1980

On the Relative Quantitative Importance of Inheritance and Other Sources of Economic Inequality

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Citation of this paper:
Davies, James B. "On the Relative Quantitative Importance of Inheritance and Other Sources of Economic Inequality." Department of Economics Research Reports, 8012. London, ON: Department of Economics, University of Western Ontario (1980).

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RESEARCH REPORT 8012

ON THE RELATIVE QUANTITATIVE IMPORTANCE

OF INHERITANCE AND OTHER SOURCES OF

ECONOMIC INEQUALITY

by

James B. Davies

June 1980
"...inheritance perpetuates and may intensify inequalities arising originally from other causes. In that sense, it is a secondary cause of inequality; but that is not, of course, to say that it is of secondary importance. The extent of its influence on distribution remains an open question, which cannot be decided merely by theoretical reasoning...but requires in addition something in the nature of a quantitative analysis of the relevant facts."


I. Introduction

The distribution of inherited wealth is highly unequal. The majority receive little, and often make "reverse" intergenerational transfers to aged relatives. On the other hand, a small number inherit extremely large amounts. The relative quantitative impact of this disparity on economic inequality (taken here to be reflected in the distributions of income, wealth, and lifetime resources) is of considerable interest. Although there have been a number of partial attempts to evaluate it, none has been mounted which rigorously compares the effects of inheritance with the other major sources of inequality in economic status: differences in age, non-investment income, rates of return, and "propensity" to save. This paper tries to remedy this situation.

Although since the 1920's repeated studies (e.g., Wedgwood, 1929; Harbury, 1962; and Menchik, 1976) have found that the parents of the majority of rich decedents themselves left sizeable estates, it was not until Atkinson (1971) that an attempt was made to assess the influence of inheritance on the overall size distribution of income, wealth, or lifetime resources. Atkinson examined the distribution of net worth in an egalitarian society where contemporaries would have both equal inheritances and the same lifetime pattern of earnings. He was able to demonstrate that in such a society, where differences in net worth would be due only to age, wealth inequality would be low compared to
actual. Atkinson appeared to conclude this meant that inheritance played a dominant role. Others immediately countered by observing that age is only one of several determinants of net worth, adding additional factors in models otherwise essentially the same as Atkinson's. All such studies may be criticized, however, on the grounds that if any major factor is excluded, the model cannot be tested (say by comparing the predicted wealth distribution with actual). Hence the residual role attributed to inheritance (or any other omitted factor) may be in serious error without the model-builder's awareness.

Blinder (1974) largely overcame the problem of "omitted factors" in a simulation of the life-cycle decisions of a large sample of isolated individuals in the U.S. based on explicit utility-maximization. Variation in impatience and the desire for leisure, as well as in wage rates and inherited wealth, were allowed although the effects of unequal rates of return were not studied. The model was grounded empirically by using sample survey data to generate wage rates and inheritances. A principal conclusion was that inequality of both income and lifetime resources was mainly due to unequal wages and differences in the taste for leisure. (The predicted distribution of net worth was not examined.) Inheritance, it was concluded, has very little impact on economic inequality in the U.S. today.

Blinder's general approach of using a utility-maximizing model grounded in actual data which does not exclude potentially important causes of inequality was very attractive. However, his conclusion that inheritance is unimportant cannot be accepted. I have shown elsewhere that although a Blinder-type model generates about as much income-inequality as is observed, it predicts a distribution of net worth far more equal than actual (Davies, 1979, pp. 233-236). This is partly due to the use of
survey data on the distribution of inheritances. Since the source in question, the 1960 SRC "Income and Welfare" study, has been used by others to assess the relative scale of intergenerational transfers in the U.S., it is worth pointing out here that the sample, of 2500 respondents, actually heavily oversampled the poor. Given the extreme skewness of the underlying distribution and the effective sample size (taking into account the oversampling of the poor) one would expect significant underestimation of the mean inheritance and dispersion, even without non-sampling error. In addition, however, it is well-known that the wealthy have very low response rates to surveys of this type. Finally, numerous validation studies have shown that people generally under-report asset holdings, tending to do so most severely for some of the assets of most importance to the rich, such as stock. In a survey of inherited assets the additional problems of feelings of embarrassment or invasion of privacy, and the difficulty of recalling correctly events which occurred (for most respondents) well in the past, likely exaggerate this problem considerably.

Rather than use inherently unreliable survey data this paper presents a model in which the distribution of inheritances is itself simulated, using the actual distribution of wealth, observed mortality rates, and stylized practices of estate division culled from the growing literature on the subject. The inheritances generated are, on average, about three times as large as those indicated by the 1960 Income and Wealth Survey.

In addition to using a new source of data on inheritances, the paper improves on previous work in several other ways. Most importantly the family context of saving is carefully modelled. The effects on consumption of changes in the number of children living at home with their parents are examined, as is the precise nature of the bequest motive for saving. In
addition actual data on non-investment income by age groups are used instead of the crude assumptions of exponentially growing wages, and absence of transfer payments, characterizing earlier work. Thirdly, the role of differences in rates of return is carefully examined. Finally, the simulation is tested by comparing as many of its predictions with what is observed as possible. Thus not only the predicted distributions of income and wealth, but the age profile of wealth-holding and the scale of aggregate saving are studied. The "base run" of the simulation is remarkably consistent with the real world on these counts. While this does not prove that the simulation is in any sense "correct", it clearly enhances the interest aroused by the results considerably.

The paper is organized as follows. Section II sets out the behavioral model. Section III then describes the structure of the simulation. Finally, the simulation results are set out in Section IV, which isolates the relative quantitative impacts of the determinants of inequality in income, wealth, and lifetime resources.

II. The Behavioral Model

Consider a man and woman who marry at the start of their independent economic lives. Assume they will live, with certainty, T years, receiving non-investment income \( E_t \), at ages \( t = 1, \ldots, T \), earning a constant rate of interest \( r \) (after tax) on all assets, and inheriting at some point a bequest with value \( I \) discounted to the start of economic life. In addition, assume that the couple has \( m \) successive children at ages \( \hat{c}_1, \ldots, \hat{c}_m \). (There are no multiple births.) Children become independent at the same age their parents did (that is \( \hat{c}_1, \ldots, \hat{c}_m \) years after their parents), and have the same lifespan, family size, and access to capital markets as their parents. All children marry immediately on leaving the parental home.
Let parents' utility be an additive function of the utility flow generated in their own household and that produced in the households set up by children when they become independent. Assume that the utility flow in a household at time $t$ is simply the sum of the flows for individual members, and that they in turn are equal and depend only on the consumption expenditure per adult equivalent family member $c_t^e$. Denoting the number of family members as $N_t$, the one period utility flow for the household as a whole is then

$$U_t = N_t u(c_t^e)$$

Now, let $c_t^1$ stand for consumption per adult equivalent in the parental household when the parents are aged $t_1$ and $c_t^{2j}$ for that in the household of the $j$-th child when he/she is aged $t$. Finally, with a constant rate of time preference, $\rho$, and the iso-elastic form for the $u$ function we have parental utility:

$$V = \sum_{t=1}^{T} \left( \frac{c_t^1}{1-\gamma} \right)^{(1+\rho)-t} + b \sum_{j=1}^{m} \left( \frac{c_t^{2j}}{1-\gamma} \right)^{(1+\rho)-t} \sum_{j=1}^{m} \left( \frac{c_t^{2j}}{1-\gamma} \right)^{(1+\rho)-t}$$

(1)

where $b$ allows differences in the strength of "altruism" and $\gamma$ is the elasticity of marginal utility, or the inverse of the elasticity of intertemporal substitution in consumption, $\sigma$.

