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AN ECONOMIC RATIONALE
FOR PUBLIC EDUCATION:
THE VALUE OF COMMITMENT

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Abstract

This paper offers an explanation for the widespread phenomenon of uniform public schooling, which is viewed here as a way for the government to precommit itself to restraints on future income redistribution. Such precommitment is likely to enhance accumulation of human capital, to bolster economic growth, and, under certain circumstances, to constitute a preferred choice for a majority of voters.

Keywords: Public Education; Human Capital Accumulation; Commitment

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1. Introduction

Public financing of private goods and services whereby the government undertakes the obligation to finance provision of a certain uniform level of these goods to every citizen is commonplace in many countries in the areas of health care, social security and, in particular, education.¹ Education is widely viewed as a communal responsibility, and both its financing and substance are controlled to a large extent by the state. In most Western countries, the state provides at least ten years of schooling, attendance is compulsory, and the curriculum is fairly uniform across schools.² Correspondingly, the economic literature has produced several theories to explain the widespread phenomenon of public education. The standard explanations focus on positive externalities, credit constraints, equity concerns, etc. In addition, there are sociological rationalizations for public education such as creation of social cohesion and conformity and instilling social norms and common values. Lott, 1990, and, more recently, Kremer and Sarychev, 1998, elaborate along these lines.

The prevalence of public education may appear surprising in light of the greater degree of flexibility of private education which allows each individual to tailor education purchases according to his particular taste. Since individuals differ in their demand for education, uniform public schooling may seem to be inefficient. Indeed, it would seem *prima facie* that positive spillovers of human capital as well as credit constraints could be more effectively dealt with by subsidizing private spending on education, rather than by providing uniform public schooling. Although public schooling may have distributional

advantages for the poor, who are provided with the same educational opportunities as the rich while paying less, it is difficult to defend on efficiency grounds.

Nevertheless, in this paper I argue that private financing of education can be an inferior public choice independent of any distributional considerations, provided that the current government representing the parents is unable to precommit the next generation to a restrained redistributive policy. Private education leads to greater income variability in the children generation implying, in turn, larger future income redistribution chosen by the relatively poor median voter. Consequently, in anticipation of such distortive redistribution, the parents tend to underinvest in the education of their children. In contrast, public education generates a more equal income distribution for the children, implying smaller future redistribution and hence a better incentive for the parents to invest in education. Thus, the system of public education is likely to generate faster accumulation of human capital and is shown to be preferable from the viewpoint of a majority of parents to the alternative of a private education regime.³

This paper is related to the extensive literature on time inconsistency which started with Kydland and Prescott's, 1977, seminal paper.⁴ In particular, in the context of optimal taxation, Fischer, 1980, has shown that the fear of expropriation causes capital to be under-accumulated when precommitment on tax policy is impossible. Subsequent literature has studied the mechanisms through which such precommitment can take place: reputation building by the policy maker,⁵ delegation of policy making power,⁶ and different types of constitutional restraints.⁷ Relatedly, in the context of the political economy of international trade, Rodrik, 1996, advanced the hypothesis that societies sometimes choose inefficient methods of redistribution in order to limit future

redistribution; Acemoglu and Robinson, 1996, interpreted the significant expansion of the franchise which took place in Western countries in the late 19th-early 20th century as a means to commit to future redistribution thereby minimizing the likelihood of an insurgency; and Persson and Tabellini, 1990, argued that election of a conservative banker may be an effective way to control inflation. None of these papers, however, deals explicitly with human capital accumulation and with the role of public education as an effective precommitment device.

The plan of the paper is as follows. Section 2 outlines the model, which then is analyzed in section 3. Further discussion and extensions are offered in sections 4 and 5 respectively, and section 6 concludes with some brief remarks.

2. Outline of the basic model

Consider an economy populated by a unit measure of households, each consisting of a parent and a child. The parents plan for their two-period life horizon and are assumed to be altruistic toward their children so that, in particular, parent i derives utility from his own private consumption, c_{i1} , and from his offspring's utility. The latter is derived from the offspring's consumption, which, in turn, is determined by her net income, y_{i2} . We will assume, without loss of generality, that an offspring's utility is equivalent to her income. All parents have the same preferences and differ solely in their incomes, y_{i1} . The distribution of parents' income is denoted F , is assumed twice differentiable with a positive support in the interval $[a, b]$, $0 < a < b$, and is typically skewed so that the average income (Y_1) exceeds its median (y_{m1}). The preferences are given by

$$(1) \quad U(c_{i1}, y_{i2})$$

This utility function is assumed to satisfy the standard monotonicity and concavity assumptions, and the Inada conditions; in addition, we also assume homotheticity although this is only necessary for some of the results.

