

The Political Economy of Public Spending on Education, Inequality, and Growth

Mark Gradstein

grade@bgumail.bgu.ac.il

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Abstract

Public provision of education has often been perceived as universal and egalitarian, but in reality it is not. Political pressure typically results in incidence bias in favor of the rich. This paper argues that the bias in political influence resulting from extreme income inequalities is particularly likely to generate an incidence bias, which we call social exclusion. This may then lead to a feedback mechanism whereby inequality in the incidence of public spending on education breeds higher income inequality, thus generating multiple equilibria: with social exclusion and high inequality; and with social inclusion and relatively low inequality. The paper also shows that the latter equilibrium leads to higher long-run growth than the former. An extension of the basic model reveals that spillover effects among members of social groups differentiated by race or ethnicity may reinforce the support for social exclusion.

1. Introduction

The public provision of goods and services—commonly perceived as uniform and egalitarian—has often been defended on normative grounds. In fact, universal public provision has been viewed as the main vehicle to achieving the equity goals in the economy (see Tawney [1952] for an influential articulation of this position). In contrast, the actual incidence of public spending many times is skewed in favor of more influential population groups. In an important work, Le Grand, 1982, for example, documents this in many areas of public intervention in the UK, such as education, health, housing and transportation, arguing that the middle class and the rich are its primary beneficiaries.

This bias in the incidence of public spending is even more significant in developing countries. Consider public spending on education, an example used throughout the paper.¹ Children from poor households have much less access to schooling at progressively higher levels than children from richer families, and their attrition rates increase with the grade (see World Bank 2003, Chapters 2 and 7).² Consequently, the distribution of public spending on education in the population is far from equal. Table 1 vividly illustrates the inequalities in the distribution of public spending on education for 21 developing economies. The median incidence of spending on education on the poorest quintiles is about 14 percent (the minimal is 7 percent); for some countries public education spending on the top quintile is three and more times that on the bottom quintile. Moreover, this bias closely mirrors the skewness of income distribution in the sample countries.³

This paper studies the causes and the consequences of these biases. The basic argument is that, universality of public education notwithstanding, its incidence—being a matter of political decisions—can be affected by rent-seeking efforts. Because of credit markets imperfections, richer households are able to exert more political pressure through rent seeking thus securing themselves a larger share of the pie than poorer ones. To what extent such rent seeking matters as part of the educational resource allocation mechanism is in itself a political decision. The distinction here is made between the two polar cases of social inclusion, when personal rent seeking is irrelevant because of its negligible marginal effect; and social exclusion, when the marginal effect of personal rent seeking is large.

¹ Spending on health presents a similar picture.

² Moreover, the poor are disproportionately concentrated geographically in rural areas, so that making schools accessible for them is more costly than for the typically richer urban population; but this specific aspect is not modeled in the paper.

³ The simple correlation for the same sample of countries between income inequality and inequality in public spending on education (as measured by Gini coefficients on the basis of the quintile data) is 0.42. Author's calculation, using the Deininger and Squire (1998) income inequality data set.

Table 1. Public spending on education by income quintile in 21 developing countries, various years

(percent)

<i>Country</i>	<i>Year</i>	<i>1st-poorest</i>	<i>2nd</i>	<i>3rd</i>	<i>4th</i>	<i>5th-richest</i>
Armenia	1996	7	17	22	25	29
Côte d'Ivoire	1995	14	17	17	17	35
Ecuador	1998	11	16	21	27	26
Ghana	1992	16	21	21	21	21
Guinea*	1994	9	13	21	30	27
Jamaica	1992	18	19	20	21	22
Kazakhstan	1996	8	16	23	27	26
Kenya	1992/3	17	20	21	22	21
Kyrgyz Republic	1993	14	17	18	24	27
Madagascar	1993/4	8	15	14	21	41
Malawi	1994/5	16	19	20	20	25
Morocco	1998/99	12	17	23	24	24
Nepal	1996	11	12	14	18	46
Nicaragua	1993	9	12	16	24	40
Pakistan	1991	14	17	19	21	29
Panama	1997	20	19	20	24	18
Peru	1994	15	19	22	23	22
Romania	1994	24	22	21	19	15
South Africa	1993	21	19	17	20	23
Tanzania	1993	13	16	16	16	38
Vietnam	1993	12	16	17	19	35

* Includes only primary and secondary education.