With constant $r$, and a proportional estate tax, $\tau$, letting $n_t$ be the number of adult equivalent family members at age $t$, (1) is maximized subject to the constraints:

(i) $\tau^1 + H^1 - \sum_{t=1}^{T} n_t c_t^1 (1+r)^{-t} + \frac{1}{1-\gamma} \left[ \sum_{j=1}^{m} (1+r)^{-t} \sum_{j=1}^{m} \left( H^2J - \sum_{t=1}^{T} n_t c_t^{2j} (1+r)^{-t} \right) \right] \geq 0$

(ii) $w_t^1 \geq 0 , \quad t=1,\ldots,T$

(iii) $w_t^{2j} \geq 0 , \quad j=1,2 ; \quad t=1,\ldots,T$

(2)
where $H^1_j$ and $H^{2j}$ are the lifetime non-investment incomes (after tax) of parents and child $j$ (and spouse) respectively, discounted to economic age zero of the household concerned. $W^1_t$ and $W^{2j}_t$ are the net worths of parents and child $j$ (and spouse) respectively. Conditions (ii) and (iii) prevent any household from ever having negative net worth. This constraint has an important effect on behavior. It is included as it seems that the scope for net borrowing in the real world is small.

Maximizing (1) subject to (2), assuming (2ii) and (2iii) are not violated, we obtain from the first-order conditions:

$$
c^i_j = \frac{(1+r)}{1+p} \frac{t}{n_t} \frac{n_j}{n_o} \left(1 + \frac{g}{c_1}ight) c^i_j (1+g) \phi_t \ c^i_j
$$

and

$$
c^{2j}_t = [b(1-r)]^{1/\gamma(1+g)} c^j_t c^i_1
$$

Equation (3) indicates that each generation plans consumption per adult equivalent to grow at a constant rate $g$, given by $1 + g = [(1+r)/(1+p)]^{1/\gamma}$, except when family size is changing. If family size is increasing, (3) shows that adult equivalent consumption will grow faster than $g$ if economies of scale make the elasticity of $n_t$ with respect to the natural number of family members less than that of $N_t$, while if size is decreasing growth is slower than $g$. (The explanation is that, in the presence of economies of scale, the price of $c_t$ varies inversely with family size.) Finally, (4) shows that when $b(1-r) \neq 1$ the divergence of $c^{2j}_t$ from $(1+g)^t c^i_1$ will be moderated if the elasticity of marginal utility is above unity, and exaggerated if it is below unity, as one would expect.

Substituting (3) and (4) into (2i), and assuming that the constraints (2ii) and (2iii) hold, we complete the consumption plan by obtaining:
\[ c_1 = \frac{1 + H^1 t^j}{1 + \beta \sum_{1}^{m} \frac{1 + \gamma}{1 + \tau} \phi_t} \]

where \( \beta = b^{1/\gamma (1-\tau)} \gamma \). In order to explore the nature of the consumption plan determined by equations (3), (4), and (5), denote the lifetime consumption of parents as \( K^1 \), and that of offspring as \( K^{2j} \), discounting to the start of parents' economic lifetime in all cases. From (4):

\[ K^{2j} = [b(1-\tau)]^{1/\gamma} \frac{1 + \gamma}{1 + \tau} \phi_t \]

If we let

(i) \[ R^1 = I^1 + H^1 \]

(ii) \[ R^2 = \sum J^2 (1+\tau) \]

then

\[ K^1 = \frac{R^1 + R^2}{1 + \beta \sum_{1}^{m} \frac{1 + \gamma}{1 + \tau} \phi_t} = \theta [R^1 + R^2] \]

That is, parents sum their resources and those of their children (and their spouses) and allocate a fraction \( \theta \) to their own lifetime consumption. This fraction depends negatively on the "altruism" parameter \( b \) and the interest rate, and positively on the rate of time preference \( \rho \), and the elasticity of marginal utility, \( \gamma \), as one would expect.

We can now study the pattern of demand for bequests, and its implications for inequality. First, (6) implies that the desired present value of bequest is:
\[ B = (1-\theta)R^1 - \left( \frac{\theta}{1-\tau} \right) R^2 \]  

where \( B = \frac{1}{T} \sum (1+r)^{-t} \). Hence the demand for bequest is an \textit{excess} demand.\(^5\)

Holding \( R^2 \) at some positive level, as \( R^1 \) rises from zero \( B \) is initially negative, but rises monotonically, becoming positive when \( R^1 > \left[ \frac{\theta}{(1-\theta)(1-\tau)} \right] R^2 \). Finally, the ratio \( B/R^1 \) also rises monotonically with \( R^1 \). Hence for a group with the same \( R^2 \), if there is any inequality in \( R^1 \) there will be \textit{greater} inequality in inheritances.

Equation (9) also throws some light on empirical estimates of elasticity of demand for bequests with respect to lifetime resources. Tomes (1979), and Menchik (1979), for example, obtain estimates of 0.9-2.9 and 2.4-2.8 respectively. These high values are easily explained by the present model if we assume that children's resources "regress towards the mean" relative to parents'.\(^6\) This implies not only that low-earners will desire (although they cannot make) negative bequests while high-earners and large-inheritors plan for large positive transfers, but also that the elasticity of \( R^2 \) with respect to \( R^1 \), \( \frac{R^2}{R^1} \), is less than unity. Hence

\[
\tau_{R^1}^B = \frac{(1-\theta)R^1 - \left( \frac{\theta}{1-\tau} \right) R^2}{(1-\theta)R^1 - \left( \frac{\theta}{1-\tau} \right) R^2} \]

must be very large for small positive values of \( B \). Thus it is not necessary to suppose that children's welfare is a marked luxury to explain the observed high income elasticity of demand for intergenerational transfers.

Finally we should note that the differences between income classes in saving propensity arising from regression towards the mean may have an important impact on the distribution of wealth. High-earning parents, on
average, will desire proportionally much higher bequests than others. Giving the strongest desire to save to some of those with the greatest means in this way should result in considerably greater inequality in wealth-holding than would otherwise be observed.

III. The Simulation Model

(i) Structure

The economy considered is assumed to be on a balanced growth path. Aggregate stocks and flows all grow at the constant rate \( q \) in per capita terms, while population grows at the constant rate \( p \). The real rate of interest before tax is also constant, at \( r^* \). Income and inheritance taxes are levied at proportional rates of \( u \) and \( \tau \) respectively, and the after-tax real rate of return, \((1-u)r^*\), is denoted \( r \). All of these parameters are exogenous, and the model therefore permits only partial equilibrium analysis.

Complete life-cycle saving is simulated for each of 500 married couples who form a single birth cohort.\(^7\) (There are no unattached individuals.) Due to constant growth, simulation for a cohort is sufficient to generate cross-sections. These are examined as of 1970 since the latest Canadian data on wealth, used here for evaluation of the simulation results, are for that year. Each couple starts economic life at age 20 (husband and wife are of equal age), and all couples have children. One half of all couples have two children, and the other half three. (Family size is unrelated to any other characteristics.) This assumption, those concerning timing of children, and the adult equivalence scale used give a realistic age profile of natural and adult equivalent family size.\(^8\) Children live with their parents until they themselves are 20. Each couple occupies
constant rank in the cohort distribution of non-investment income throughout life.\textsuperscript{9} The age-specific distributions of non-investment income are taken from the 1971 Canadian SCF survey. Non-investment income includes government transfer payments and all pensions, in addition to earnings. Social security and occupational pension wealth are therefore both included with human capital in this model. One advantage of this approach is that simulated savings may be compared directly with estimated actual distributions of net worth, which also exclude these forms of wealth.\textsuperscript{10}

The non-negativity constraints (2.ii) and (2.iii) are imposed as follows. Couples who desire a negative bequest are not allowed to initiate a consumption plan leading to this goal, but are forced to aim for $W_T = 0$. This makes their consumption problem collapse to the maximization of single generation utility, that is the first term of (1). The second constraint, which prevents negative net worth at any point during the life cycle, is applied to both those who plan positive, and those who would like (but cannot have) negative, bequests. If any couple wishes to go into net debt, its consumption for one period is simply set at its after-tax income $Y_t$. A new computation of its lifetime consumption plan is then necessary at the start of the subsequent period.