The child's gross income, z_{i2} , is assumed to be determined by the quality of her human capital, h_{i2} :

$$(2) \quad z_{i2} = h_{i2}$$

Human capital, in turn, is assumed to depend linearly on the amount a parent invests in his offspring's education, which is determined from the parent's budget constraint as follows:

$$(3) \quad y_{i1} = c_{i1} + h_{i2}$$

The relationship between the educational investment of the parents and the income of their children is obtained through the government redistributive policies in conjunction with the education regime. In each period the relevant policy is determined by the vote among the adult population, so that the parents vote in the first period and the children vote in the second period.

Under *private education*, in the first period the parents determine individually the level of educational investment, which in turn determines their offsprings' quality of human capital and, subsequently, gross income. Under *public education*, all individuals are provided with a uniform education level which is financed by an education tax, T , levied on every individual parent. (We assume lump sum taxation in order to minimize other, distributional advantages of public education; obviously, the more progressive the taxes are, the better off are the poor majority of parents under public education.) The amount of spending on education per child, thus his level of human capital and gross income therefore is:⁸

$$(4) \quad z_{i2} = h_{i2} = T$$

It should be stressed again that this modeling disregards many realistic features of public education which would bias public opinion even further towards it, and it allows us to

focus solely on its commitment value. An important feature of public education thus conceived which distinguishes it from other means of government intervention, such as subsidization of private schooling, for example, is that it minimizes the differences in the human capital of the children.

The net income of the children is then dependent in both cases on the next period redistributive policy. We assume for simplicity that the latter is captured by a single parameter θ from the unit interval, which is set by the second period government so that the relationship between the gross and the net income is as follows:

$$(5) \quad y_{i2} = [(1-\theta)z_{i2} + \theta Z_2] A(\theta)$$

where Z_2 is the average gross income of the children. The productivity parameter $A(\theta)$ captures the excess burden of a redistributive policy and is a decreasing function, $A'(\theta) < 0$. Redistribution can adversely affect productivity through a variety of channels, for example, by affecting labor supply or by impairing the incentives to conduct inventive activities. Thus, a larger value of θ implies more redistribution from the rich to the poor; furthermore, this redistribution also has an adverse effect on everyone's income. The redistribution scheme represented by equation (5) can be conceived as being composed of a lump sum transfer financed by a proportional tax, which also has a "leaked bucket" component.

The game consists of three stages and the timing of events is as follows. In the first, the constitutional stage, the parents collectively choose the education regime – public or private. Then, given this choice, educational decisions within the chosen system are made. Specifically, if public education is the first stage choice, then the parents collectively determine the amount of public spending on education; otherwise, if private education were chosen, each parent would determine the amount of schooling for her offspring. The above two stages take place in the first period and the choices made lead to the determination of the second period gross incomes. Finally, in the third stage of the game, which occurs in the second period, the children vote on the extent of income

redistribution, and the outcome of this vote determines net income, hence consumption of each child.

3. Analysis

We study the time consistent equilibrium of the game starting with the determination of the redistribution policy by the children generation. Assuming first that public education was the majority choice in the first period, human capital, and therefore gross income of the children, will be identical. This implies that no redistribution will be undertaken in the last stage, $\theta=0$. Turning to the determination of the equilibrium level of public education in the second stage of the game, note that its optimal value, from the viewpoint of parent i , is given by:

$$(6) \quad -U_1(y_{i1}-T, TA(0)) + U_2(y_{i1}-T, TA(0))A'(0) = 0$$

Differentiation of (6) reveals that the most preferred T varies positively with income. Hence, preferences are single peaked, and those of the median income parent are decisive in determining the equilibrium level of public schooling.

In contrast, consider the determination of redistributive policy by the next generation assuming that private education was the majority choice in the first period. For a given distribution of human capital (hence income), the optimal value of the redistribution parameter for offspring i , θ_i , is then given as follows:

$$(7a) \quad (-z_{i2} + Z_2)A(\theta_i) + [(1-\theta_i)z_{i2} + \theta_i Z_2]A'(\theta_i) = 0, \quad 0 < \theta_i < 1$$

$$(7b) \quad (-z_{i2} + Z_2)A(0) + z_{i2}A'(0) < 0$$

$$(7c) \quad (-z_{i2} + Z_2)A(1) + Z_2A'(1) > 0$$

Differentiation of the left-hand side of (7a) reveals that θ_i decreases with the offspring's income implying that the offspring with the median income is decisive: all θ 's higher than her most preferred one will be defeated by a coalition of the median income voter and those richer than her; all θ 's lower than her most preferred one will be defeated by a coalition of poor voters. In other words, preferences in this case satisfy the single-

crossing property which implies the existence of a majority voting equilibrium, see Gans and Smart, 1996, for more details.

