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MERITOCRACY, REDISTRIBUTION, AND THE SIZE OF THE PIE

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Abstract

This paper examines how ambiguous notions such as "meritocracy", "equality of opportunity" and "equality of outcomes" can be given a formal content and related to more standard economic concepts such as social mobility, income inequality, and efficiency. It then proceeds to examine how redistributive policies affect each of these criteria of social justice and economic performance. This is done using a dynamic model with endogenous labor supply and missing credit and insurance markets, where redistribution has both adverse and beneficial effects on investment and output.

Keywords: Income Distribution, Inequality, Opportunity, Meritocracy, Education, Mobility, Redistribution, Efficiency.

JEL classification: D31, D63, E62, I22.

Introduction

This paper examines how ambiguous notions such as "meritocracy", "equality of opportunity" and "equality of outcomes" can be given a formal content and related to more standard economic concepts such as social mobility, income inequality, and efficiency. It then proceeds to examine how redistributive policies affect each of these criteria of social justice and economic performance. This is done using a dynamic, optimizing model of earnings determination which incorporates ability, effort, family background, educational bequests and redistributive policies. Because of endogenous labor supply and missing credit markets, redistribution has both adverse and beneficial effects on investment and output.

Writers on distributive justice have put forward very different views of what an individual "deserves" or is "entitled to". At one end is Rawls (1971), who sees no moral justification for differences in welfare across individuals. Innate talent and socioeconomic background are equally arbitrary forms of luck, which in themselves merit no reward. Some inequality is necessary to provide incentives for people to produce, but it should be kept to the minimum level consistent with maximizing the welfare of the most disadvantaged individual. At the other end are libertarians like Nozick (1974), who view individuals as entitled to the entire endowment with which they came into the world, comprising both their own qualities and whatever was inherited from parents or other altruistic donors.[1] Common perceptions of fairness fall between these two extremes, with the line often drawn between innate qualities of the individual, which are mostly seen as true merits, and inherited economic and social advantages, which are not. For instance, Loury (1981) states that "it is widely held that differences in ability provide ethical grounds for differences in rewards", then proceeds to define measures of meritocracy based on the correlation between talent and income. Roemer (1995) goes further and proposes that resources be redistributed so as to equalize utility across people whose performance deviates to a similar extent from the predicted median for individuals with whom they share a set of basic characteristics, observed early on in life.

Although surely arbitrary, this distinction between background and ability or talent seems to underlie two recurrent themes in discussions of social justice: *equality of opportunity*, which is seen

[1] With the proviso that the capital thus transmitted should not have been acquired unjustly in the past, through expropriation, exploitation, etc. But while Nozick briefly concedes that a principle of "just redress" is necessary, he remains silent on what it should be.

as desirable, and *equality of outcomes,* which is not. I begin this paper by discussing potential measures of each, based on the extent to which individual ability is rewarded both relative to background and in absolute terms. Even in the context of a simple abstract model, it is clear that redistributive policies (or exogenous technological change) will generally affect these two notions in opposite ways, so that they cannot be examined separately. I therefore discuss possible indices of meritocracy which take the form of "meritocratic utility functions" defined over these two "goods".

To see whether these concepts are useful, I then examine whether they are good indicators of the effects of *redistribution* on social mobility, income inequality, and growth. These effects, which constitute the paper's second main focus, are studied in the context of a dynamic optimizing model where heterogeneous families accumulate human capital. Because the idea of meritocracy is often associated with that of maximizing the size of the economic "pie" –be it at some cost in terms of insurance or social preference for equality– I focus on the path of total output as the main indicator (or component) of efficiency. The exposition is centered on the case on progressive income taxation, but I also discuss the similar effects of progressive education finance (equalization of school inputs). Equality of opportunity is shown to be closely related to social mobility. Perhaps more surprisingly, meritocratic utility functions, introduced to represent competing notions of distributive justice, turn out to reflect fairly accurately the main channels through which redistribution affects growth. Equality of outcomes dulls individuals' incentives to provide the effort required to translate ability into earnings, and this contributes to lower output. Enforcing greater equality of opportunities, on the other hand, yields efficiency gains when there are imperfections in the markets for loans and insurance. For instance, reallocating educational funds towards poorer, liquidity–constrained families who have a higher return on human capital investment tends to raise the economy's growth rate (e.g. Loury (1981), Bénabou (1996a)). It also provides valuable insurance against idiosyncratic shocks (e.g., Varian (1980), Persson (1983)). Most of these benefits are shown to occur in future periods, through a gradual reduction in inequality and the inefficiency of human capital investment which it implies. In contrast, all the costs are contemporaneous. Thus society may be faced with an intertemporal tradeoff: maximizing short–run growth in every period does not result in maximizing long run output.

As explained above, the analysis generally validates the common intuition that meritocracy, appropriately defined, is desirable not only on grounds of fairness but also on grounds of efficiency. Indeed, long–run output takes a form very similar to the meritocratic utility function posited in the first part of the paper. There are differences, however, arising in particular from the complementarity between the inputs into human capital accumulation which are being redistributed (money and the classroom resources which it buys) and those which are not (neighborhood effects, social capital) or even can not (parental characteristics). Meritocracy calls for greater redistribution in the presence of these complementarities, whereas efficiency pushes the other way, unless some of these non–purchased inputs can be simultaneously redistributed. I extend the model to show how residential stratification and human capital heritability affect the desirability of redistribution (through tax or education policy) from either point of view.

1 Measures of Meritocracy

1.1 Equality of Opportunity versus Equality of Outcomes

A recurrent theme in discussions of meritocracy is *equality of opportunity*, which means that family origins should not constitute a significant advantage or handicap in pursuing economic success. One intuitive measure of this is the fraction of variance in income which is attributable to an individual's own qualities, or lack thereof, rather than to his or her background. Starting with the simplest case, suppose that a person's (lifetime) income can be written as

$$y = \bar{y} + \lambda a + \mu b, \tag{1}$$

where b represents social background (e.g., family resources) and a some intrinsic quality of the individual (e.g., cognitive ability) which for now is taken to be independent of b. Both are normalized to have mean zero, so $\bar{y} = E[y]$. One can then define meritocracy in opportunities as:

$$M^{opp} \equiv \frac{Var[\lambda a]}{Var[y]} = \frac{\lambda^2 \sigma_a}{\lambda^2 \sigma_a + \mu^2 \sigma_b^2} \tag{2}$$

This is also the squared correlation between income and ability, which Loury (1981) proposed as a definition of "weak meritocracy". It is also the main definition of equality of opportunity discussed in Atkinson (1980). It increases as $\mu\sigma_b$ is reduced, say by equalizing school expenditures or neighborhood compositions, or if $\lambda\sigma_a$ rises, say because technological progress increases the return to ability. In the more realistic case where a and b are correlated one must decide what part of their covariance represents qualities which it is "meritocratic" to reward, as opposed to inequitable disparities in opportunity. For instance, it is generally viewed as un–meritocratic that children's educational opportunities should be constrained by parental wealth; inherited talent or beauty, on the other hand, seem far less objectionable. But this is a thin line to draw, and one that can shift rapidly with technology. Family resources already determine, through the quality of pre– and post–natal care, some permanent characteristics of children's health and physical appearance which directly impact their productive abilities. With the continued progress of genetic engineering, disparities in wealth will increasingly translate into different abilities to ensure that children are born with desirable traits (or at least free of undesirable ones), whether physical, cognitive, or behavioral.