\textbf{(ii) Selection of Parameter Values}

Although an attempt has been made to achieve realism in the economic environment and distribution of tastes assumed in the "base run" simulation, due to lack of evidence the choice of some parameter values is to an extent arbitrary. It is demonstrated in the appendix, however, that except for those parameters directly governing the dispersion of tastes and rates of return, changing the values of the parameters which are not empirically grounded has no essential effect on the conclusions drawn from the simulation experiments.
Characteristics of the economic environment which must be specified include \( r^* \), \( q \), \( u \), \( \tau \) and \( p \). Of these, all but the real before-tax rate of return, \( r^* \), are uniform across families. Following currently popular estimates (see, e.g., Boskin, 1978, p. S19, and Feldstein, 1978, p. S64), the mean rate, \( \bar{r}^* \), is set at the moderate level of .04. There is some evidence that the distribution of annual rates of return among families is highly positively skewed and fairly well approximated by the lognormal distribution, which is used here. Drawing on Mincer's (1974, p. 56) estimate of an upper bound of 0.33 for the coefficient of variation of rates of return on human capital, and since we would not like to exaggerate the possible importance of unequal rates of return, a coefficient of variation of 0.25 is imposed. Finally, it seems realistic to give \( r^* \) a small positive correlation (+0.3) with lifetime resources.\(^{11}\)

The remaining parameters of the economic environment were selected as follows. The per capita growth rate, \( q \), and the two tax rates were set at their mean values over the post-war period up to 1970. This gave \( q = 2.0\% \), an income tax rate, \( u \), of 10.8\%, and an estate tax rate, \( \tau \), of 97\%. Finally, the rate of growth of population was set at 1.0\%, the natural rate of increase of the Canadian population prevailing in the late 1960's.

Of the taste parameters \( \gamma \), \( \rho \), and \( b \), only the latter two are allowed to vary between families. These unobservables are given normal distributions, which is motivated, as in Blinder (1974), by the observation that many physical characteristics are normally distributed. No variation in \( \gamma \) is allowed since sufficiently interesting differences in the desired growth rate of consumption and altruism can be obtained by allowing \( \rho \) and \( b \) to vary between families.

There is a variety of recent evidence on \( \gamma \), all of which points to a value in excess of unity as most plausible. Taken as a whole, this evidence suggests \( \gamma = 2 \), the value used in my "base run", as a "best guess".\(^{12}\)
Having set \( r^* \) and \( \gamma \), a plausible central value of \( \rho \) can be determined from \( 1/\gamma \) the relationship \( g = 1 - [(1+r)/(1+\rho)] \) since the desired growth rate of consumption, \( g \), is not without intuitive content. With the values of \( r \) and \( \gamma \) chosen we find that \( \rho = 0 \) gives \( g = 1.8\% \). Evidence from Canadian family expenditure data suggests that, if anything, this is a low value. However \( \overline{\rho} \) is set at 0 since to go lower would give the majority a negative rate of time preference, which seems unattractive. Finally, \( \overline{b} \) is set at 0.1. Initially experiments were conducted with \( \overline{b} = 1 \), the value suggested by perfect altruism. However this produced much stronger accumulation over the life-cycle than is actually observed. The lower value used in the base run was determined by reducing \( \overline{b} \) until the mean net worth of those aged 75+ relative to the overall mean fell to 1.1, equal to the estimated actual ratio.

Blinder set the coefficients of variation of \( \rho \) and \( b \), \( CV(\rho) \) and \( CV(b) \), at 0.33 and 1.0 respectively. Although there is no empirical evidence, these figures seem to be of the correct order of magnitude. A value of \( CV(b) = 0.5 \) is experimented with here. However, a different approach is required for \( \rho \), since with \( \overline{\rho} = 0 \), \( CV(\rho) \) is not defined. A standard deviation sufficient to give 20% of the population a negative desired growth rate of consumption if \( r^* \) was uniform at .04 was selected. As was the case in assigning \( r^* \), \( \rho \)'s and \( b \)'s were not distributed to families randomly. There are good reasons to believe that families with larger lifetime resources also have tastes more conducive to accumulation. Therefore \( \rho \) and \( b \) were given the mild correlations -0.3 and +0.3 with lifetime resources. This degree of correlation is very similar to that used by Blinder (1974, pp. 110-113) in his moderately "programmed" society.

(iii) Determination of Children's Human Capital

An attractive formulation for regression towards the mean in children's human capital is:
\log H_2^j = \nu_o^j + \nu_1^j \log H_1^j + \nu^j \tag{11}

where the error \( \nu^j \) is uncorrelated with \( H_1^j \). If \( H_1^j \) were lognormal, making \( \nu^j \) normal gives \( H_2^j \) a lognormal distribution. Letting

\[ \sigma^2(\nu) = (1 - \nu_1^2) \sigma^2(\log H_1^j) \tag{12} \]

and

\[ \nu_o^j = \hat{\nu}_j \log(1+q) + (1 - \nu_1^j) \log H_1^j \tag{13} \]

where \( \log H_1^j \) is the mean of the log \( H_1^j \)'s, the distribution of \( H \) is stationary across generations except for growth. The proportion of the variance of \( \log H_2^j \) explained by \( \log H_1^j \) is clearly \( \nu_1^2 \). Although the distribution of the \( H_1^j \)'s is not perfectly lognormal in our study (it is less positively skewed), the choice of \( \nu^j, \nu_o, \) and \( \nu_1 \) is made as if this were the case. Accordingly, \( \nu_o^j \) is set by (13), and \( \nu^j \) is given a normal distribution. The remaining parameter, \( \nu_1^j \), reflecting the degree of correlation of \( \log H_1^j \) and \( \log H_2^j \), was set at 0.866 on the basis of the relevant empirical evidence. \(^{16}\)

(iv) **Parents' Inheritances**

An important role is played by the distribution of inheritances assigned to the initial generation. In previous work the problem of developing such a distribution has either not been addressed or has been resolved by drawing on questionable survey evidence. It is surprising that a third, much more attractive, approach has not been used more often. This is to simulate the distribution of inheritances from observed wealth and mortality data. For while there are only one or two sample surveys yielding inheritance data, much effort has been devoted to developing an accurate view of the distribution of personal wealth and patterns of mortality. This alternative approach is followed here. \(^{17}\)

Given an equilibrium distribution of wealth, the steady-state parameters chosen above, and a menu of mortality rates, appropriate assumptions
on estate division imply a steady-state distribution of inheritances. Such a distribution was simulated, in preparation for our main simulation, using (a) the adjusted estimate of the Canadian distribution of wealth in 1970 developed in Davies (1979b), (b) mortality rates by age and sex for Canada in 1970, adjusted by "high status" differentials for the top 10% of decedents, and (c) assumptions based on the stylized facts regarding estate division that emerge from the recent literature on this subject.