Source: Reproduced from the *World Development Report, 2000/2001*.

I find that the growth and distributional implications of these two alternative regimes are quite different. In particular, social inclusion leads to reduction in income inequality and enhances intergenerational mobility in future generations relative to the social exclusion regime. While the immediate growth effect is ambiguous and depends on the extent to which parental wealth can be transmitted across generations, in the long run social inclusion has the advantage of achieving a higher level of steady-state average income.

Yet, because of the different distributional implications of the two regimes, the political support for social inclusion is not guaranteed. Although in the basic framework, a majority of (poor) households favor it, if the political system reveals bias toward the interests of the rich, social exclusion may win the political support—both immediately and in the future. This indicates the possibility of multiple equilibria, which depend on initial income distribution as well as on the distribution of political power. An extension of the analysis to the case of multiple groups differentiated by race, ethnicity, etc., reveals that in the presence of within-group spillover effects social exclusion may even win a majority support.

Taken together, these results explain why the bias of the incidence of public education spending is more severe in some countries than in others. It also indicates the potential negative implications of such bias for long-run growth, which is consistent with existing empirical evidence discussed below. A policy implication of the analysis below is that any reform proposal toward social inclusion with the view of making the public education system more equitable, such as by increasing the relative share of spending on primary schooling, has to take into consideration the likely political opposition to such a move.

This paper is related to recent studies on the dynamic effects of public education and its political sustainability by Bénabou (1996), Glomm and Ravikumar (1992), Gradstein and Justman (1997), and Saint-Paul and Verdier (1993). It differs from all this work, however, by examining the implications of politically determined differential access to public funds. As argued above, this assumption seems to be more realistic, especially (but not exclusively) in the context of developing economies. It extends to a dynamic context the static voting model in an earlier paper Gradstein (2004), and is related to recent work Bertocchi and Spagat (2003), who similarly pay attention to the lack of uniformity of public education albeit addressing its different aspect, namely, the joint evolution of comprehensive and vocational schooling. Also related is the discussion of the equality of opportunity, especially as applied to the allocation of educational resources in Roemer (1998). While the flavor of Roemer's arguments is essentially normative, this paper is an attempt at a positive analysis. Finally, one of the paper's main results, that initial level of inequality determines the equilibrium convergence, is related to much of the recent literature (see e.g., Benabou [2000] and Ferreira [2001] for relevant references). It differs, however, from that literature in pointing out that such equilibrium multiplicity is due to political forces that subvert the uniformity of public education spending.

Section 2 lays out the modeling framework of an economy. Section 3 contains the main substantive results of the paper by working out the economy's intertemporal evolution. Section 4 extends the analysis to the case of distinct social groups. Section 5 discusses some existing empirical evidence consistent with the model's results. Section 6 concludes with brief remarks.

2. The Basic Framework

Consider an economy populated by an infinite number of households, indexed i , whose measure is normalized to one, each consisting of a parent and a child, operating over an infinite horizon. The initial amount of household income is y_{i0} , and income in period t is y_{it} .

In each period, the households invest part of their income in the public provision of an investment good.⁴ This good can have the interpretation of physical infrastructure (a public good) or human capital investment through education or health (a publicly provided private good). For concreteness, I will stick to the latter interpretation and confine attention to issues associated with public education finance and its distribution as the means to build human capital. This is mainly because of the belief expressed in recent growth theories that human capital is an important determinant of economic growth.

Thus, public spending on education is assumed to be financed by a proportional income tax, whose rate in period t is denoted T_t ; the disposable income is then $y_{it}(1 - T_t)$. Assuming a balanced budget, the aggregate (or, what is the same, the average) amount of spending on public education is $T_t Y_t$.

The disposable income is allocated between family consumption, c_{it} , and individual investment made in an attempt to ensure a larger share of educational resources for one's offspring, x_{it+1} . As will be seen below, this investment does not have any productive value; rather, it just affects the distribution of educational resources across the households. It can be interpreted, therefore, as rent seeking. For example, one can think about the allocation of public spending on education between comprehensive and vocational schooling as in Bertocchi and Spagat (2003), or, perhaps better, between the different layers of education, such as primary and secondary as opposed to tertiary education.