Rearranging terms, the equilibrium is therefore given as follows:

$$(8a) \quad (-z_{m2}/Z_2 + 1) + [(1-\theta)z_{m2}/Z_2\theta + 1]\theta A'(\theta)/A(\theta) = 0, \quad 0 < \theta < 1$$

$$(8b) \quad (-z_{m2}/Z_2 + 1)A(0) + z_{m2}A'(0)/Z_2 < 0$$

$$(8c) \quad (-z_{m2}/Z_2 + 1)A(1) + A'(1) > 0$$

where z_{m2} denotes the median income. This implies that the equilibrium level of redistribution is a function of the ratio between the median and the average income in the next generation, z_{m2}/Z_2 . Furthermore, differentiation of the left-hand side of (8a) reveals that it is a decreasing function, so that the higher the ratio the smaller the redistribution. In particular, inspection of (8) reveals that when the ratio is high enough, no redistribution is undertaken in equilibrium; when $A(\theta)$ is completely inelastic this happens when the ratio is 1, but the more elastic $A(\theta)$ is the lower is the cutoff ratio that generates no redistribution.

The left-hand side of (8a) consists of two terms, the first of which represents the redistributive effect on offspring with the median income of increasing θ , and the second of which captures the distortive effect. Obviously, this second term has a negative sign: a larger redistribution entails a larger deadweight loss. As is shown in the following lemma, the sign of the first term is positive.

Lemma 1. Given that the parents' income distribution is typically skewed, for any anticipated θ , the distribution of income in the next generation is skewed as well, implying that the ratio of the median-to-mean income is smaller than one.

Proof. Homothetic preferences imply that

$$(9) \quad c_{i1}/y_{i2} = G(\theta), \quad G' > 0$$

Substituting the constraints into (9), rearranging terms and solving for the equilibrium (details are trivial and available upon request) we obtain that the equilibrium level of a

child's income is given as a linear combination of own income and the average income in the parents' cohort:

$$(10) \quad z_{i2} = ay_{i1} + bY_1$$

But (10) then implies that $z_{m2} < Z_2$ if and only if $y_{m1} < Y_1$, so that under the assumption that the latter holds, the former holds as well. //

Clearly, the elasticity of $A(\theta)$, which captures the distortive effect of income redistribution, plays a crucial role in determining θ . In particular, if $A(\theta)$ is inelastic, so that the deadweight loss is insensitive to redistribution, the left-hand side of (8a) is positive implying that (8c) holds and that at equilibrium $\theta=1$. But then, in anticipation of such extreme redistribution undertaken in the next generation, the parents will refrain from providing their children with any education, implying in turn that no capital accumulation will take place. Thus, the next period income will be minimized, implying (given the Inada condition) that the parents' utilities will be smaller than those in the public education case - which although imposes the same level of schooling on everybody, does allow for the accumulation of human capital. This result is summarized in

Proposition 1. Provided that the elasticity of redistributive distortion is small enough, public education constitutes the majority choice.

Note that uniformity of public schooling is essential for the above result, and other methods of government intervention that perpetuate large variability in human capital investment would not have the same effect. Consider for instance the case of a fixed rate subsidization of private schooling (financed by a proportional income tax, for example). This policy clearly preserves variability of incomes in the next generation and thus does not prevent the threat of redistribution, which could again be extreme when $A(\theta)$ is

inelastic. But then the previous argument applies and the parents would refrain from investing in education.

4. Discussion

To further understand the mechanism behind the popularity of public education, we reconsider some of the assumptions made above. One crucial assumption is that the parents are unable to precommit themselves to a redistributive policy in the next generation. Alternatively, suppose that such precommitment is possible. That is, suppose that the parents make all the decisions: they determine collectively the value of the next period redistribution parameter, as well as make the education choices. Under private education, for a given value of θ , these choices are given by:

$$(11) \quad -U_1 + U_2 A(\theta)(1-\theta) = 0$$

The optimal value of the redistribution parameter for parent i is determined from the following first-order condition:

$$(12) \quad (-z_{i2} + Z_2 + \theta dZ_2/d\theta)A(\theta) + [(1-\theta)z_{i2} + \theta Z_2]A'(\theta) = 0$$

Differentiation then reveals that the optimal value of θ is a monotonically decreasing function of income, implying as before the existence of a majority voting equilibrium, with the median income individual being decisive. Also, comparison between (8) and (12) reveals - noting that Z_2 is a decreasing function of θ - that the level of redistribution chosen ex post the education choices is higher than the one determined ex ante.