In simulating inheritances each family was assumed to have one son and one daughter, both of whom would marry. Mates were selected for the younger generation in such a way that their parents' net worths would correlate at the level +0.3 at age 50. It was assumed that fathers held 80% of family wealth, that 1/4 of the net bequest of the first parent to die would pass to the children and the remainder to the surviving spouse, and that all of the net bequest of the second parent to die would pass to the children. Sons and daughters were assumed to inherit equal amounts. A fixed deduction for funeral and administrative expense ($2,500 in 1970), and an estate tax of \( t = 9.7\% \) were levied. Finally, it was assumed that children would receive gifts from the older generation equal to 30% of the value of inheritances discounted to their age 20.

All the assumptions used in the inheritance simulation are based on actual data, of which much—on patterns of bequest—has come to light quite recently. Extensive sensitivity-testing shows that the resulting distribution (shown in column 2 of Table 3 below) is remarkably robust. Moderate changes in the split between sons and daughters, the correlation of mates' parents' wealth, and the proportion of family wealth held by the father had little effect on the simulated distribution. Alternative values for funeral expense, estate tax, and importance of gifts have the obvious order of
magnitude. A surprisingly large effect, however, is obtained by varying the proportion of the estate passing to children on the death of the first spouse. This reflects the difference in the impact of discounting on transfers received on the deaths of the two parents. Fortunately the evidence reviewed in note 18 indicates that assuming 1/4 of the typical estate to pass to children on the death of the first spouse is sufficiently conservative.

When we turn to our main simulation we must decide what relationship to introduce between a couple's human resources and its inheritance. It is likely that in the real world there is a moderate positive correlation. Accordingly, as with \( r, \rho, \) and \( b, I^1 \) is correlated with \( H^1 \) at the moderate level 0.3 in the base run.\(^20\)

IV. Simulation Results

Figure I shows two of the basic determinants of savings behavior in the simulations: the time paths of family size and earnings over the lifetime. The diagram shows four distinct phases. Earnings, relative to lifetime average, are at first high compared with family size (relative to its lifetime average), then fall below, once more rise above, and finally fall below permanently. One would expect this to give rise to two rapid periods of accumulation: from ages 20 to 30 and again from 50 to 60. Moderate accumulation should occur between ages 30 and 50, but beyond about age 65 one might suppose rapid decumulation would set in.

The speculations arising from Figure I are confirmed in the next two diagrams. Figure II shows that because consumption per adult equivalent on the whole rises gently with age, total consumption shows much the same hump shape as family size. Up to about age 35 mean consumption falls short of mean net income, but from about 35 to 45 the gap between income and consumption is very small. Then consumption falls well below income, only rising above again for those over 65. These patterns are echoed in Figure III, where we
Figure I

\( a_t \) and \( \bar{E}_t \) Relative to Mean for all Ages, 1970

Figure II

\( \bar{C}_t, \bar{C}_t, \) and \( \bar{Y}_t \), 1970

Figure III

\( \bar{W}_t \), 1970
find that mean wealth rises quite quickly between 20 and 30 and between 50 and 60, with quite a sharp decline past age 65. There is, however, an interesting feature not predicted by the previous figure. Whereas median net worth indeed rises very slowly between ages 30 and 50, as we expected from Figure II, average net worth rises almost as quickly between 30 and 50 as immediately before and after. The explanation is that it is just in this age range that most inheritances are received in the simulation. Since the distribution of inheritances is highly unequal, mean net worth is affected much more strongly than median.

Tables 1-3 present the base run distributions of income, wealth, and lifetime resources, as well as experiments which assess the relative impact of the different sources of inequality. In addition, the first two tables compare the simulated distributions of income and wealth with estimated actual. In both cases the base run distributions are strikingly realistic. Not only the Gini coefficients (G), and coefficient of variation, but the overall shapes of the distributions as shown by the quantile shares, are extremely close to actual. It is especially interesting that a feature as critical as the estimated upper tail of the wealth distribution is reproduced almost exactly by the simulation. Further evidence of the realism of the simulation is given by its prediction that in any year 10.2% of aggregate household income would be saved. This corresponds closely to estimates for Canada and the U.S. which use a comprehensive definition of saving. (Boskin, 1978, e.g., finds that net private saving averaged 10.8% of net national income over the period 1945-69 in the U.S.) While these correspondences do not, of course, imply that the simulation model is "correct", the do enhance the interest aroused by the results considerably.

As mentioned, each of Tables 1-3 present experiments designed to help gauge the quantitative impact of the relevant sources of inequality. The procedure is largely one of removing such sources from the simulation alternatively and observing the impact on the indexes of inequality (G, CV, and the
quantile shares). In judging whether an impact is large or small the only safe
course is to study the changes in quantile shares and consider whether, from
one's own point of view, they represent a significant reduction in inequality
taken together. While we know that when the Lorenz curve shifts uniformly
inward there is an unambiguous reduction in inequality (see Dasgupta, Sen,
and Starrett, 1973), the relative importance attributed to inward
movement in different ranges of the distribution will differ, legitimately,
between observers. Thus, although changes in G and CV are revealing, if
we bear in mind the properties of these indexes, it must be recalled that
they merely embody two of an infinite range of possible points of view.

Cursory examination of Table 1 shows that there are four major causes
of wealth inequality which, recognizing the ambiguities of inequality
measurement, can only be ranked as of similar quantitative importance.
These are differences in tastes, rates of return, earnings, and parents'
heritances. Eliminating each cause in turn has a distinct impact on
the shape of the distribution, but none stands out as the source of greater
inequality than the others unambiguously.

Next consider the influence of age. Since it is impossible to eliminate
age differences from a simulation of life-cycle saving, their impact can only
be assessed by eliminating all other sources of inequality. Column 8
shows that when this is done much the same level of concentration as found
by Atkinson in his simple study of age differences is obtained. The shares
of the top 1, 5, and 10% of 2.4, 11.4, and 22.1%, for example, correspond
closely to figures of 2.6, 12.4, and 24.0% in Atkinson's most similar case.
(See Atkinson, 1971, p. 243) Although a comparison with the factors already
discussed is difficult, Atkinson was clearly correct in concluding that age
differences are not a dominant cause of wealth-inequality. Perhaps then, they
can be included in roughly the same category as the four factors considered above.
Table 1
Simulated Distributions of Wealth, 1970