It seems hard to avoid carrying this logic to its natural conclusion, namely that inherited advantages or disadvantages of any kind make opportunities unequal. In that case one simply replaces a by $a' = a - E[a|b]$ in the computation of M^{opp}.[2] Thus if intelligence, initiative or beauty is partly inherited and contributes to earnings, its predicted component is counted as part of b. Only innovations, including market luck, are part of the individual's intrinsic "merit". This information–based definition may seem unusual, but I do not see that ethical considerations provide a convincing rationale for drawing the line elsewhere. The distinction commonly made, between traits whose transmission is mediated by socioeconomic resources and those inherited through other channels, seems to reflect instead a practical concern about what can or cannot be redistributed across families. Fortunately, none of the issues, results and policy tradeoffs to be discussed in the remainder of the paper are critically predicated on a specific definition.

For instance, while a general distinction between background and intrinsic qualities captures an important component of what most people mean by "meritocracy", the picture is incomplete. What is missing is the converse notion that imposing *equality of outcomes* is un–meritocratic, as the following example will make clear. Let income still be determined by (1), but suppose now

[2]More generally, if ability and background are multidimensional vectors A and B, one simply replaces λa by $y - E[y|B]$ in (2). Thus income is decomposed into the part which is predictable on the basis of family and social characteristics and that which is not.

that the government taxes it at the rate τ and redistributes it in an egalitarian manner. Post–tax income is therefore:

$$\hat{y} \equiv (1-\tau)\, y + \tau \bar{y} = \bar{y} + \lambda(1-\tau)a + \mu(1-\tau)b. \tag{3}$$

This equalization could also take the form of pay scales or wage norms within the firm, as in Scandinavian countries, or arise through technological complementarity between the labor inputs of workers with different levels of human capital (defined as y). What do such redistributions imply for meritocracy? According to any informational criterion such as (2), *nothing!* Yet one would usually think that such a society is less meritocratic, the higher is τ. This is most clearly the case when $\mu = 0$, so that income (or marginal product) reflects purely own ability or talent; nonetheless rewards are equalized across individuals, perhaps even to the point where $\tau = 1$. Similarly, while the salient feature of Roemer–type (1995) redistributive schemes is that people are rewarded only for the "distance travelled" from the median of their peer group, equal attention needs to be paid to the steepness or flatness of this reward schedule for "personal responsibility".

These considerations argue for a two-dimensional measure of meritocracy, capturing both:

(i) *Equality of opportunities:* the extend to which talent, rather than background, is a determinant of income or rewards. This is measured by M^{opp}, defined in (2).

(ii) *Inequality of outcomes,* with respect to ability: the extent to which talent (or market luck) is rewarded in absolute terms.[3] This is measured by $M^{out} \equiv \lambda(1-\tau)$.

This makes clear that there can be no single, value–free definition of meritocracy, but only preference orderings over values of (M^{opp}, M^{out}). The relative importance placed on each of these desirable attributes can then be summarized through a *"meritocracy utility function":*

$$M = W(M^{opp}, M^{out}) \tag{4}$$

with the standard properties: W is increasing in both arguments, quasiconcave, and $W_{12} > 0$, as illustrated on **Figure 1.** I shall also impose the normalization that $W = 0$ when either M^{opp} or M^{out} is zero, which correspond to the following limiting cases:

a) *"Aristocracy":* when $M^{opp} \to 0$, all income-generating characteristics are passed down from

[3] Rewards to effort (which is endogenously chosen given ability and background) are discussed in Section 1.2 below.

parents to children. Whether they consist of education expenditures, social connections, family human capital or even inherited intelligence, as some have recently argued, is irrelevant. An individual has no opportunity to advance on his own "merits".

b) *"Mediocracy":* when $M^{out} \to 0$, talent is not rewarded, that is, irrelevant to the determination of income. Note from the above tax example that when $M^{out} \to 0$ the same need not be true of M^{opp}, because μ may be changing together with λ.

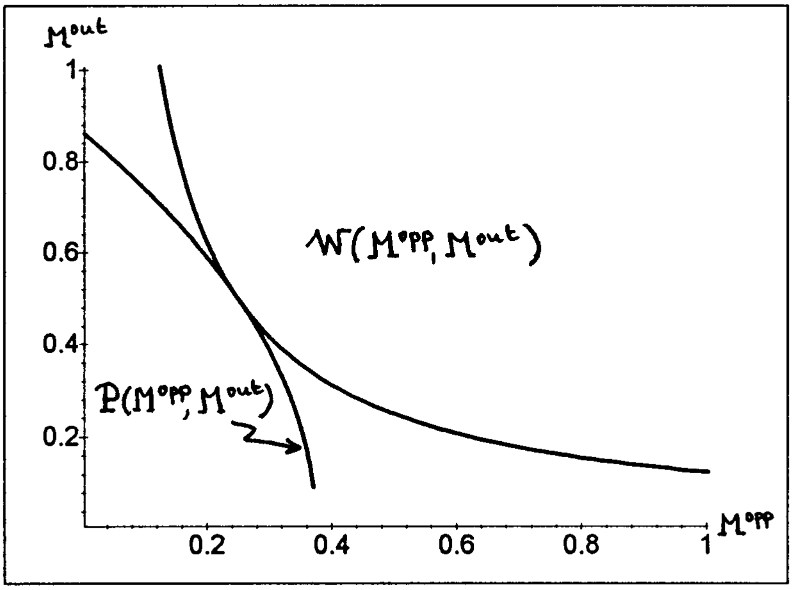

Figure 1: Meritocratic Utility Function and Meritocracy Possibility Frontier

This elementary model is static. Once *intergenerational dynamics* are brought into the picture, however, it becomes apparent that most policies will cause M^{opp} and M^{out} to move in opposite directions. Summarily put, parents' outcomes determine children's opportunities, and vice–versa. For instance, redistributing each generation's income at the rate τ clearly reduces M^{out}, but if parental resources affect educational opportunities ($b = \theta\hat{y} + (1 - \theta)c$, where c captures non–pecuniary background variables) it reduces σ_b^2 and therefore raises M^{opp}. Similarly, redistributing educational funds or subsidizing schooling for the poor increases M^{opp}, but it also lowers the real income of parents, i.e. reduces M^{out} once outcomes are appropriately measured.[4] Indeed, the quality of the schools and neighborhoods where their child is educated is an integral part

[4]These arguments will be made more formal in Section 3, using the dynamic model developed in Section 2.

of parents' reward, and in particular of their reward for ability. These observations suggests that policy outcomes are constrained to lie on a *"meritocracy possibility frontier"* $P(M^{opp}, M^{out})$, subject to which one would like to maximize the meritocratic welfare function $W(M^{opp}, M^{out})$, as illustrated on **Figure 1**.

