distribution of the tax burden is:

$$\tau_1^i = \begin{cases} \tau_1^{\delta_0} & \forall \quad i \in [0, \delta_0]; \\ \tau^{sub} & \forall \quad i \in (\delta_0, \frac{1}{2}]; \\ 0 & \forall \quad i \in (\frac{1}{2}, 1]. \end{cases} \tag{25}$$

The resulting total tax comes to $R_1(\delta_0) = \int_0^1 \tau_1(i)\ di = (\frac{1}{2} - \delta_0)\tau^{sub} + \delta_0 \tau_1^{\delta_0}$. For the second period, we divide the fraction δ_1 of the society into two groups. The parents of both groups are subsidized so that in period $T = 3$ their offspring will enjoy full education. But since the fraction $(\frac{1}{2} - \delta_0)$ must be taxed in period 2, it is necessary to pay a higher subsidy to these households than to the untaxed ones. Therefore,

$$s_1^i = \begin{cases} 0 & \forall \quad i \in [0, \delta_0]; \\ s_1^1 & \forall \quad i \in (\delta_0, \frac{1}{2}]; \\ s_1^2 & \forall \quad i \in (\frac{1}{2}, (\delta_0 + \delta_1)]; \\ 0 & \forall \quad i \in ((\delta_0 + \delta_1), 1]; \end{cases} \tag{26}$$

where $s_1^1 > s_1^2$. The policy causes human capital accumulation in $t = 2$:

$$\lambda_2^i = \begin{cases} zh(e(\alpha\lambda_1^i - \tau_1^{\delta_0}))\lambda_1^i + 1 & \forall \quad i \in [0, \delta_0]; \\ zh(e(\alpha + s_1^1)) + 1 & \forall \quad i \in (\delta_0, \frac{1}{2}]; \\ zh(e(\alpha + s_1^2)) + 1 & \forall \quad i \in (\frac{1}{2}, \delta_0 + \delta_1]; \\ 1 & \forall \quad i \in (\delta_0 + \delta_1, 1]. \end{cases} \tag{27}$$

Balancing the budget requires

$$R_1(\delta_0, \delta_1, s_1^1, s_1^2) = (\frac{1}{2} - \delta_0)s_1^1 + ((\delta_0 + \delta_1) - \frac{1}{2})s_1^2. \tag{28}$$

At the beginning of $t = 2$, fraction $(1 - \delta_1 - \delta_0)$ is still in a state of backwardness. The sum $\delta_0 + \delta_1 + \delta_2$ must equal one, because the intention is to educate society fully in $t = 3$. Therefore, the government has to subsidize all the rest, $\delta_2(\delta_0, \delta_1) = (1 - \delta_1 - \delta_0)$, up to the income level necessary to bear λ^a in the very next period, i.e. $s_2 \equiv s^a$:[50]

$$s_2^i = \begin{cases} 0 & \forall \quad i \in [0, (\delta_0 + \delta_1)]; \\ s^a & \forall \quad i \in ((\delta_0 + \delta_1), 1]. \end{cases} \tag{29}$$

[50]Recall that the corresponding subsidy, s^a, is given implicitly by $\lambda^a = zh(e(\alpha + s^a)) + 1$. Note that as long as $zh(1) + 1 < \lambda^a$, there is no subsidy s^a and the society cannot be fully educated within 3 periods.

To finance these subsidies, fractions δ_0 and $(\frac{1}{2} - \delta_0)$ are taxed adequately in $t = 2$:

$$\tau_2^i = \begin{cases} \tau_2^{\delta_0} & \forall \quad i \in (0, \delta_0]; \\ \tau_2^{\delta_1^1} & \forall \quad i \in (\delta_0, \frac{1}{2}]; \\ 0 & \forall \quad i \in (\frac{1}{2}, 1]. \end{cases} \tag{30}$$

Again, the restriction $(1-\delta_0-\delta_1)s^a = \delta_0\tau_2^{\delta_0} + (\frac{1}{2}-\delta_0)\tau_2^{\delta_1^1}$ is taken into account. If $T = 3$ is a solution of the considered policy problem, the human capital accumulation must fulfill:

$$\lambda_3^i = \begin{cases} zh(e(\alpha\lambda_2^i - \tau_2^{\delta_0}))\lambda_2^i + 1 \geq \lambda^a & \forall \quad i \in [0, \delta_0]; \\ zh(e(\alpha\lambda_2^i - \tau_2^{\delta_1^1})\lambda_2^i + 1 \geq \lambda^a & \forall \quad i \in (\delta_0, \frac{1}{2}]; \\ zh(e(\alpha\lambda_2^i))\lambda_2^i + 1 \geq \lambda^a & \forall \quad i \in (\frac{1}{2}, (\delta_0 + \delta_1)]; \\ zh(e(\alpha + s^a)) + 1 = \lambda^a & \forall \quad i \in ((\delta_0 + \delta_1), 1]. \end{cases} \tag{31}$$

Hence, the exogenous benevolent agenda setter must set the agenda with respect to balanced budgets, which we have solved by construction. Second, the tax-and-subsidy scheme has to be such that no period's taxation is too high in the sense that the taxed household will not reach the human capital of λ^a in period T, given its taxation and subsidization over all periods. Using the definition of υ in equation (10), a general form of condition (31) is:

$$\lambda_3^i(\upsilon_0^i, \upsilon_1^i, \upsilon_2^i) = zh[\alpha\lambda_2^i(\upsilon_0^i, \upsilon_1^i) - \upsilon_2^i] \ \lambda_2^i(\upsilon_0^i, \upsilon_1^i) + 1 \geq \lambda^a \quad \forall \ i \ \in [0..1], \tag{32}$$

with

$$\lambda_2^i(\upsilon_0^i, \upsilon_1^i) = zh[\alpha\lambda_1^i(\upsilon_0^i) - \upsilon_1^i]\lambda_1^i(\upsilon_0^i) + 1; \tag{33}$$

$$\lambda_1^i(\upsilon_0^i) = zh[\alpha - \upsilon_0^i] + 1. \tag{34}$$

Whether or not there exists a solution for $T = 3$ depends upon the tax potential the agenda setter is facing and on the productivity of the schooling system. If it is too low, the policy's time horizon must be prolonged, but there will be a solution $T = n < \infty$ as we have shown. A simple example for a solution $T = 3$ is $\delta_t = \frac{1}{3}$ and $s_t = \frac{3\tau^{sub}}{2}$ for all $t = \{0, 1, 2\}$ if $zh(e(\alpha + \frac{3\tau^{sub}}{2})) + 1 \geq \lambda^a + \tau^{sub}$.

A noteworthy result of this example is that as soon as $\lambda^* < zh(1) + 1 < \lambda^a$, the tax-and-subsidy policy cannot educate the society within three periods; however, the system's inherent growth ensures the success of the education program within finite time.

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