<table>
<thead>
<tr>
<th>Share of ...</th>
<th>Estimated Actual Distribution</th>
<th>Base Run</th>
<th>(3) Unequal Tastes</th>
<th>(4) Unequal r's</th>
<th>(5) Unequal E's</th>
<th>(6) Unequal I's Only</th>
<th>(7) Unequal I's Parents &amp; Kids</th>
<th>All Except Age</th>
<th>Unequal r's and Parents' I's</th>
</tr>
</thead>
<tbody>
<tr>
<td>top 1%</td>
<td>19.6%</td>
<td>21.0</td>
<td>19.2</td>
<td>15.6</td>
<td>17.1</td>
<td>16.8</td>
<td>6.3</td>
<td>2.4</td>
<td>11.4</td>
</tr>
<tr>
<td>top 5%</td>
<td>43.4%</td>
<td>45.9</td>
<td>35.7</td>
<td>36.2</td>
<td>36.0</td>
<td>40.4</td>
<td>20.9</td>
<td>11.4</td>
<td>30.6</td>
</tr>
<tr>
<td>top 10%</td>
<td>58.0%</td>
<td>59.3</td>
<td>47.4</td>
<td>50.8</td>
<td>50.2</td>
<td>53.9</td>
<td>33.6</td>
<td>22.1</td>
<td>45.0</td>
</tr>
<tr>
<td>top quintile</td>
<td>74.0%</td>
<td>75.6</td>
<td>63.9</td>
<td>69.5</td>
<td>68.6</td>
<td>70.5</td>
<td>52.3</td>
<td>42.3</td>
<td>63.8</td>
</tr>
<tr>
<td>2nd quintile</td>
<td>17.8%</td>
<td>16.0</td>
<td>20.6</td>
<td>19.5</td>
<td>19.7</td>
<td>18.3</td>
<td>26.6</td>
<td>33.3</td>
<td>22.2</td>
</tr>
<tr>
<td>3rd quintile</td>
<td>8.0%</td>
<td>6.6</td>
<td>10.8</td>
<td>8.4</td>
<td>9.0</td>
<td>8.9</td>
<td>15.9</td>
<td>17.3</td>
<td>11.1</td>
</tr>
<tr>
<td>4th quintile</td>
<td>1.7%</td>
<td>1.8</td>
<td>4.3</td>
<td>2.5</td>
<td>2.6</td>
<td>2.3</td>
<td>5.0</td>
<td>6.5</td>
<td>2.9</td>
</tr>
<tr>
<td>5th quintile</td>
<td>-1.5%</td>
<td>0.0</td>
<td>0.4</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
<td>0.2</td>
<td>0.6</td>
<td>0.0</td>
</tr>
<tr>
<td>Coefficient of Variation</td>
<td>2.519</td>
<td>2.619</td>
<td>2.936</td>
<td>2.023</td>
<td>2.371</td>
<td>2.186</td>
<td>1.070</td>
<td>.799</td>
<td>1.566</td>
</tr>
<tr>
<td>Gini</td>
<td>.746</td>
<td>.740</td>
<td>.634</td>
<td>.683</td>
<td>.677</td>
<td>.696</td>
<td>.535</td>
<td>.455</td>
<td>.638</td>
</tr>
<tr>
<td>Mean</td>
<td>$27,600</td>
<td>33,527</td>
<td>19,730</td>
<td>24,805</td>
<td>28,948</td>
<td>36,073</td>
<td>22,922</td>
<td>27,153</td>
<td>23,976</td>
</tr>
<tr>
<td>Median</td>
<td>$11,000</td>
<td>10,672</td>
<td>10,585</td>
<td>11,257</td>
<td>11,034</td>
<td>13,039</td>
<td>28,948</td>
<td>22,922</td>
<td>13,163</td>
</tr>
</tbody>
</table>

*Davies (1979b, p. 255) and more detailed unpublished figures.*
The conclusion that the five influences mentioned so far have, in some sense, roughly the same quantitative impact on wealth-inequality might seem rather dull. In fact it is extremely interesting because, at one time or another, each of the five has either explicitly or implicitly been identified as the major cause of inequality in wealth distribution. The simulation results argue strongly that anyone holding such a point of view has simply succeeded in exaggerating the admittedly significant, but not dominant, influence of the factor attracting his attention.

Next, consider the result of eliminating unequal inheritances for children as well as parents; that is of abolishing the institution of unequal inheritance completely. In column 9 all parents receive the mean inheritance at age 50 and pass it along, with accumulated interest, when they die at 80. Extraordinary rates of saving on the part of a relatively small number of couples with high lifetime resources who desire to make large bequests to compensate for regression to the mean in children's earnings capacities are therefore eliminated. The result is such a dramatic decrease in simulated wealth inequality that one could well describe the tolerance of unequal inheritance as the dominant cause of wealth inequality according to the present model.

Identifying the institution of unequal inheritance as the major cause of wealth inequality is perhaps potentially misleading. This is because unequal saving, a matter of choice, is in fact a more important element in the process whereby this institution affects wealth-inequality than that of unequal parental inheritances, a matter of opportunity. (Compare columns 6 and 7) In order to find out how much of wealth inequality is due to "unequal opportunity" one must turn to an experiment like that of the final column where both parental inheritances and rates of return are equalized. This experiment produces declines of 14 and 38% in G and CV respectively compared with the base run, and a drop in the shares
of the top 1, 5, and 10% from 21, 46, and 59% to 11, 31, and 45%. That is, unequal opportunity may have a very sizeable impact indeed on wealth inequality, and an especially important effect on the upper tail of the distribution.

Table 2 shows that all the factors dealt with except non-investment income have much less effect on the distribution of income than on that of wealth. This is because, with the exception of age, their only effect comes via that on investment income, which is a relatively small part of total income on average. (Part of the impact of age also comes from that on investment income, but much is due simply to age differences in earnings.) While differences in non-investment income are the dominant influence on income distribution, it is interesting to note the wealth-related factors have a significant impact. Reductions in CV, for example, of 11, 18, and 9% are obtained when tastes, rates of return, and parents' inheritances are equalized respectively. More dramatically, when we remove completely either the institution of unequal inheritance, or unequal opportunity on the wealth side (columns 7 and 9 respectively), there is strong equalization in the extremes of the distribution. Both experiments reduce the share of the top 10% from 30 to 25% and increase that of the bottom 10% by a surprisingly large amount. These changes are reflected in declines of CV of more than 20% in both cases. Thus, for a person concerned with the extremes of the income distribution, both the institution of unequal inheritance, and the existence of unequal opportunity in wealth-formation should be viewed as important causes of income inequality.

Lifetime resources, as analyzed in Table 3, are the sum of lifetime non-investment incomes and inheritances where all discounting occurs at the average rate across families of 3.6%. One indication of the relative importance of the two components is given by the fact that the addition of inheritances to non-investment income to arrive at lifetime resources
<table>
<thead>
<tr>
<th>Share of ...</th>
<th>Estimated Actual Distribution*</th>
<th>Base Run</th>
<th>Unequal Tastes</th>
<th>Unequal r's</th>
<th>Unequal E's</th>
<th>Unequal T's Parents Only</th>
<th>Unequal T's Parents and Kids</th>
<th>All Except Age</th>
<th>Unequal r's and Parents' T's</th>
</tr>
</thead>
<tbody>
<tr>
<td>top 1%</td>
<td>n.a.</td>
<td>7.2</td>
<td>6.1</td>
<td>5.3</td>
<td>3.5</td>
<td>6.2</td>
<td>5.1</td>
<td>1.3</td>
<td>5.1</td>
</tr>
<tr>
<td>top 5%</td>
<td>n.a.</td>
<td>19.4</td>
<td>16.9</td>
<td>16.3</td>
<td>10.0</td>
<td>17.9</td>
<td>15.5</td>
<td>6.3</td>
<td>15.6</td>
</tr>
<tr>
<td>top 10%</td>
<td>26.9%</td>
<td>29.6</td>
<td>26.8</td>
<td>26.3</td>
<td>16.7</td>
<td>27.9</td>
<td>25.2</td>
<td>12.4</td>
<td>25.4</td>
</tr>
<tr>
<td>top quintile</td>
<td>43.2%</td>
<td>45.4</td>
<td>42.7</td>
<td>42.5</td>
<td>28.8</td>
<td>43.8</td>
<td>41.0</td>
<td>24.3</td>
<td>41.5</td>
</tr>
<tr>
<td>2nd quintile</td>
<td>24.8%</td>
<td>23.6</td>
<td>24.5</td>
<td>24.7</td>
<td>22.2</td>
<td>23.9</td>
<td>24.2</td>
<td>22.6</td>
<td>24.7</td>
</tr>
<tr>
<td>3rd quintile</td>
<td>17.7%</td>
<td>17.0</td>
<td>17.8</td>
<td>17.8</td>
<td>20.8</td>
<td>17.3</td>
<td>17.7</td>
<td>21.1</td>
<td>18.0</td>
</tr>
<tr>
<td>4th quintile</td>
<td>10.6%</td>
<td>10.3</td>
<td>10.9</td>
<td>11.0</td>
<td>16.9</td>
<td>10.7</td>
<td>11.9</td>
<td>18.1</td>
<td>11.3</td>
</tr>
<tr>
<td>5th quintile</td>
<td>3.7%</td>
<td>3.8</td>
<td>4.2</td>
<td>4.0</td>
<td>11.4</td>
<td>4.2</td>
<td>5.2</td>
<td>13.8</td>
<td>4.5</td>
</tr>
<tr>
<td>Coefficient of Variation</td>
<td>.950</td>
<td>.969</td>
<td>.859</td>
<td>.793</td>
<td>.447</td>
<td>.885</td>
<td>.747</td>
<td>.194</td>
<td>.763</td>
</tr>
<tr>
<td>Gini</td>
<td>.400</td>
<td>.417</td>
<td>.389</td>
<td>.388</td>
<td>.174</td>
<td>.398</td>
<td>.360</td>
<td>.108</td>
<td>.375</td>
</tr>
<tr>
<td>Mean</td>
<td>8,845</td>
<td>9,253</td>
<td>8,600</td>
<td>8,772</td>
<td>8,801</td>
<td>9,021</td>
<td>9,192</td>
<td>8,755</td>
<td>8,646</td>
</tr>
<tr>
<td>Median</td>
<td>7,838</td>
<td>7,834</td>
<td>7,696</td>
<td>7,835</td>
<td>9,147</td>
<td>7,873</td>
<td>9,195</td>
<td>8,271</td>
<td>7,811</td>
</tr>
</tbody>
</table>