To assess whether these notions are really meaningful, one needs a more proper economic model of intergenerational dynamics and redistribution. I develop such a model in Section 2, and show in Section 3 that notions like $W(M^{opp}, M^{out})$ and $P(M^{opp}, M^{out})$ indeed provide useful (but imperfect) intuitions both on *social mobility* and on the *efficiency costs and benefits* of redistribution. But first I turn to the issue of effort decisions.

1.2 Rewards to Effort

Is a society which rewards effort more necessarily more meritocratic? A common view of distributive justice indeed holds that individuals should be held responsible for the actions which are under their control but not for their innate attributes, which are not (e.g., Roemer (19995)). However, different propensities to work must ultimately reflect different (perceived) returns to effort, hence differences in either background or ability. Formally, let income net of effort costs be determined by:

$$\max_e \{\bar{y} + \lambda a + \mu b + \nu e - e^2/2(\gamma a + \delta b)\}. \tag{1'}$$

Then:

$$\begin{aligned} M^{out} &= \lambda + \gamma\nu^2, \\ M^{opp} &= \frac{(\lambda + \gamma\nu^2)^2\sigma_a^2}{(\lambda + \gamma\nu^2)^2\sigma_a^2 + (\mu + \delta\nu^2)^2\sigma_b^2}. \end{aligned}$$

While a higher return to effort ν always improves M^{out}, its effect on M^{opp} depends on the behavior of $(\lambda + \gamma\nu^2)/(\mu + \delta\nu^2)$. Equality of opportunity increases or decreases depending on $\gamma/\delta \gtrless \mu/\lambda$, that is on the relative *"ability–intensity"* of effort, compared to the other determinants of income. To make things concrete, suppose that the cost or perceived cost of graduating from high-school is much higher is a community with poor role models and peers. To the extent that the sorting of families into towns and neighborhoods reflects differences in parents' wealth, education, or even tastes, the differences in studying effort (attendance, homework, etc.) observed between the children of poor and better off communities will not reflect differences in their individual merits.

2 Inequality, Redistribution and Growth

I now turn to a truly dynamic, optimizing model of earnings determination, which embodies the effects of luck (genetic or other), effort, family background, educational bequests and redistributive policies. It will allow me to relate the dual notions of meritocracy defined above to more standard economic variables such as social mobility, income inequality or productive efficiency, and to clearly demonstrate the costs and benefits of redistribution. The model is more fully developed in Bénabou (1996c), (1996d) and the reader is referred to these papers for proofs, which will be omitted here. The second one also provides a quantitative analysis through numerical simulations.

2.1 The Model

A continuum $i \in [0,1]$ of infinitely-lived agents or dynasties maximize the intertemporal utility

$$U_0^i = E\left[\sum_{t=0}^{\infty} \rho^t (\ln c_t^i - \delta (l_t^i)^\eta)\right] \tag{5}$$

subject to:

$$c_t^i + e_t^i = \hat{y}_t^i \tag{6}$$

$$y_t^i = (h_t^i)^\lambda \, (l_t^i)^\mu \tag{7}$$

$$h_{t+1}^i = \kappa \, \xi_{t+1}^i \, (h_t^i)^\alpha \, (e_t^i)^\beta. \tag{8}$$

In period or generation t, agent i produces output y_t^i using his human capital h_t^i and labor input l_t^i. Taxes and transfers, specified below, then transform this gross income into *net* income, denoted $\hat{y}_t^i$. Both consumption c_t^i and education expenditures e_t^i are financed out of these current resources, reflecting agents' inability to borrow for human capital investment. Insurance markets are also incomplete, so that the random shocks ξ_t^i cannot be diversified away. The simplest interpretation of ξ_t^i is as the child's innate ability, as in Loury (1981), but it can also stand for other forms of luck. This shock is assumed to be i.i.d., without much loss of generality since children already inherit some of their parents' productive potential through the term $(h_t^i)^\alpha$. This non-pecuniary effect of family background on the young's human capital can be viewed as a convenient stand–

in for genetic inheritance.[5] More generally, if the home environment provides important inputs which affect children's ability to learn in school, α is large. Social capital spillovers at the level of the school, neighborhood or community have the same effect when these "clubs" are highly segregated by income and occupation; see Section 4.2. I shall assume $\ln \xi_t^i \sim \mathcal{N}(-s^2/2, s^2)$, so that $E[\xi] = 1$, and $\ln h_0^i \sim \mathcal{N}(m_0, \Delta_0^2)$. I also restrict $\eta \geq 1 > \rho$ and $\alpha + \beta\lambda < 1$.

Let us now turn to public policy. Income redistribution is almost always modelled as a combination of linear taxes and lump–sum transfers, making post–tax income an arithmetic average of own and aggregate income. In reality, most countries have *progressive* taxes and transfers; moreover, the fairness and efficiency implications of increasing marginal rates are important issues in discussions of meritocracy. I shall therefore use here the same progressive scheme as in Bénabou (1996c), (1996d), which makes post–tax income a geometric average of own resources and some economy–wide aggregate:

$$\hat{y}_t^i = (y_t^i)^{1-\tau_t} (\tilde{y}_t)^{\tau_t} \tag{9}$$

where $\tilde{y}_t$ is defined by the balanced–budget constraint:

$$\int_0^1 (y_t^i)^{1-\tau_t} (\tilde{y}_t)^{\tau_t} \, di = y_t \, . \tag{10}$$

Note that $\tilde{y}_t$ is the break-even point where pre– and post–tax income coincide, and that $\tilde{y}_t > y_t \equiv E[y_t^i]$ when $\tau_t > 0$, in contrast to the usual linear case. Indeed, the elasticity τ_t measures the degree of *progressivity* of the tax scheme, or conversely its regressivity when it is negative.[6] As usual, tax rates $\tau_t > 1$ must be excluded because they are not incentive-compatible. Redistributive policies other than income taxation, such as education finance or residential integration, will be discussed in Section 4.