The outcome in this case is preferred by a majority of voters to that achieved in the case of public education. To show this, note that private education without redistribution, $\theta=0$, is unanimously preferred by the parents to public education: in the

former case, every parent is free to choose the level of education for his offspring, whereas in the latter case this decision is imposed by the median income voter.⁹ The higher the value of θ is, however, the better off are those individuals whose income is below the average (and the worse off the rest). Therefore the poor majority prefers private education where redistribution is determined by the median income voter to public education. Contrasting this result with that of Proposition 1, we conclude that the inability of parents to determine the next period redistributive policy is crucial for the paper's result.

Another salient feature of the above sketched argument is the potential redistributive pressure by the poor masses in the next generation which is likely to be materialized under the democratic system of universal franchise. For if, in contrast, the income of the decisive voter is high relative to the average income in the next generation – as would be the case had the franchise been limited to the upper income elite – then no redistribution would follow, implying that uniformity of public schooling ceases to have any advantages, and that the public education system is unlikely to constitute the superior choice in the current generation.

To examine in greater detail the empirical validity of this argument, it may be useful to review the evolution of the system of public education and democratization from the historical perspective. Indeed, there is substantial evidence that mass public education typically flourishes as a consequence of franchise expansion. In England, for example, in the period preceding this expansion that took place in the late nineteenth century, schooling was provided by religious denominations. Education for the working classes consisted of religious instruction and the basic three R's (reading, writing and

arithmetic), and only free if they absolutely could not afford it. While there existed institutions of higher learning for the elite, the elementary schools were “very much working-class schools, very much supplied from above. They were not “popular“ schools inspired by the people for whom they were intended.“ (Musgrave, 1968, p. 40) In as late as 1865, only less than 20% of the adult population were enfranchised. The balance of political power was changed as a result of the Reform Acts of 1867 and 1884. The former gave the right to vote to the urban working class, while the latter extended this right to the workers in rural areas, so that after 1884, 88% of the adult male population were enfranchised (see Justman and Gradstein, 1999, for a more detailed account of the enfranchisement process in Britain during this period). This, in turn, led to an increased demand for free schooling, first at the elementary school level and subsequently at the secondary level. Parallel to these developments was the change in attitudes towards knowledge. Instead of the traditional view that knowledge was acquired by practice and effort, transmitted from father to son, and tested by experience, the modern view was instrumental. The state assumed a more responsible role under the 1870 Education Act, which made elementary schooling compulsory. The 1902 Act allowed the state to be directly responsible for running the school system and opened the door for the universal provision of secondary schooling, which was eventually implemented through the 1944 Act.

An apparent counterexample to this argument is provided by Prussia where public schooling was introduced by Frederick the Great in as early as 1763. A careful historical analysis, however, reveals that the primary impetus for this was ideological – educating the masses into obedient servants – rather than instrumental. In fact, public schooling had

to be imposed on the poor, in many cases against their will, and a powerful system of school inspection was constructed to enforce compulsory schooling (see Lamberti, 1989). It was not until after the democratization of the late nineteenth century that the curriculum was changed becoming more instrumental than ideological, and thus enabling the students to translate knowledge acquired in school into earned income. Hence, in Germany public education in the modern sense of the word was shaped only following the democratization of the political process and can be interpreted, in line with this paper's argument, as a means of containing future redistribution.

5. Extensions

Our results can be further extended by modifying some of the assumptions. This section briefly considers these modifications by sketching the required variations of the model and discussing the robustness of the results.

5.1. *Inherited parental input*

There is strong evidence suggesting that parental income is an important determinant of an offspring's income - indeed, Solon, 1992, finds a correlation of as high as .40 between the two. Suppose therefore that (2) is modified to incorporate parental income as follows:

$$(2') \quad z_{i2} = f(y_{i1})h_{i2}$$

where f is an increasing concave function. Under public education, these differences in parental income are the only source of variability in the offspring's income, but under private education they are amplified by differences in education choices - rich parents acquiring more education. This implies that redistribution will be more aggressive in the

latter case than in the former, which again may deter the parent from making adequate education choices. The comparison between the two systems would then hinge on the interplay between the flexibility advantage of private education and the commitment advantage of public education. Qualitatively, however, the previous results will remain unchanged.