Normalizing all prices to one, the budget constraint then is

$$y_{it} = c_{it} + T_t y_{it} + x_{it+1} \quad (1)$$

The shares are then determined based on the individual efforts:

$$s_{it+1} = x_{it+1}^{E_t} / \int_0^1 x_{jt+1}^{E_t} dj \quad (2)$$

where $E_t \in \{0,1\}$ is interpreted as the degree of social exclusion practiced in the economy. When $E_t = 0$, there is social inclusion and all households have an equal access to educational resources. This corresponds to the situation where the existing institutional and political arrangements preclude rent seeking with the resulting differential access to public education. In contrast, when $E_t = 1$, social exclusion is practiced, and the access to public education depends to a large degree on households' efforts to gain this access.

⁴ Very similar results are obtained when the good is interpreted as a natural resource.

An individual's production input is then $s_{it+1} T_t Y_t$.⁵ Thus, the intention of uniformity of public spending on education notwithstanding, households may be able to appropriate this spending to various degrees. Indeed, the assumption that credit markets are imperfect, embodied in equation (1) effectively will imply that richer households possess an advantage—whose extent will be assumed to be politically determined—in appropriating a larger portion of public educational resources than poor households do.⁶

The children differ in their production capabilities to make use of their educational endowment. These differences may have to do with innate abilities, access to technological knowledge, social and family background or differences in previously acquired skills. We let A_{it} denote the production capability of individual i . Assuming a variation of the Cobb-Douglas technology, the amount of next-period income generated by household i is

$$y_{it+1} = A_{it+1} (s_{it+1} T_t Y_t)^\alpha, \quad 0 < \alpha < 1 \quad (3)$$

A person's production capability depends on random personal ability denoted a_{it+1} and on the parent's income:⁷

$$A_{it+1} = A a_{it+1}^\gamma y_{it}^{1-\gamma} \quad (4)$$

where the parameter γ , $0 \leq \gamma \leq 1$, represents the relative importance of individual ability as opposed to inherited characteristics; the higher is γ the more intergenerationally mobile the economy is. Thus, when $\gamma = 0$ a child's production capability is solely determined by parental income, whereas when $\gamma = 1$ it only depends on randomly acquired ability. It might well be argued that γ is a matter of political choice itself, as it can be affected, among other things, by existing laws governing inheritance taxes; this additional complexity is brushed aside here despite its importance by assuming that γ is exogenously given.⁸

⁵ Other production inputs are disregarded for simplicity. Perhaps more importantly, please note that private spending on education is ignored here not because it is not important (on the contrary it can be significant, especially in developing countries), but because its existence would likely exacerbate the results by skewing the distribution of educational resources even more (see Ferreira [2001]). This also keeps the focus on the main point, which is the bias in the distribution of public spending.

⁶ Note that the assumption that all private spending incurred to gain access to educational resources is all rent seeking is extreme. Admission to public institutions of learning (schools, colleges, universities, etc.), as well as allocation of scholarships, are frequently determined by aptitude tests, which do have social value. Yet, even this aspect of the allocation of educational resources may entail rent seeking to the extent that these tests are imprecise and preparation for them improves performance.

⁷ An alternative assumption would be that a child's ability depends on parental ability. Assuming, however, that income and ability are correlated this would lead to very similar results.

⁸ The technical reason for leaving the determination of γ outside the scope of analysis is related to the non-existence of voting equilibria in multidimensional settings.

The generated income is bequeathed to the child. Preferences are assumed to be identical across individuals. In particular, all parents are assumed to derive utility from household consumption as well as from a child's anticipated income. Assuming for simplicity logarithmic preferences and ignoring discounting, the households will be interested in maximizing the expected utility:

$$U_{it}(c_{it}, y_{it+1}) = \ln(c_{it}) + \ln(y_{it+1}) \quad (5)$$

Note that, as will become clearer later, the logarithmic specification in conjunction with the assumed production technology imply a lack of complementarity between personal traits and individual inputs. While these assumptions are made to simplify the dynamic analysis, they still allow for an interesting interaction between personal characteristics on the one hand and individual and collective decisions on the other hand.

All decisions in the economy are made by the parents. They first collectively determine the extent of social exclusion, then the tax rate; finally, they individually allocate family budget according to (1). The equilibrium will consist of a sequence of such mutually consistent decisions.

3. Dynamic Evolution

We conduct the dynamic analysis by assuming first a given level of social exclusion, and then study its political determination. The analysis proceeds backwards, and the equilibrium derivation is presented in the appendix. Moreover, the economy converges to the steady state for any level of social exclusion only when intergenerational mobility is high enough, namely, when $\gamma > \alpha$. When this holds, the steady state can be fully characterized (see the appendix).