[5] Allowing for first–order serial correlation in ξ_t^i involves additional algebra but is not very difficult. The main features of this extended model are qualitatively similar to those of the original one with a higher α. For instance, there is greater intergenerational persistence of income, and the growth benefits of redistribution arising from capital market imperfections are attenuated due to the complementarity between education expenditures and the non–redistributed input (talent, parental human capital).

[6] Since writing Bénabou (1996c), (1996d) and the first version of the present paper, I have become aware of a couple of articles in the public finance literature which used a similar geometric scheme in a static context, most notably Svensson (1983).

2.2 Savings and Effort

Intuition suggests that the anticipation of future taxes $\{\tau_t\}_{t=1}^{\infty}$ will negatively affect parents' incentives to invest in their children's education. While this is correct, it can be shown that the policy described by (9)-(10) can be combined with an investment subsidy, financed by a proportional tax on consumption, to ensure that the savings rate never deviates from its optimal level, $\mathfrak{s} \equiv \rho\beta\lambda/(1-\rho\alpha)$. Moreover, for any envisioned sequence $\{\tau_t\}_{t=0}^{\infty}$, this complementary scheme is Pareto–optimal: it will be unanimously supported by every family, in every generation.[7] For brevity I shall directly assume here that agents save a constant fraction $\mathfrak{s}$ of their post–tax income,

$$e_t^i = \mathfrak{s}\,\hat{y}_t^i, \tag{11}$$

as in a Solow model. The only margin subject to distortion is therefore labor supply, and the dynamic optimization problem faced by an agent with human capital h is:

$$V_t(h) = \max_l \left\{ \ln[(1-\mathfrak{s})(h^\lambda\, l^\mu)^{1-\tau_t}(\tilde{y}_t)^{\tau_t}] - \delta l^\eta + \rho E V_{t+1}[\kappa\,\xi\, h^\alpha(\mathfrak{s}\,(h^\lambda\, l^\mu)^{(1-\tau_t)}(\tilde{y}_t)^{\tau_t})^\beta] \right\}. \tag{12}$$

It can be solved under any tax profile $\{\tau_t\}_{t=0}^{\infty}$, but for simplicity I shall restrict attention from here on to time–invariant policies, $\tau_t \equiv \tau$. One can then show the following result.

Proposition 1 *Let the rate of progressive taxation be $\tau_t = \tau$ for all t. Agents then choose in every period a common, constant labor supply:*

$$l = \left(\frac{(\mu/\delta\eta)(1-\tau)(1-\rho\alpha)}{1-\rho(\alpha+\beta\lambda(1-\tau))} \right)^{1/\eta}. \tag{13}$$

A more progressive tax system reduces the return to effort because it impounds each generation's current consumption (numerator) as well as its ability to pass on human capital to its offspring (denominator). Because of the second effect, the distortion is greater the more forward–looking agents are, and the more lasting is human capital: $-l'(\tau)$ increases with ρ and α. Finally, note that it would be straightforward to allow an individual's effort to vary with his ability ξ_t^i or

[7] The first–best savings rate $\mathfrak{s}$ corresponds to agents' choice in the absence of all taxes or subsidies, as there are no externalities in this model. The political unanimity result is proved in Bénabou (1996c), while Bénabou (1996d) derives the equilibrium path of savings rates when corrective consumption taxes and investment subsidies are not available.

background h_t^i, as in Section 1.2. Replacing in (5) the cost of effort δ by $\delta(\xi_t^i)^{-\nu}(h_t^i)^{-\nu'}$ leaves the model's structure unchanged, up to a renormalization of the parameters.

2.3 Individual and Aggregate Dynamics

Taking logs in (7)-(8), the accumulation of human capital becomes:

$$\ln h_{t+1}^i = \ln \xi_{t+1}^i + \ln \kappa + \beta \ln s + \beta\mu(1-\tau)\ln l + (\alpha + \beta\lambda(1-\tau))\ln h_t^i + \beta\tau \ln \tilde{y}_t. \tag{14}$$

It is easy to see that human wealth and income always remain *log-normally distributed* across families. Indeed, suppose that $\ln h_t^i \sim \mathcal{N}(m_t,\, \Delta_t^2)$; the production function (7) then implies

$$\ln y_t^i \sim \mathcal{N}(\lambda m_t + \mu \ln l, (\lambda\Delta_t)^2), \tag{15}$$

and the budget constraint (10) allows us to compute the break–even point of the tax–and–transfer scheme:

$$\ln \tilde{y}_t = \ln y_t + (1-\tau)(\lambda\Delta_t)^2/2 = \lambda m_t + \mu \ln l + (2-\tau)(\lambda\Delta_t)^2/2. \tag{16}$$

Substituting into (14) yields next period's distribution, $\ln h_{t+1}^i \sim \mathcal{N}(m_{t+1},\, \Delta_{t+1}^2)$, as a function of the current one.

Proposition 2 *The cross-sectional distribution of human capital evolves according to the linear difference equations:*

$$m_{t+1} = \ln \hat{\kappa} + \beta\mu \ln l + (\alpha+\beta\lambda)m_t + \beta\tau\,(2-\tau)(\lambda\Delta_t)^2/2$$
$$\Delta_{t+1}^2 = (\alpha + \beta\lambda(1-\tau))^2\,\Delta_t^2 + s^2$$

where $\ln \hat{\kappa} \equiv \ln \kappa - s^2/2 + \beta \ln s$ *is a constant. The distribution of income is then given by (15).*

Two important terms appear in these expressions. The first is $\alpha + \beta\lambda(1-\tau)$, which measures the degree of persistence of inequalities in human capital and income, or conversely the lack of *social mobility.* I will show in Section 3 that it is directly related to the index of "equality of opportunity" M^{opp}. The other critical term is $\beta\tau\,(2-\tau)(\lambda\Delta_t)^2/2 = \beta(1-(1-\tau)^2)(\lambda\Delta_t)^2/2$, which captures the gains in *aggregate welfare* achieved by redistributing income at the rate τ in period t –keeping labor supply constant. These arise from two sources:

(a) redistribution provides insurance against the idiosyncratic shock ξ^i_{t+1};

(b) it tends to raise total output $y_{t+1} \equiv E[y^i_{t+1}]$, through a reallocation of capital from low to high marginal product investments.

Since this paper's main concern is with the links between meritocracy, redistribution and the size of the economic "pie", I shall from here on focus on the second of these effects.[8] Proposition 2 easily leads to the following result, where $\ln \tilde{\kappa} \equiv \lambda(\ln \kappa + \beta \ln \mathfrak{s}) - \lambda(1-\lambda)s^2/2$ is a constant.