*Family unit basis, 1971 (Love and Wolfson, 1976, p. 117).
Table 3: Determinants of the Distribution of Life Resources, Couples Aged 20-24 in 1970

<table>
<thead>
<tr>
<th>Share of...</th>
<th>Life Earnings</th>
<th>Inheritances</th>
<th>Life Resources</th>
<th>Earnings Base</th>
<th>Earnings Equalized</th>
<th>Inheritance Equalized</th>
</tr>
</thead>
<tbody>
<tr>
<td>top 1%</td>
<td>4.8%</td>
<td>22.3</td>
<td>4.8</td>
<td>2.3</td>
<td></td>
<td>4.5</td>
</tr>
<tr>
<td>top 5%</td>
<td>14.6%</td>
<td>43.6</td>
<td>15.3</td>
<td>7.4</td>
<td></td>
<td>14.0</td>
</tr>
<tr>
<td>top 10%</td>
<td>24.0%</td>
<td>58.1</td>
<td>24.9</td>
<td>13.0</td>
<td></td>
<td>23.1</td>
</tr>
<tr>
<td>top quintile</td>
<td>39.3%</td>
<td>72.3</td>
<td>40.4</td>
<td>23.3</td>
<td></td>
<td>38.1</td>
</tr>
<tr>
<td>2nd quintile</td>
<td>23.9%</td>
<td>16.3</td>
<td>24.0</td>
<td>19.8</td>
<td></td>
<td>23.6</td>
</tr>
<tr>
<td>3rd quintile</td>
<td>18.2%</td>
<td>8.4</td>
<td>17.9</td>
<td>19.3</td>
<td></td>
<td>18.3</td>
</tr>
<tr>
<td>4th quintile</td>
<td>13.0%</td>
<td>2.8</td>
<td>12.4</td>
<td>18.9</td>
<td></td>
<td>13.4</td>
</tr>
<tr>
<td>bottom quintile</td>
<td>5.6%</td>
<td>0.1</td>
<td>5.3</td>
<td>18.8</td>
<td></td>
<td>6.5</td>
</tr>
<tr>
<td>Coefficient of Variation</td>
<td>.684</td>
<td>.862</td>
<td>.709</td>
<td>.175</td>
<td>.641</td>
<td></td>
</tr>
<tr>
<td>Gini Coefficient</td>
<td>.336</td>
<td>.219</td>
<td>.351</td>
<td>.044</td>
<td>.315</td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>281,311</td>
<td>18,812</td>
<td>300,123</td>
<td>300,123</td>
<td>300,123</td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td>256,881</td>
<td>7,798</td>
<td>269,106</td>
<td>289,108</td>
<td>275,701</td>
<td></td>
</tr>
</tbody>
</table>

is not as disequalizing as might be expected from the high concentration of inheritances. This is partly because mean inheritance is only 7% of mean lifetime non-investment income, and partly because the assignment of inheritances is largely random. (The correlation between $H^1$ and $I^1$ is very mild.) The relative impacts of inheritance and non-investment income are better gauged, however, by examining the effect of equalizing them alternatively. When this is done we find that the impact of inheritance is in fact far from negligible. Equalizing inheritance completely produces a 10% drop in both the coefficient of variation and the Gini coefficient and a fall in the share of the top 10% from 25 to 23%, for example. Thus inheritance has a significant effect on lifetime economic inequality.
V. Summary and Conclusions

This paper has investigated the quantitative impact of the major sources of economic inequality on the size distributions of wealth, income, and lifetime resources. This has been accomplished by simulating the behavior of a representative sample of families using an attractive utility-maximizing model of life-cycle saving and bequest. Careful empirical grounding has been achieved through the use of actual data on non-investment income, and a distribution of inheritances derived from wealth and mortality data. The relevance of the model is confirmed by its prediction of distributions of both income and wealth remarkably similar to actual.

The relative importance of different sources of inequality has been gauged mainly by eliminating them alternatively from the simulation. The first major conclusion was that differences in tastes, rates of return, earnings, parents' inheritances, and age all have a significant impact on wealth-inequality, but that an unambiguous ranking of these factors according to quantitative importance is impossible. This means that those who have argued that inheritance, age, earnings, luck, or choice, for example, has the dominant impact on wealth-inequality are mistaken, according to the present model. The second conclusion was that equalizing inheritances for both parents and children has such a large impact that one would be justified in attributing to the institution of unequal inheritance a dominant effect on the distribution of wealth. Finally, it was noted that unequal rates of return and parents' inheritances, the major elements of unequal opportunity in the present model, together, have an impact almost as large as that of the institution of inheritance. Thus the observed high concentration of wealth may be due to a considerable extent to inequality of opportunity.

Turning to annual income and lifetime resources, our major conclusions are that while earnings differences are dominant in both cases, wealth-related phenomena are also important. Differences in accumulation-related
tastes, rates of return, and inheritances all have a significant impact on annual income, while eliminating either the institution of unequal inheritance, or inequality of opportunity on the wealth side, would have an especially large effect, particularly for the extremes of the distribution. Finally, unequal parents' inheritances account for about 10% of overall lifetime inequality as measured by lifetime resources, according to both the coefficient of variation and Gini coefficient.

In closing, one might ask how much confidence can be placed in the simulation results. There appears to be only one major area of concern. While it is undoubtedly true that earnings abilities of children regress toward the mean, and there is evidence that parents make compensatory bequests, the bequest motivation assumed here, although intuitively attractive, is not as firmly grounded as other aspects of the simulation. We have concluded that the effort by high-earners to make compensatory bequests is strongly disequalizing for the wealth distribution. Consider the consequences of removing this type of bequest motivation. Simulated wealth-inequality would fall considerably, probably below estimated actual.