Summarizing the analytical details relegated to the appendix we obtain,

Proposition 1. Social inclusion reduces income inequality in the next period and thereafter. Its propensity to induce faster next-period growth relatively to the exclusion regime hinges on the parental factor being relatively unimportant; in the long run, however, the social inclusion regime attains a higher steady-state average income level than social exclusion.

The dynamics of political choices in this model depends crucially on the distribution of voting power as it emanates from income distribution. Under the "one-man-one-vote" system, where all households exert an equal influence on the political outcome, social inclusion would be the initial choice of the poor majority. And in all subsequent periods the relatively poor median income voter is decisive too; from her perspective the utility differential between the two regimes, from expression (A3) in the appendix, is

$$U_{mt}^1 - U_{mt}^0 = \ln(1/(1+\alpha)) + \ln(y_{mt}/Y_t)^\alpha < 0 \quad (6)$$

where the inequality follows because with the lognormal distribution $y_{mt} < Y_t$. Hence, social inclusion will prevail throughout.

Suppose, more generally, that political influence increases with income. Much empirical evidence testifies to the validity of this assumption.⁹ The simplest way to capture this phenomenon is to assume that the identity of the decisive voter, y_{dt} , is given by:

$$\ln(y_{dt}) = \mu_t + \phi\sigma_t^2 \quad (7)$$

where ϕ represents the extent of political bias in favor of the rich. If $\phi = 0$, the median income voter is decisive; when $\phi = 1/2$, the average income voter is decisive. For illustrative purposes, suppose that the political bias is large enough, $\phi > 1/2$.

Then the utility differential for the decisive voter is:

$$U_{dt}^1 - U_{dt}^0 = \ln(1/(1+\alpha)) + \ln(y_{dt}/Y_t)^\alpha = \ln(1/(1+\alpha)) + \alpha(\phi - 1/2)\sigma_t^2 \quad (8)$$

which increases in σ_t^2 . If income inequality, σ_t^2 , is initially small then (8) is negative and social inclusion wins political support. But then the variance of the income distribution decreases further reinforcing the support for social inclusion. In contrast, if initial income inequality is large enough so that (8) is positive, social exclusion wins the political support of the influential rich, which then leads to an increase in next-period inequality, thus reinforcing political domination by the rich with the ensuing support for social exclusion. Combining this analysis with the results of Proposition 1, we obtain

Proposition 2. When the political bias in favor of the rich is large enough, multiple equilibria may be realized depending on the initial income inequality level. If it is low, then the economy will adopt the social inclusion regime and will converge to a relatively high average income level with low inequality; if it is high then social exclusion will win political support, and the economy will converge to a low-income steady state.

4. Group Exclusion

We now extend the model by adding another dimension of individual heterogeneity in addition to income, namely, distinct social groups, differentiated by race or ethnicity, for example. The motivation for this extension comes from recently documented detrimental effects of such social heterogeneity on public provision of goods and services, see Alesina, Baqir, and Easterly (1999), in the U.S. context, and

⁹ See Rosenstone and Hansen (1993), for evidence in the U.S. context (and Benabou [2000] for its discussion); see Rodriguez (1999) for a discussion of evidence pertaining to developing countries.

Easterly and Levine (1997), in the international context with an emphasis on African countries. While this literature focuses on the effects of social heterogeneity on the provision levels, here the intention is to study its distributional implications.

Suppose that the population consists of two groups, indexed G , say B and W , where the average initial income in the former group is smaller than that in the latter. The groups can be interpreted in terms of race, ethnicity, natives versus immigrants, etc., although for concreteness I will use the first interpretation. Specifically, to simplify, suppose that all individuals in each group are divided into two income classes, y_{BLO} and y_{BHO} in the former, and y_{WLO} and y_{WHO} in the latter, where $y_{BLO} < y_{BHO}$, $y_{WLO} < y_{WHO}$. We also assume that the low-income group among each B and W is the more populous and that the group composition is such that y_{WLO} is the median income group in the population and that $y_{WLO} < Y_0$. Because of the positive monotonicity between current and next-period incomes as developed below, these same relationships will hold in future periods as well.