Proposition 3 *Income inequality reduces the growth rate of per capita income,*

$$\ln y_{t+1} - \ln y_t = \ln \tilde{\kappa} + \mu(1-\alpha)\ln l(\tau) - (1-\alpha-\beta\lambda)\ln y_t - \mathfrak{L}(\tau)(\lambda\Delta_t)^2/2, \tag{17}$$

to an extent which is measured by

$$\mathfrak{L}(\tau) \equiv \alpha + \beta\lambda(1-\tau)^2 - (\alpha + \beta\lambda(1-\tau))^2. \tag{18}$$

This loss factor is positive for all τ and minimized at $\bar{\tau} \equiv 1 - \alpha/(1-\beta\lambda)$.

These results have simple interpretations. The first three terms in (17) give the growth rate of a *representative agent* economy, where everyone has the same level of human capital. Convergence to the steady-state $\ln y_\infty$ occurs at the rate $(1-\alpha-\beta\lambda)$. As usual, continual growth could be sustained by incorporating spillovers to preserve constant returns. The last term shows that *inequality* constitutes a *drag on growth,* in line with the empirical findings of Alesina and Rodrik (1994), Persson and Tabellini (1994), and Perotti (1996), among others. The reason is that credit markets imperfections result in a misallocation of education resources: given that $\alpha + \lambda\beta < 1$, families with low human capital have a higher return than wealthier ones, but are constrained to lower levels of investment by their inability to borrow. This differential marginal productivity of education expenditures reflects the presence of decreasing returns in educational investment $(\lambda\beta < 1)$, which are only partially mitigated by the positive impact of family background $((h^i_t)^\alpha$

[8]It is not difficult, however, to compute from (14) and Proposition 2 a family's expected intertemporal welfare, which embodies the insurance effect. On the insurance value of redistributive taxation (in a static model) see also Varian (1980) and Persson (1983).

in (8)).[9] The role of decreasing returns can be made more apparent by rewriting:

$$\mathfrak{L}(\tau) \equiv \alpha + \beta\lambda(1-\tau) - (\alpha + \beta\lambda(1-\tau))^2 - \beta\lambda(1-\tau-(1-\tau)^2).$$

Under a tax rate τ, y_{t+1}^i is proportional to $(y_t^i)^{\alpha+\beta\lambda(1-\tau)}\ (\tilde{y}_t)^{\beta\lambda\tau}$, and the difference of the first two terms in $\mathfrak{L}(\tau)$ directly measures the *concavity* of this accumulation technology. The last term embodies the extent to which $\tilde{y}_t > y_t$, which in turn is due to the concavity of $\hat{y}_{t+1}^i = (y_t^i)^{1-\tau}\tilde{y}_t$ with respect to y_t^i.

The role of credit market imperfections in generating a dependence of aggregate growth on the distribution of income and wealth has been explored in a number of recent papers such as Loury (1981), Galor and Zeira (1993), Banerjee and Newman (1993), Perotti (1993), Saint–Paul and Verdier (1993), Bénabou (1996a), (1996c), Aghion and Bolton (1997) or Piketty (1997). The potential for growth–increasing redistributions is another common feature of these models (most of which abstract from labor supply), although in some of them the presence of a fixed cost in the investment technology implies that regressive policies may be called for at the early stages of development. Calibrated simulations on U.S. data suggest that the long–run gains from redistributing resources (either directly or through income transfers) towards educational investment by poor families or communities could be quite large, amounting to a few percentage points of GDP (Fernandez and Rogerson (1994), Bénabou (1996d)).

2.4 Short and Long–Run Effects of Redistribution

Consider the economy at a given point in time. The degree of inequality Δ_t^2 is given, as the result of historical accidents and past policies. The degree of progressivity $\tau_{SR}^*(\Delta_t)$ which maximizes

[9] This complementarity between background and purchased inputs explains why the tax rate $\bar{\tau}$ which minimizes the growth losses from inequality $\mathfrak{L}(\tau)$ decreases with α. In its absence ($\alpha = 0$), and with fixed labor supply ($l'(\tau) = 0$), the growth-maximizing tax rate would be $\tau = 1$; such is for instance the case in Loury (1981) or Piketty (1996). One could easily incorporate into the model additional features which make inequality either more costly or more desirable: complementarity or substitutability in the production of goods and human capital, costs of crime, etc. These additional components of $\mathcal{L}$ are studied in Bénabou (1996a) and to some extent in Section 4.2 below, but for now I intentionally focus on a "benchmark" case with no externalities of any kind.

the current growth rate is determined as the solution to[10]

$$\mu(1-\alpha)l'(\tau)/l(\tau) = \mathcal{L}'(\tau)(\lambda\Delta_t)^2/2. \tag{19}$$

The marginal distortion to labor supply is optimally balanced with the marginal gain from relaxing the liquidity constraints on poor families' investment. As a result, τ^*_{SR} increases with Δ^2_t but remains bounded above by $\bar{\tau}$. This static tradeoff, however, is only part of the story. Looking more than one period ahead reveals another, dynamic effect of redistribution: increasing τ_t at time t reduces Δ^2_{t+1} and, more generally, all future variances. Similarly, if the tax rate is permanently set to τ, inequality converges to:

$$\Delta^2_\infty(\tau) = \frac{s^2}{1-(\alpha+\beta\lambda(1-\tau))^2}. \tag{20}$$

By lessening future growth losses due to the combination of inequality of resources with imperfect markets, this *homogenizing effect* on the distribution of human capital and income generates an important intertemporal tradeoff.[11]

Proposition 4 *Much of the benefit from an increase in redistribution occurs in future periods, whereas all of costs are contemporaneous. Therefore maximizing short–run growth in every period will not result in maximizing long run growth or output.*

Formally, long–run output, which is obtained by taking limits in (17),

$$\ln y_\infty = \frac{\theta + (1-\alpha)\mu\ln l(\tau) - \mathcal{L}(\tau)\lambda^2\Delta^2_\infty(\tau)/2}{1-\alpha-\beta\lambda}, \tag{21}$$

is maximized by the tax rate τ^*_{LR} defined as the solution to:

$$\mu(1-\alpha)l'(\tau)/l(\tau) = \mathcal{L}'(\tau)\lambda^2\Delta^2_\infty(\tau)/2 + \mathcal{L}(\tau)\lambda^2(\Delta^2_\infty)'(\tau)/2. \tag{22}$$

[10] Throughout this section I shall implicitly assume strict quasi–concavity of the relevant objective functions. This condition was always satisfied in numerical simulations.

[11] Writing $l'(\tau)$ in (19) implicitly assumes that agents always expect the current tax rate to remain constant into the future. But the result applies in the general case: for any given expected sequence $\{\tau_{t+k}\}_{k=1}^{\infty}$, a change in τ_t can be shown to affect labor supply l_t and the loss factor $\mathcal{L}(\tau_t)$ only in the current period, but inequality $\{\Delta^2_{t+k}\}_{k=1}^{\infty}$ in all future periods.