In order to restore realistic wealth dispersion one would be compelled to increase the inequality caused by differences in tastes and rates of return, since unlike differences in age, inheritances, and non-investment income these are not firmly empirically grounded. Thus one who regarded our behavioral model with skepticism might feel that choice and luck (or unequal opportunity in capital markets) have a larger role than is attributed to them by the present simulations. My own opinion is that, if anything, the desire for compensatory bequests has been introduced in a mild form and that future research may not just confirm, but enlarge the important role attributed to it here.
Footnotes

1 Flemming (1976) and Oulton (1976) both added unequal earnings, and the latter also unequal rates of return. Despite the similarity of their models the two arrived at quite different conclusions. Flemming argued his model gave wealth inequality almost equal to actual, while Oulton regarded his model as producing negligible dispersion. The contrast is almost entirely explained by the exclusive use in each case of a single inequality index. See Davies (1979a, p. 15).

2 See Davies (1979b) for a full discussion of both sampling and non-sampling error, and references.

3 It is assumed that parents are not concerned about the welfare of grandchildren once they become adults, or about higher-order descendants at any age. This makes our problem manageable and does little damage, as the essential determinants of intergenerational transfers can be captured in the two generation context. (See Shorrocks, 1979, pp. 420-423 and Becker and Tomes, 1979, for similar analyses.)

4 Assume all family members enjoy an equal true consumption flow \( c_t \). Due to economies of scale in consumption, \( c_t \) exceeds total consumption expenditure of the family per capita. Define \( n_t = C_t / c_t \), that is, let \( n_t \) be the number of individuals who could achieve true consumption \( c_t \) living separately, with a total expenditure between them of \( C_t \). Then \( c_t = C_t / n_t \), or "consumption per adult equivalent family member".

5 Bequests motivated as in (9) are sometimes referred to as "compensatory" since they "compensate" children for having low \( H^2 \). Tomes (1979b) in a careful study of the determinants of bequests for a sample of small inheritors in the U.S. finds that parents in fact make larger bequests to their lower-earning offspring.
To the extent that earnings are genetically determined non-additive interaction of genes (for example, through "dominance") will cause such regression. See Jencks (1972, p. 271). From an economist's point of view, if $H^1$ is an input in a production function for $H^2$, diminishing returns also predict such regression. Finally empirical estimates of the elasticity of sons' earnings with respect to fathers' lie below unity. See, e.g., Atkinson, Trinder, and Maynard (1978, p. 388).

With a sample of this size the problem of sampling variation is effectively eliminated. Davies (1979a, pp. 491-92) reports the results of repeated simulations taking different drawings in all random elements of the model. As Blinder (1974, pp. 117-18) found with his sample size of 400, the sampling variation was negligible.

There is a uniform distribution of parents' ages at first birth with upper and lower bounds of 25 and 34. In all families children come at three-year intervals until family size is completed. The adult equivalence scale:

<table>
<thead>
<tr>
<th>N</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>1.0</td>
<td>1.45</td>
<td>1.85</td>
<td>2.20</td>
<td>2.46</td>
</tr>
</tbody>
</table>

was derived from a Statistics Canada budget study underlying the formulation of poverty lines.

Davies (1979a, Chapter 11) shows that allowing "earnings mobility" leaves the character of the present results unchanged.

In previous work transfer income and pensions have usually been ignored. See, e.g., Blinder (1974), Bevan (1979), and Flemming (1979).

It would be more natural to allow a relationship between $r^*$ and net worth. However, since the latter is endogenous, solution of the consumer's plan becomes intractable.
Estimates range from 1 to 4, and have been obtained by a variety of methods. See Davies (forthcoming) for a review of the evidence, as well as Bevan (1979, p. 391), who also suggests $\gamma = 2$ as a best guess.

The average growth rate of consumption, in real terms, for Canadian families in the mid-1960's was estimated as follows. In 1964 and 1967 Statistics Canada conducted family expenditure surveys using identical methods and published the results using five-year age ranges. I computed the age profiles of mean consumption per adult equivalent member and then fitted fourth order polynomials to each profile. ($R^2 = .97$ and .96 for 1964 and 1967 respectively.) I then compared $c_t$ for families with heads aged 20, ..., 77 in 1964 with $c_t$ for ages 23, ..., 80 in 1967. Adjusting for inflation the average rate of increase was 3.0%.

Parents with lower $\rho$'s and higher $b$'s pass on more resources to their children. If children's tastes are partly determined by parents', they will therefore be correlated with lifetime resources.

Thought of in a production context, equation (11) shows a uniformly declining marginal product of parental human capital in the production of children's when $\nu_1 < 1$.

The proportion of the variance of log earnings explained by "family background" may be viewed as an estimate of $\nu_1^2$. Taubman (1976, p. 867) obtains upper and lower bounds of 0.30 and 0.55 for the combined influence of genetics and family environment using identical twins data. In a survey of studies using siblings data Griliches (1979, p. 559), although criticizing Taubman's methods, suggests that the $R^2$ might be as high as 0.5. Taking into account the fact that $R^2$ is the sum of the child's human capital and that of his spouse, since there is a well-known gross positive correlation between the
earnings ability of spouses, the appropriate $R^2$ for $H^1$ and $H^2$ is likely in excess of 0.5. Here a value of 0.75 is assumed.

17 Wolfson (1979) has employed a similar approach for Canada in an exercise which, like the present, suggests that inheritance is an important cause of inequality. Kotlikoff and Summers (1980) also use this approach, in order to support their contention that inherited wealth is in aggregate more important than self-accumulated in the U.S.

18 These are derived from Smith (1974, pp. 158-60), who uses data on preferred-risk insurance policy holders to estimate the mortality rates of the wealthy. These are disaggregated by age and sex, and lie from 9 to 28% below overall death rates.

19 The reasons for making the assumptions outlined are as follows. The +0.3 correlation in mates' parents' wealth is motivated by the observation that mates' education, IQ, and other characteristics heavily affected by background correlate at about this level. (See Blinder, 1973, p. 625.) The assumption that 80% of family wealth belongs to the husband is based on the proportion of earnings of married couples contributed by the husband in the 1960's.

Evidence provided by Menchik (1976) and the U.K. Royal Commission on the Distribution of Income and Wealth (1976) was valuable in determining the typical division of net estate between spouse and children. The latter indicates that an average of 22% of the estate of the first parent to die went to the children (p. 173). While Menchik does not compare married and widowed parents he does indicate that 34% of the wealth of all decedents in his sample passed to children (p. 148). Since this is a little higher than the 30% figure found in the U.K. study it may be that a slightly higher proportion of the estates of married decedents passed to children in Menchik's data than in the U.K. study. In addition Menchik's study indicates that
primogeniture is uncommon, and that equal division of estates is the rule rather than the exception. (See Menchik, 1980.) The U.K. study also finds that equal division is common, although apparently less so than in the U.S.

The $2,500 deduction for funeral and administrative costs is derived from Blinder's (1976, p. 631) estimate of the average "cost of dying" in the U.S. at $3,000 in 1973 by adjusting for the rise in consumer prices between 1970 and 1973.

Finally Whalley (1975) and Horsman (1975) provide U.K. data which suggests that gifts received over the lifetime (discounting to age 20) may be about 20-40% of inheritances, on average.

20 The procedure was to take a weighted sum of a couple's percentile position in the H distribution and a random number to obtain a position in the distribution of inheritances. By changing the weights on the two components, one can iterate to an assignment of inheritances with the desired correlation.