To further simplify we now disregard individual productivity differences by assuming that $A_{it+1} = A$. On the other hand, we assume the existence of human capital spillovers among the members of own group, so that the production function for the members of each group K , $K = B, W$, is:

$$y_{Kit+1} = A (s_{Kit+1} T_t Y_t)^\alpha (S_{Kt+1} T_t Y_t)^\beta, \quad 0 < \beta < \alpha \quad (9)$$

where $S_{Kt+1} T_t Y_t$ is the average human capital of the income group individual i does not belong to. Equation (9) captures the spillover effect among the members of the same race group, which can be due to residential or social segregation.

The rest of the assumptions are as above. The budget constraint and the determination of the individual shares are analogous to (1) and (2), and the utility function is as in (5). The households first vote on the extent of social exclusion, then on the tax rate, and finally, they allocate family budget to maximize utility.

Summarizing the political equilibrium analysis whose details are presented in the appendix, we obtain:

Proposition 3. In the presence of spillover effects among members of a race group, even democratic voting may generate social exclusion as a political outcome.

5. Discussion of Empirical Evidence

One important implication of this paper's analysis is that inequality in the distribution of incidence of public spending on education slows long-run growth, and that income inequality is also detrimental in this regard. While, to the best of my

knowledge, no direct test of this hypothesis on a large data set has been conducted, some recent work provides some tentative support for this hypothesis.¹⁰

Birdsall and Londono (1997), for example, find a significantly negative effect of human capital inequality (although not specifically in public education) on economic growth. More recently, their results have been updated in a larger sample of countries and with improved set of controlled variables in Castello and Domenech (2002). There, the authors note that the reduction in education inequality in the period 1960–2000 has been a significant factor in spurring up subsequent growth.

The other implication, that income inequality is linked to the inequality in the distribution of the benefits from public education, has received some attention recently. Birdsall (1997), for example, notes that spending on primary education in developing countries is small relatively to spending on tertiary education, whose main beneficiaries are the rich. The problem is especially acute in Latin American and in African countries, where income inequality in general is notoriously high. Addison and Rahman (2001), have tried to systematically explain the large disparities in public education spending between the rich and the poor. They find a significant effect of income inequality. In particular, controlling for income per capita, population density and some other variables, a one standard deviation increase in the Gini of income inequality decreases the ratio of primary to tertiary spending by 0.20 points.¹¹

The paper Addison and Rahman (2001) is also relevant to the previous section's analysis as it attempts to study the effects of the existence of distinct racial/ethnic groups on the incidence of public education spending. Using a measure of ethnolinguistic polarization to this end, the authors find that a one standard deviation increase in this measure increases the inequality in public education spending by 0.18 points.

With regard to this latter point, direct examination of the experience of several developing countries is very suggestive. Particularly striking is the case of South Africa during the apartheid.¹² By the end of the apartheid era, in the 1990s, Africans made up 98 percent of the poorest quintile and only slightly more than 10 percent of the richest, whereas whites had no one among the poorest quintile and made up more than 75 percent of the richest quintile.¹³ The adult illiteracy rate among Africans exceeded those in neighboring Lesotho, Zimbabwe, Swaziland, Kenya, or Botswana

¹⁰ One reason for the paucity of empirical analysis in this regard is the very limited amount of available data on the incidence of public education spending.

¹¹ Schwartz and Ter-Petrossian (2000), summarizing earlier research, discuss the bias in public spending, suggesting that it could be affected by political influence, although no direct test of this hypothesis is offered.

¹² Several Latin American countries offer similar evidence.

¹³ Incidentally, South Africa happens to be a society with one of the most unequal income distributions in the world, with the Gini coefficient of around 0.61.

by between 10 and 30 percentage points, and their life expectancy was also considerably lower. Inequalities in access to and use of services, durable goods, employment, and wages were very large.¹⁴ Concomitantly, there was also a large difference in the distribution of benefits from government spending, in particular, on education. Thus, per-pupil spending on white students was more than four times higher than that of homeland African children for primary and secondary education, and between 20 percent and five times higher on tertiary education, depending on the measure used.¹⁵ With spending on education constituting more than a one-quarter of total non-interest government spending, these discrepancies generated considerable differences in the quantity and quality of education between Africans and whites.

6. Concluding Remarks

It has frequently been argued that the incidence of public spending on education, far from being uniform, is biased in favor of the rich. This paper has presented a view according to which this bias is ultimately a political determination. It has shown that a political bias induced by an unequal income distribution may well generate political support for social exclusion whereby rent seeking determines the extent of access to public education. This effect is exacerbated by the existence of spillovers among members of the same social group.