Let $\Delta^*_{LR} \equiv \Delta_\infty(\tau^*_{LR})$ denote the associated level of inequality; it is easy to see that $\tau^*_{LR} > \tau^*_{SR}(\Delta^*_{LR})$. Thus, starting from the steady-state $(\tau^*_{LR}, \Delta^*_{LR})$, a tax cut would boost growth for a while but eventually lower output permanently –as well as increase income disparities. Conversely, suppose that in every period τ is set so as to maximize current growth: $\tau_t = \tau^*_{SR}(\Delta^2_t)$. The economy will converge to the steady-state $(\tau^*_{SR}, \Delta^*_{SR})$ located at the intersection of the upward-sloping locus defined by (19) and the downward–sloping locus given by (20); note that $\tau^*_{SR} < \tau^*_{LR}$. Starting from this steady-state, higher long-run output can be achieved at the cost of an initial phase of slower growth, through a permanent increase in the rate of tax progressivity.

This intertemporal tradeoff, which also occurs when evaluating individual or aggregate welfare rather than per capita income, makes clear the importance of the horizon over which policies are evaluated by governments and voters. It arises, fundamentally, from the fact that incomplete markets make the entire *distribution* of income a *state variable* relevant to the economy's aggregate behavior.[12] To obtain a similar reversal between the short–and long–run effects of tax policy in a standard growth model one would have to introduce a form of "time to build" delay between government spending (say, on infrastructure) and its productivity benefits.

Bénabou (1996a) shows that a similar tradeoff is likely to apply to other forms of redistribution, which involve *social capital* rather than financial resources. That paper develops a general analysis of the costs and benefits of mixing together heterogenous populations in the presence of human capital spillovers or production complementarities. It explains in particular how policies promoting the *residential integration* of neighborhoods, or *affirmative action* in education or at the workplace, may reduce growth in the short run yet still increase it in the long–run.

3 Meritocracy, Social Mobility and Growth

Do more meritocratic societies grow faster? To address this question, let us now relate the determinants of growth to the dual notions of meritocracy discussed in Section 1. Recall that $\ln \hat{y}^i_{t+1} = (1-\tau)(\lambda \ln h^i_{t+1} + \mu \ln l) + \tau \ln \tilde{y}_t$, while $\ln h^i_{t+1}$ is explained in terms of ability $\ln \xi^i_t$ and background $\ln h^i_t$ by equation (14). The proportion of variance in $\ln \hat{y}^i_{t+1}$, $\ln y^i_{t+1}$ or $\ln h^i_{t+1}$ which

[12] This is also the property which allows for multiple long–run equilibria in models such as those of Banerjee and Newman (1993), Piketty (1996) and Bénabou (1996c).

is due to own ability is therefore

$$M_t^{opp} = \frac{s^2}{\Delta_{t+1}^2} = 1 - (\alpha + \beta\lambda(1-\tau))^2 \, \frac{\Delta_t^2}{\Delta_{t+1}^2}. \tag{23}$$

Over time, this measure of *equality of opportunity* tends to:

$$M_\infty^{opp} = 1 - (\alpha + \beta\lambda(1-\tau))^2, \tag{24}$$

which is an exact measure of *social mobility.* As to *inequality of outcomes*, measured by the elasticity of post–tax income to ability, it is simply:

$$M^{out} = \lambda(1-\tau) \tag{25}$$

Let us now temporarily "forget" the dependence of $\mathfrak{L}(\tau)$ on τ, denoting it simply as $\mathfrak{L}$. The accumulation equation (17) can be rewritten as:

$$\ln y_{t+1} - \ln y_t = \theta - \mu\frac{(1-\alpha)}{\eta} \ln\left(\frac{\lambda}{M^{out}} - \frac{\rho\beta\lambda}{1-\rho\alpha}\right) - (1-\alpha-\beta\lambda)\ln y_t - \mathfrak{L}\frac{\lambda^2 s^2/2}{M_{t-1}^{opp}},$$

which makes apparent that *both dimensions of meritocracy contribute positively to growth*: inequality of outcomes sharpens individual incentives for effort, whereas equality of opportunities improves the allocation of investment. The tradeoff between equality of opportunity and equality of outcomes therefore *differs from the standard one* between equity and efficiency. In particular, M^{opp} enhances both equality and aggregate growth. Naturally, the beneficial effects of meritocratic values on the economy's growth path are also reflected in the long–run level of per capita income y_∞, which by (21) is proportional to:

$$W(M^{out}, M^{opp}) \equiv \left(\frac{\lambda}{M^{out}} - \frac{\rho\beta\lambda}{1-\rho\alpha}\right)^{-\mu(1-\alpha)/\eta} \times \exp\left(-\mathfrak{L}\frac{\lambda^2 s^2/2}{M_\infty^{opp}}\right). \tag{26}$$

It is rather striking that W has all the properties discussed in Section 1 for indices of meritocracy: $W_1 > 0$, $W_2 > 0$, and $W(M, M') = 0$ whenever $MM' = 0$; moreover, $W_{12} > 0$ and W is quasiconcave (even concave at high enough values) in (M, M'). Introduced to represent competing notions of distributive justice, *meritocratic utility functions* turn out to also capture the two main forces which shape efficiency. Moreover, these two effects are indeed tied together by movements along a convex *"meritocracy possibility frontier"*:

$$M_{\infty}^{opp} + (\alpha + \beta M^{out})^2 = 1. \tag{27}$$

If $\mathfrak{L}$ was actually a constant we could interpret it as measuring the relative weight of M_{∞}^{opp} with respect to M^{out} (slope of the iso-meritocracy curves) and we would be exactly in the case of **Figure 1.**[13] The analogy is imperfect, however, because $\mathfrak{L}(\tau)$ is *not* a constant preference parameter, but an *endogenous* measure of the productivity gains obtained by reducing disparities in educational opportunity: it varies together with $(M_{\infty}^{opp}, M^{out})$ in response to the progressivity rate τ. This more subtle but important effect marks the limit of the general intuition that meritocracy and efficiency go together. I explore this issue further in Section 4.2.