5.2. Endogenous labor supply

To endogenize labor supply decisions, suppose that an offspring's utility is derived from consumption, which in turn is determined by her net income, y_{i2} , as well as from the consumption of leisure, n_{i2} . Each child is endowed with one unit of time which is allocated between work and leisure, and the child's gross income, z_{i2} , is assumed to be determined as a function of the quality of her human capital, h_{i1} , and the amount of time devoted to work. Analysis of this variation of the model indicates that the paper's argument holds under certain conditions, in particular, when labor supply is sufficiently inelastic.

5.3 Supplementation of public education

Supplementation of public schooling with private education purchases could also be considered. One obvious way of interpreting such supplementation is in terms of extra private tutoring. A broader interpretation views private supplements as more years at school - in addition to publicly provided basic schooling. In this variation of the model, education spending is determined through the parents' vote on public education and through additional private spending on education. Analysis of this model (presented in an

earlier version of the paper and available upon request) reinforces the case for public education, which emerges as a popular choice irrespective of the magnitude of the redistributive excess burden.

6. Concluding remarks

This paper shows that an education system, which allows for individual differences in the demand for education to express themselves, may provide an incentive for subsequent aggressive redistribution. In contrast, a more uniform system, while having the disadvantage of eliminating otherwise efficient variations, prevents such a redistribution. More specifically, public financing of education is likely to prevent time inconsistency that is associated with the threat of future income redistribution, thus yielding a higher level of human capital accumulation and, therefore, a faster growth of average income than a private education regime.

While the argument put forth in this paper should be viewed as complementary to the more standard ones mentioned in the Introduction, it may help explain policies inexplicable by alternative theories. For example, positive spillovers of human capital, have recently been widely articulated in the context of endogenous growth theories,¹⁰ implying that public intervention may be called for. But in that case education subsidies, not publicly provided education, is a superior policy, see Devarajan et al., 1996.¹¹ Similarly, credit constraints that prevent human capital investment by poor families could be addressed by directly subsidizing the poor. I argue, however, that such subsidies, through preserving a significant variability in human capital, might be an ineffective means of protection against future redistribution.

This same argument may also be used to explain the fact that public education has become a widespread phenomenon in Western countries only since the late nineteenth century, following the expansion of the voting franchise and the democratization of the political process. By stretching our model a bit, it could be argued that political decision making prior to that period was dominated by the rich elite, who were not interested in fiscal redistribution. The lack of a redistributive threat, however, renders the commitment value of public education redundant. In contrast, with the expansion of the voting franchise that took place in the late nineteenth century, the threat of future redistribution has become real, thus increasing the commitment value of public education.

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¹ Among the different types of private goods that are publicly financed, education (and, to a lesser extent, health care) is special in at least two respects. First, the primary and the secondary components of it are consumed by minors, that is by a disenfranchised part of the population. Second, investment in education is directly related to human capital formation, which ultimately determines an individual's earning capacity. Hence, the choice of an education policy shapes future income inequality and affects economic growth.

² This is definitely the case in countries where education is administered nationally, as in many European countries; but it also holds to a large extent in the US with its more decentralized, local administration of schooling.

³ Note that this paper's focus is public *financing* of education by which we mean the obligation by the government to finance a certain uniform level of schooling. A related important question – not dealt with explicitly here – is that of public *provision*, in particular, why do governments actually run schools. For some attempts to deal with this latter issue see Lott, 1990, and Kremer and Sarychev, 1998, as well as the references therein.

⁴ It is also related to the literature that justifies public financing of private goods by the inability of an altruistic government to precommit itself - see Bruce and Waldman, 1991, and Coate, 1995.

⁵ See, e.g., Chari and Kehoe, 1990.

⁶ As in Persson and Tabellini, 1994.

⁷ Buchanan and Tullock, 1962, and Brennan and Buchanan, 1980, are the leading contributions to this literature.

⁸ We assume for simplicity that no parent will be liquidity constrained with this education tax.

⁹ In reality this deficiency of the public education system is to some extent mitigated by the progressiveness of education taxes, the possibility to opt out to private schools, etc.

¹⁰ See Lucas, 1988, for the forceful case in this regard.

¹¹ In general, subsidization entails a lower deadweight loss and allows more flexibility than public provision.