21 The profile shown in Figure III differs from the estimated Canadian actual in reaching a later and somewhat higher peak. The estimated actual profile of mean wealth peaks at age 50, about 40% above lifetime average, and thereafter declines slowly, reaching the same relative value as the simulated profile for those 75+. Certain historical circumstances may explain why the wealth of those aged 50-70 does not reach the peak predicted by our steady-state simulation. First, anyone over 60 in 1970 was of working age throughout the depression of the 1930's. Second, the real value of the savings of all those over 50 would have been affected by the rapid immediate post-war inflation. Finally, the simulation assumes the 1970 cross-section distribution of non-investment income held throughout the period before 1970, except for scale. Past about age 50 an increasing proportion of income is made up of transfers. Since the relative size of such flows was continually
increasing in the post-war period, assuming the 1970 cross-section held before 1970 likely exaggerates the relative incomes of those over about 50 in those years.

A uniform inward shift of the Lorenz curve is easy to infer from the behavior of the quantile shares as it reduces the share of each top X% of the population.

G is most concerned with inequality in the middle of unimodal distributions, while CV is most sensitive to extreme values. Since typical distributions of income and wealth have much longer upper than lower tails, here CV reacts most strongly to changes in the upper tail.

CV actually rises when tastes are equalized due to its extreme sensitivity to the upper tail. There are a small number of very large inheritances which place their recipients at the top of the wealth distribution. Although equalizing tastes affects what the successors do with their inheritances, there is no effect on their value at point of receipt. Now, when tastes are equalized mean wealth overall falls 41%—much more dramatically than in any other experiment. The result is that the wealth held by the top inheritors increases considerably relative to the overall mean. G is undisturbed by this since it is principally concerned with the equalizing trend in the middle of the distribution.

It is also interesting that further experiments (not shown in the table) indicate that the mild correlation of ρ, b, and r with lifetime resources is as important as dispersion in these characteristics per se in explaining overall wealth inequality.
Atkinson (1971) was written in response to a London Times leader which claimed age was dominant, and countered with a rival nomination of inheritance for this distinction. Flemming (1976) appears to view age and earnings jointly as most important. That differences in wealth are mainly due to differences in savings propensities is a widespread belief. (The importance of differences in impatience was cogently argued by Fisher, 1930, pp. 333-340.) Finally, those who emphasize the role of luck frequently call attention to unequal rates of return. See, e.g., Jencks (1972, p. 227) who argues that luck is a more important cause of success in life than, say, education. Many of the examples given ("...whether bad weather destroys your strawberry crop, whether the new superhighway has an exit near your restaurant...") relate to the dispersion in rates of return.

The relatively small change in G in both cases calls attention, once again, to its disinterest in the tails of the distribution, and points out how serious an error may be made when G is the only inequality index examined.

Blinder (1974) concluded that inheritance had hardly any impact on the distribution of lifetime resources. The reason for the contrast between his conclusion and the present is partly that he did not perform the experiment of equalizing inheritances, looking only at the difference between the distributions of lifetime earnings and total resources, and partly that his inheritances were derived from a survey source (discussed in the introduction) which gives average inheritances about 2/3 below those used here. (Davies, 1979a, pp. 261 and 405.)
References


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_________. "Inheritance and the Intergenerational Transmission of Inequality: Theory and Empirical Results." University of Western Ontario, mimeo, 1979b.


Appendix

This appendix investigates the sensitivity of the results obtained in the paper to changes in some of the parameters which were most difficult to select. Those parameters which are not firmly grounded empirically are $\overline{r^*}$, $\overline{\rho}$, and $\overline{b}$; the dispersions of $r^*$, $\rho$, and $b$; and $\nu_1$. It is clear that altering the dispersion of $r^*$, $\rho$, or $b$ would affect income and wealth-inequality, and the likely effect can be gauged from the appropriate columns of Tables 1 and 2 in the text. What is not clear, however, is whether changing $\overline{r^*}$, $\overline{\rho}$, $\overline{b}$, or $\nu_1$ would alter the conclusions drawn in the paper. The experiments shown in Table 4 were performed to help answer this question.

Table 4 partially repeats the inequality-decomposing experiments of Table 1 (i.e., for the wealth distribution only) four times, in each case starting from the same parameterization as in the text, but with a new value for one of $\overline{r^*}$, $\overline{\rho}$, $\overline{b}$, or $\nu_1$. There are two principal results--First, the base run wealth distribution is highly sensitive to changes in parameter values. This does not detract from the exercise carried out in this paper. That is because this paper is concerned with the relative quantitative importance of different sources of inequality. Table 4 shows that the ranking of earnings differences, unequal parents' inheritances, and the institution of unequal inheritance for all generations, as causes of wealth inequality is largely unaffected by the changes in $\overline{r^*}$, $\overline{\rho}$, $\overline{b}$, and $\nu_1$ examined. (Similar results are obtained for the other experiments of Table 1, and for the income distribution.) Hence, even if it could be convincingly argued that the base run parameterization errs significantly, it is unlikely that the rough ranking according to relative importance of sources of inequality also errs, subject to the qualification that altering the dispersions of $r$, $\rho$ or $b$ could make unequal rates of return or tastes appear more or less important.
<table>
<thead>
<tr>
<th>Parameter Change</th>
<th>Simulation</th>
<th>Share of...</th>
<th>Coefficient of Variation</th>
<th>Gini Coefficient</th>
<th>Mean</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Top 1%</td>
<td>Top 10%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Raise $\alpha^*$ to 0.06</td>
<td>a) Base Run</td>
<td>23.3%</td>
<td>63.4%</td>
<td>2.933</td>
<td>.749</td>
<td>$63,314</td>
</tr>
<tr>
<td></td>
<td>b) Equal Earnings</td>
<td>18.7</td>
<td>51.7</td>
<td>2.560</td>
<td>.664</td>
<td>43,130</td>
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<tr>
<td></td>
<td>c) Equal Parents' Inheritances</td>
<td>20.8</td>
<td>60.1</td>
<td>2.653</td>
<td>.723</td>
<td>55,627</td>
</tr>
<tr>
<td></td>
<td>d) Equal Parents' and Kids'</td>
<td>6.4</td>
<td>32.4</td>
<td>1.046</td>
<td>.518</td>
<td>57,994</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Raise $\beta$ to 0.018</td>
<td>a) Base Run</td>
<td>24.7</td>
<td>64.4</td>
<td>3.159</td>
<td>.788</td>
<td>20,681</td>
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<td>b) Equal Earnings</td>
<td>22.3</td>
<td>58.0</td>
<td>3.202</td>
<td>.748</td>
<td>15,620</td>
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<td>c) Equal Parents' Inheritances</td>
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<td>53.7</td>
<td>2.210</td>
<td>.717</td>
<td>17,659</td>
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<td>d) Equal Parents' and Kids'</td>
<td>6.2</td>
<td>33.8</td>
<td>1.118</td>
<td>.570</td>
<td>26,927</td>
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<tr>
<td>3. Raise $\delta$ to 0.25</td>
<td>a) Base Run</td>
<td>21.6</td>
<td>64.3</td>
<td>2.762</td>
<td>.770</td>
<td>42,054</td>
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<td>b) Equal Earnings</td>
<td>18.2</td>
<td>55.3</td>
<td>2.516</td>
<td>.707</td>
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<td>2.451</td>
<td>.736</td>
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<td>d) Equal Parents' and Kids'</td>
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<td>.529</td>
<td>35,160</td>
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<tr>
<td>4. Lower $\nu_1$ to 0.707</td>
<td>a) Base Run</td>
<td>21.4</td>
<td>63.1</td>
<td>2.718</td>
<td>.763</td>
<td>39,747</td>
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<tr>
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<td>b) Equal Earnings</td>
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<td>c) Equal Parents' Inheritances</td>
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<td>.531</td>
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