When computing equality of opportunity and equality of outcomes I focused for simplicity on current income as a measure of individual reward. In a dynamic model one should more properly use expected *intertemporal utilities,* which take into account the value to parents of their children's welfare. To see that this leads to very similar results, observe that consumption is proportional to post–tax income $\hat{y}_t^i$, which has elasticity $\lambda(1-\tau)$ with respect to human capital; h_t^i, in turn, follows an autoregressive process with innovations ξ_t^i and persistence coefficient $p(\tau) \equiv \alpha+\beta(1-\tau)$. Therefore:

$$\hat{M}_t^{opp} \equiv \frac{Var[\ln \xi_t^i]}{Var[U_t^i]} = \frac{s^2}{s^2 + p(\tau)^2 \Delta_{t-1}^2}, \text{ so that } M_{\infty}^{opp} = 1 - p(\tau)^2; \tag{28}$$

$$\hat{M}^{out} \equiv \frac{\partial U_t^i}{\partial \ln \xi_t^i} = \frac{\lambda(1-\tau)}{1-\rho p(\tau)}. \tag{29}$$

It is clear that M^{out} and M_t^{opp} (which is unchanged) are constrained to lie on a possibility frontier very similar to (27), and that $\ln y_{\infty}$ can again be expressed as a function of M^{out}, M_t^{opp} and $\mathfrak{L}$.[14]

[13] Note from (26) that this slope also depends positively on λ and s^2, both of which tend (ceteris paribus) to increase long–run income dispersion. This accords well with intuition: inequality of opportunity (a strong dependence of children's education and income on parental background) should be more of a concern, the more unequal are families' resources.

[14] Ex–ante or aggregate welfare in the steady–state, $\lim_{k\to\infty}(E[U_{t+k}^i | h_t^i])$, also depends on M^{out}, M_t^{opp} and $\mathfrak{L}$. But, in addition, it incorporates the insurance value of redistribution.

4 Education Finance, Family Background and Social Capital

4.1 Redistributing Education Funding Versus Redistributing Income

A welfare–based measure of equality of outcomes becomes indispensable when redistribution occurs directly at the level of education funding rather than through progressive income taxation. Such is the case when the state provides free universal public education or transfers which aim to equalize school budgets between rich and poor communities. The distributional and efficiency properties of alternative systems of education finance have been investigated in a number of recent papers (e.g., Loury (1981), Glomm and Ravikumar (1992), Bénabou (1996a), (1996b), Fernandez and Rogerson (1996), (1994) or Gradstein and Justman (1995)). Here I shall simply explain the close similarity –but for one important difference– with the income redistributions studied earlier.

Suppose that earnings are left untaxed, but that educational monies are redistributed according to a progressive scheme.[15] Thus e_t^i is replaced in (8) by $\hat{e}_t^i$, with:

$$\hat{e}_t^i = (e_t^i)^{1-\tau} (\mathfrak{s}\, \tilde{y}_t)^{\tau} , \tag{30}$$

where $\mathfrak{s}$ and $\tilde{y}_t$ are defined as before. The case $\tau = 0$ corresponds to laissez–faire, while at the other extreme $\tau = 1$ imposes egalitarian funding. This policy has implications very similar to those of income taxation, and in particular gives rise to the same tradeoff between distortions to $l(\tau)$ and gains from relaxing both present and future wealth constraints. With respect to meritocracy, it is easy to see that equality of opportunity $\hat{M}_t^{opp}$ remains unchanged, while the utility–based $\hat{M}^{out}$ is now equal to the expression in (29) except that $1 - \tau$ does not appear in the numerator any more. This reduced impact on outcomes reflects the fact that parental consumption now escapes redistribution, and indicates that distortions to effort will be smaller than under progressive income taxation. It also implies that if human capital is the main transmission mechanism for intergenerational income differences, as in our model, progressive *education finance* is *more meritocratic* than progressive *income taxation.* If other channels such as financial bequests are important, on the other hand, the increase in M^{out} obtained by redistributing only e^i rather than all of y^i must, once again, be traded against a reduction in M^{opp}.

[15]In addition, there may be a flat consumption tax whose proceeds are used to finance educational subsidies, so that the savings rate remains equal to $\mathfrak{s}$. See the discussion in Section 2.2.

4.2 The Role of Family and Social Inputs to Education

In addition to teachers, classrooms, books and other school resources, the accumulation of human capital involves important non–purchased inputs, provided either by the family or by the local community. Examples of neighborhood influences include peer effects, role models, job contacts, local norms of behavior, and crime. Altering through law or financial incentives the socioeconomic mix of schools, communities or even firms amounts to a redistribution of these various forms of "social capital" (a term coined by Loury (1977)), which can be studied in a way similar to redistributions of income. Conversely, the presence of socioeconomic background as a complement to expenditures in the education production function impacts the effectiveness of income redistribution and school finance reform. This is one of the main sources of divergence between meritocracy and efficiency.

Let us start by recalling the claim in Section 2 that the transmission of human capital within the family and the impact of social capital in segregated communities can both be captured by the term $(h_t^i)^\alpha$ in (8). In the latter case, this reflects a more general technology of the form

$$h_{t+1}^i = \kappa \xi_{t+1}^i (h_t^i)^\alpha (e_t^i)^\beta (L_t^i)^\gamma, \tag{31}$$

where the local spillover L_t^i is measured by a CES average of education levels in the community or "club" Ω_t^i where individual (i,t) is educated

$$L_t^i = \left(\int_{j \in \Omega_t^i} (h_t^j)^{\frac{\varepsilon - 1}{\varepsilon}} dj \right)^{\frac{\varepsilon}{\varepsilon - 1}}. \tag{32}$$

By allowing the *elasticity of complementarity* $1/\varepsilon$ to vary between $+\infty$ and $-\infty$, this specification captures all cases between the two extremes where local interactions are dominated by the lower or the upper tail of the human capital distribution ($L_t^i = \min\{h_t^j,\, j \in \Omega_t^i\}$ and $L_t^i = \max\{h_t^j,\, j \in \Omega_t^i\}$ respectively). Perfectly segregated communities correspond to $L_t^i = h_t^i$, while perfectly integrated ones yield $L_t^i = L_t$, where this index is computed over a representative sample of the economy's population. A rise in the degree of socioeconomic *stratification*, such as an exodus of better–off families to the suburbs, can therefore be represented in the transmission equation $h_{t+1}^i = \kappa \cdot \xi_{t+1}^i \cdot (h_t^i)^\alpha (e_t^i)^\beta (L_t)^\gamma$ by an increase in α and a corresponding decline in γ. This extension leaves the general structure of the model unchanged, and in particular, human capital remains distributed log-normally over time, $\ln h_t^i \sim \mathcal{N}(m_t, \Delta_t^2)$. Thus:

$$\ln L_t = m_t + \Delta_t^2(\varepsilon - 1)/2\varepsilon = \ln y_t - \Delta_t^2/2\varepsilon, \tag{33}$$

and the economy's dynamics are obtained by simply replacing $\ln \kappa$ with $\ln \kappa + \gamma(m_t + \Delta_t^2(\varepsilon - 1)/2\varepsilon)$ in (14). The law of motion for cross-sectional inequality Δ_t^2 is then unchanged from Proposition 2, and so is intergenerational mobility $p(\tau) = \alpha + \beta\lambda(1 - \tau)$. As to growth in per capita income, it becomes:

$$\ln y_{t+1} - \ln y_t = \theta - (1 - \alpha - \beta\lambda - \gamma) \ln y_t + (1 - \alpha - \gamma)\mu \ln l(\tau) - \mathfrak{L}(\tau)(\lambda\Delta_t)^2/2 \tag{34}$$

where θ is still a constant but $\mathcal{L}(\tau)$ is now:

$$\mathfrak{L}(\tau) \equiv \alpha + \beta\lambda(1 - \tau)^2 - (\alpha + \beta\lambda(1 - \tau))^2 + \lambda\gamma(1/\varepsilon - (1 - \lambda)) \tag{35}$$

which of course reduces to (17) in the absence of local spillovers. Note that when $\alpha + \beta\lambda + \gamma = 1$ the economy experiences continual growth, and redistributive policies as well as the extent of socioeconomic stratification affect the asymptotic growth rate. Two related questions can be addressed with this model.