An often articulated policy prescription to alleviate poverty is to reach out to the poor through an egalitarian provision of public services, especially in poor countries (see the *World Development Reports 2000/1* and *2004*). In this paper it has been argued that, while this is a worthy policy goal in terms of equality and long-run growth, there are deeply rooted political reasons for existing provision arrangements to be unfavorable to the poor. It implies that the political bias induced by extreme income inequality is one major obstacle in a reform of existing programs, and opposition by influential political interests is to be taken into account in a meaningful debate about the implementation of more egalitarian reforms.

¹⁴ In rural South Africa, the average white farm household owned about 530 hectares, compared with only 2.2 hectares for the average African farming household; one-half of the farmland owned by white farmers has access to irrigation as compared with only 2 percent of land owned by Africans, and these 30,000 white commercial farmers represent 50 percent of total water use in South Africa; 99 percent of whites had access to running water as compared to 43 percent of blacks; in 1980, 83 percent of public expenditure on agriculture went to whites in agriculture (see Klassen, 2002, and references therein).

¹⁵ And whites benefited disproportionately from large subsidies for tertiary education, as they constituted approximately 45% of tertiary students.

Appendix

Equilibrium Derivation

The analysis proceeds backwards, starting with the individual investment decisions. Maximization of the utility function (5) subject to (1) – (4) yields:

$$x_{it+1} = \alpha E_t y_{it} (1 - T_t) / (1 + \alpha E_t)$$

so that individual rent-seeking efforts decrease with the level of social exclusion E_t .

Substituting the above values into (3) and then (5), respectively, we obtain:

$$y_{it+1} = A_{it+1} (s_{it+1} T_t Y_t)^\alpha = A_{it+1} [y_{it}^{E_t} T_t Y_t / \int_0^1 (y_{jt})^{E_t} dj]^\alpha \quad (A1)$$

and

$$U_{it} = \ln[y_{it}(1-T_t)/(1 + \alpha E_t)] + \ln\{ A_{it+1} [y_{it}^{E_t} T_t Y_t / \int_0^1 (y_{jt})^{E_t} dj]^\alpha \} \quad (A2)$$

Differentiation of (A2) with respect to the tax rate yields the optimal value, $T_t = \alpha/(1+\alpha)$.

It follows that there is unanimous agreement across the households with regard to the tax rate. This greatly simplifies the characterization of the political equilibrium, which in general may fail to exist in a multidimensional decisionmaking setting. Because our focus here is the political determination of social exclusion, this modeling route is clearly advantageous.

Letting U_{it}^1 denote the utility level under social exclusion and U_{it}^0 the utility level under social inclusion, the welfare differential between the two regimes is calculated to be as follows:

$$U_{it}^1 - U_{it}^0 = \ln(1/(1+\alpha)) + \ln(y_{it}/Y_t)^\alpha \quad (A3)$$

It increases with a household's income indicating that the richer the household the more favorable it is toward social exclusion. Also note that (A3) is negative when $y_{it} = Y_t$, indicating that all households whose income is below the average favor social inclusion.

For the purposes of explicit characterization of economy's dynamic evolution, we make the following distributional assumptions. Suppose that $\ln(a_{it})$ is distributed normally with zero mean and variance ε^2 and that $\ln(y_{i0})$ is distributed normally with mean μ_0 and variance σ_0^2 ; we assume that they are not correlated.

Equation (4) implies that in subsequent periods, $\ln(A_{it})$ is then also normally distributed; and (A1) implies that $\ln(y_{it})$ is normally distributed as well. Finally, we let μ_t and σ_t^2 respectively denote the mean and the variance of $\ln(y_{it})$.

Substituting (4) into (A1) and taking the logarithms we obtain:

$$\ln(y_{it+1}) = \ln A + \gamma \ln(a_{it+1}) + (1-\gamma + \alpha E_t) \ln(y_{it}) + \alpha \ln(T_t Y_t) - \alpha \ln \left[\int_0^1 (y_{jt})^{E_t} dj \right],$$

where $T_t = \alpha/(1+\alpha)$.