First, what are the effects of greater socioeconomic segregation on the macroeconomy? This problem is analyzed in detail in Bénabou (1996a), so here I will just sketch the answer.[16] In the short–run, the impact on growth reflects the response of $\mathcal{L}$ to a simultaneous increase in α and decrease in γ, with $\alpha + \gamma$ constant. The last term in (35) shows that whether this is beneficial or detrimental depends in particular on the balance between the *costs of heterogeneity* at the *local* and *global* levels: the former reflect the degree of interdependence $1/\varepsilon$ between peers or neighbors, while the latter arise from decreasing returns to individual human capital in production (recall that aggregate output is $y = l^\mu \int_0^1 (h^i)^\lambda di$). In the long run, the homogenization effect also comes into play: steady–state disparities in education and income increase with segregation, and this

[16]That paper provides a general treatment of dynamic economies with both local and economy–wide spillovers of the form (32).

rise in Δ^2_∞ is always detrimental. Therefore the potential tradeoff between short–run growth and long–run output discussed in Section 2.4 for income redistributions arises as well for redistributions of social capital.

The second question is how the presence of family or social inputs to education affects the desirability of redistributing financial resources, both from the point of view of meritocratic values and from that of long–run output (or efficiency more generally). Focusing for simplicity on income redistributions, note first that a rise in α lowers $\hat{M}^{opp}_\infty = M^{opp}_\infty = 1 - (\alpha + \beta\lambda(1-\tau))^2$ and increases $\partial\hat{M}^{opp}_\infty/\partial\tau$. Therefore, in response to an increase in segregation, *equality of opportunity* unambiguously calls for an offsetting increase in redistribution. The picture is a little less clear–cut concerning *inequality in outcomes.* The income–based definition $M^{out} = \lambda(1-\tau)$ remains unaffected but the utility–based measure $\hat{M}^{out} = \lambda(1-\tau)/(1-\rho p(\tau))$ rises, and so does $\partial M^{out}_\infty/\partial\tau$: high–ability parents now enjoy more effective channels trough which to pass human capital on to their offspring, and this is more valuable, the lower are future tax rates. Whether more or less redistribution is called for thus depends on the specific form of $W(M^{opp}, M^{out})$, that is, on the relative weights placed on the two meritocratic values. Nonetheless, in plausible situations where the discount factor ρ is not too high –or equivalently when equality of outcomes is judged mostly in terms of (lifetime) income rather than intergenerational welfare– the concern for equality of opportunity will dominate, leading to an increase in τ.

Things are quite different from the point of view of *efficiency.* Focusing once more on long–run output, let us now examine how $\partial \ln y_\infty/\partial\tau$ or, equivalently, how

$$\frac{\partial}{\partial\tau}\left((1-\alpha-\gamma)\mu\ln l(\tau) - \mathfrak{L}(\tau)\frac{\lambda^2\Delta^2_\infty(\tau)}{2}\right) \tag{36}$$

varies with α, keeping $\alpha+\gamma$ constant. There are three effects.

(a) As explained following Proposition 1, an increase in α magnifies the effort disincentive $-\partial\ln l(\tau)/\partial\tau$, because when human capital depreciates more slowly it becomes more sensitive to permanent changes in taxation.

(b) For any given distribution of backgrounds, a greater α also magnifies the efficiency loss from a marginal increase in redistribution: $\mathfrak{L}(\tau)$ is maximized at $\bar{\tau} = 1 - \alpha/(1-\beta\lambda)$, which varies inversely with α.[17]

(c) On the other hand, the efficiency value of reducing permanent inequality $\Delta^2_\infty = s^2/\hat{M}^{opp}_\infty$ calls for responding to a rise in α with greater progressivity: one can show that $\partial^2(\Delta^2_\infty)/\partial\tau\partial\alpha < 0$.

The balance of these three effects is generally too complicated to determine analytically, but in simple cases where it can be done –and in all the simulations of the model– the first two dominate. For instance, Proposition 1 and equation (20) imply that when $\alpha = 0$, $\mathfrak{L}(\tau)\Delta^2_\infty(\tau)$ is minimized by $\tau = 1$. For $\alpha > 0$, however, the solution can be shown to be interior. This suggests that $\partial\tau^*_{LR}/\partial\alpha < 0$, even before distortions to labor supply are taken into account.

These results accord well with intuition: when families or communities provide complementary inputs to education expenditures, factors which magnify disparities in background make redistribution less efficient, even though more of it would be called for from the point of view of meritocracy (or at least, from that of equal opportunity). Compounding this problem is the fact that disparities in non–purchased or background inputs are likely to arise independently of capital market imperfections, and therefore to persist in the face of extensive redistribution –which in turn, they make less efficient. This is obvious when h^α just reflects family human capital, but it also applies to social capital. Indeed, significant socioeconomic stratification can arise even with perfect credit markets, whether due to some group's preference for racial separation or to differences in families' valuations of community quality. The distributional, growth and policy implications of endogenous community composition in the presence of local human capital spillovers are studied in Bénabou (1993), (1996b), Durlauf (1996a), (1996b), Cooper (1992) and Lundberg and Startz (1994), among others.

5 Conclusion

There is no value–free definition of meritocracy. Redistributive policies such as progressive income taxation or education finance typically involve a tradeoff along a "meritocracy possibility frontier" linking equality of opportunity with equality of outcomes. This tradeoff differs from the conventional one between equity and efficiency, because equalizing the young's opportunities for human capital investment enhances not only social mobility but also the growth of aggregate

[17] See Arrow (1971) for an early analysis of the impact of such complementarities between background and inputs on the optimal degree of redistribution, in a static model.

output. The model presented in this paper shows precisely how this positive contribution of educational or even fiscal redistributions to the size of the economic pie must be weighed against the concomitant disincentive effect of imposing a greater equality of outcomes among adults. The optimal degree of redistribution also reflects how family inputs and social capital affect the productivity of education expenditures, and incorporates the efficiency value of reducing inequality of resources in future generations.

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