It follows that $\ln(y_{it+1})$ has the mean of

$$\begin{aligned} & \ln A + (1-\gamma + \alpha E_t) \mu_t + \alpha \ln [\alpha/(1+\alpha)] + \alpha(\mu_t + \sigma_t^2/2) - \alpha(E_t \mu_t + E_t^2 \sigma_t^2/2) = \\ & \ln A + (1-\gamma + \alpha) \mu_t + (1-E_t^2) \alpha \sigma_t^2/2 + \alpha \ln [\alpha/(1+\alpha)] \end{aligned} \quad (A4a)$$

and the variance of

$$\gamma^2 \varepsilon^2 + (1-\gamma + \alpha E_t)^2 \sigma_t^2 \quad (A5b)$$

which increases with the extent of social exclusion; moreover, when $E_t = 0$, (A5b) decreases over time, whereas when $E_t = 1$, the variance increases over time.

This allows us to calculate the logarithm of the average income growth rate,

$$g_{t+1} = \ln(Y_{t+1}/Y_t) = \ln A + \alpha \ln [\alpha/(1+\alpha)] - \gamma \mu_t + \gamma^2 \varepsilon^2 / 2 + [-1 - \alpha E_t^2 + (1-\gamma)^2 + (1-\gamma + \alpha E_t)^2] \sigma_t^2 / 2. \quad (A6)$$

Comparing the growth rates for $E_t = 0$ and $E_t = 1$ reveals that next-period growth is higher under social inclusion provided that $\gamma > (1+\alpha)/2$. In other words, social inclusion induces faster growth when the role of the parental factor is determining an offspring's productivity is relatively small.

At the steady state, the variance of (the logarithm of) income distribution is determined from (A5b) as

$$\sigma^{2*} = \gamma^2 \varepsilon^2 / [1 - (1-\gamma + \alpha E^*)^2] \quad (A7)$$

lower when $E^* = 0$ than when $E^* = 1$. Likewise, the mean is determined from (A5a):

$$\mu^* = \{\ln A + (1-E^*)^2 \alpha \sigma^{2*}/2 + \alpha \ln [\alpha/(1+\alpha)]\} / (\gamma - \alpha) \quad (A8)$$

Hence, the average income in the long run is determined from:

$$\ln Y^* = \mu^* + \sigma^{2*}/2 = \{\ln A + \alpha \ln [\alpha/(1+\alpha)]\} / (\gamma - \alpha) + (\gamma - \alpha E^{*2}) \sigma^{2*} / [2(\gamma - \alpha)] \quad (A9)$$

Comparing the steady-state average income level for $E^* = 0$ and $E^* = 1$, we obtain that it is higher under the former.

Derivational Details for Group Exclusion

It is easy to verify that the individually optimal decision remain unchanged. It then follows after substitution that the utility level of an individual member of group G , $G = B, W$, is given by:

$$U_{Gt} = \ln[y_{Gt}(1-T_t)/(1+\alpha E_t)] + \ln\{A[y_{Gt}^{E_t} T_t Y_t] / \int_0^1 (y_{jt})^{E_t} dj\}^\alpha [(y_{Gkt+1} T_t Y_t / \int_0^1 (y_{jt})^{E_t} dj)^\beta] \quad (A10)$$

As can be seen by differentiating (A10), all individuals unanimously agree on the optimal value of the tax rate, $T_t = (\alpha + \beta)/(1 + \alpha + \beta)$ —higher than in the previous analysis because of the positive spillover effect. And the welfare differential between social exclusion and inclusion is: $U_{Gt}^1 - U_{Gt}^0 = \ln(1/(1+\alpha)) + \ln[(y_{Gt}/Y_t)^\alpha (y_{Gkt}/Y_t)^\beta]$.

The assumptions on income distribution above guarantee that the y_{Wt} group is decisive—both initially and, because of a monotonic relationship between current and future incomes, in subsequent periods. The welfare differential for the members of this group is

$$U_{Wt}^1 - U_{Wt}^0 = \ln(1/(1+\alpha)) + \ln[(y_{Wt}/Y_t)^\alpha (y_{Wht}/Y_t)^\beta]. \quad (A11)$$

Because $y_{Wht} > Y_t$, this group's support for social exclusion increases with the magnitude of the spillover effect, β . When β is small, this group—hence, the majority of voters—support social inclusion thus reproducing the “one-man-one-vote” result of the previous section; and if it is large enough the support for social exclusion may emerge.

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The word “processed” describes informally reproduced works that may not be commonly available through library systems.

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