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HUMAN CAPITAL AND THE RISE
AND FALL OF FAMILIES

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Abstract

This paper develops a model of the transmission of earnings, assets, and consumption from parents to children and later descendants. The model is based on utility maximizing by parents concerned about the welfare of their children. The degree of intergenerational mobility, or the rise and fall of families, is determined by the interaction of utility maximizing behavior with investment and consumption opportunities in different generations, and with different kinds of luck.

In most of the paper, cultural and genetic endowments are assumed to be automatically transmitted from parents to children, with the relation between the endowments of parents and children determined by the degree of "inheritability." The degree of intergenerational mobility in earnings is also determined by the number of children in different families.

We have examined about a dozen empirical studies relating the earnings, income, and assets of parents and children. Aside from families victimized by discrimination, regression to the mean in earnings in the United States and other rich countries appears to be rapid, and wipes out in three generations almost all the advantages or disadvantages of ancestors.
1. **Introduction**

Ever since Pareto discovered that the distribution of larger incomes and wealth was reasonably well approximated by a particular skewed distribution, since then called the "Pareto distribution," economists have continued to discuss inequality in the distribution of earnings, income, and wealth among individuals and families. However, they have paid little attention to the inequality within families over generations as determined by the relation between the incomes or wealth of parents, children, and later descendants. Schumpeter is the only major economist who systematically considered inter-generational mobility with empirical evidence as well as theoretical analysis (see Schumpeter [1951]).

Sociologists and other social scientists, on the other hand, have presented considerable empirical evidence on the occupations, education, and other characteristics of children and parents. Blau and Duncan's *The American Occupational Structure* [1967] is an influential book that considers the impact of family background on the achievements of children. As long ago as 1889, John Dewey wrote, "... upon the average, children of parents who are exceptional, or who deviate from the mean, will themselves deviate from the mean only one third of their parents' deviation. ... It is not likely that children of the poor would be better off, and children of the wealthier poorer in anything like the ratio of 2/3." (Dewey [1889], pp. 333-34; this statement was brought to our attention by O. D. Duncan).

Although discussions of inequality among families and discussions of inequality between generations of the same family have been almost entirely separated, they are analytically closely related. In particular, regression away from the mean in the relation between say the incomes of parents and children would be associated with large and growing inequality of income over
time, while regression toward the mean would be associated with a smaller and more stable degree of inequality. These statements are obvious in a simple Markov model of the relation between parents and children:

$$I_{t+1} = a + bI_t + \varepsilon_{t+1},$$

where $I_t$ is the income of parents, $I_{t+1}$ is the income of children, $a$ and $b$ are constants, and the stochastic forces affecting the income of children ($\varepsilon_{t+1}$) are assumed to be independent of the income of parents.

Inequality in income would continue to grow over time if $b$ were greater than or equal to unity, but would approach a constant level if $b$ were smaller than unity in absolute value. Clearly, the size of $b$ also measures whether children of richer parents tend to be less rich than their parents, and whether children of poorer parents tend to be better off than their parents. This example implies that even in rigid and caste-dominated societies, many of the elite and underprivileged families would change places over generations unless inequality continued to grow over time ($b \geq 1$).

The degree of regression toward or away from the mean in the achievements of children compared to those of their parents is a measure of the degree of equality of opportunity in a society. The purpose of this paper is to analyze the determinants of unequal opportunities, sometimes called "inter-generational mobility," or as in the title of our paper, "the rise and fall of families." We use all these terms interchangeably.

The many empirical studies of mobility by sociologists have lacked a framework or model to interpret their findings. We try to remedy this defect and fill a more general lacuna in the literature by developing a systematic
model that relies on utility maximizing behavior by all participants, equilibrium in different markets, and stochastic forces with unequal incidence among participants.

An analysis that is adequate to cope with the many aspects of the rise and fall of families must incorporate, among other things, concern by parents for children, as expressed in altruism toward children, assortative mating in marriage markets, the demand for children, the treatment by parents of exceptionally able or handicapped children, and expectations about events in the next or even later generations. Although these and other aspects of behavior are incorporated into a consistent framework based on maximizing behavior, we do not pretend to handle them all in a fully satisfactory manner. However, our approach indicates how a more complete analysis can be developed in the future.

The next section has a lengthy discussion of investments in the human capital of children. The discussion is lengthy because the relation between the earnings of parents and children is the major determinant of the rise and fall of most families. Section 3 moves on to consider the interaction between investments in human capital, transfers of material wealth (gifts and bequests) from parents to children, and the evolution of consumption over generations.

Since the amount invested in each child tends to be negatively related to the number of children, section 4 considers the effect on intergenerational mobility of the number of children. Section 5 analyzes the effect on mobility of assortative mating in marriage markets.

Section 6 assembles about a dozen studies of the degree of regression to the mean between parents and children in income, earnings, and wealth. Available studies are few and based on limited data, but the magnitudes of some
basic parameters of our model are suggested by the evidence for the United States and other rich countries.

Much of our analysis of human capital is based on the model developed in Becker's Woytinsky Lecture [1967] to explain different investments among families. However, that Lecture is mainly concerned with inequality and skewness in earnings and wealth, and does not derive relations between the earnings and assets of parents and children. The approach in this paper is also based on a series of papers by us in the last decade that analyzes marriage, fertility, altruism of parents, and long-run equilibrium relations between parents and children (see especially Becker [1974], Becker and Tomes [1976], Becker and Tomes [1979], Becker [1981], and Tomes [1981]). Although these studies do explicitly relate the earnings and other characteristics of parents and children, the present paper extends our previous work in several significant ways.

We have indicated with equation (1) why inequality over generations and inequality between families are closely related. Therefore, any adequate analysis of inequality must also consider marital patterns, fertility, expectations about future generations, and investments in human capital. It is not surprising that a growing literature during the last fifteen years has tried to integrate more realistic models of family behavior into models of the distribution of income and wealth. Although this literature and our work has many similarities, the present paper is almost alone in relating the rise and fall of families to investments in human capital interacting with the accumulation of assets, the evolution of consumption, and the demand for children.
2. Earnings and Human Capital
   a. Perfect Capital Markets

Some children have an advantage because they are born into families with greater ability, greater emphasis on childhood learning, and with other favorable cultural and genetic attributes. Both biology and culture are transmitted from parents to children: one encoded in DNA and the other in a family's culture. Much less is known about the transmission of cultural attributes than of biological ones, and even less is known about the relative contributions of biology and culture to the distinctive endowment of each family. We do not need to separate cultural from genetic endowments, and will not try to specify the exact mechanism of cultural transmission, but will follow our previous paper (Becker and Tomes [1979]; also see, for example, Bevan [1979]) in assuming as a first approximation that both are transmitted by a stochastic linear or Markov equation:

\[ E_t^i = \alpha_t + hE_{t-1}^i + \nu_t^i, \]  \hspace{1cm} (2)

where \( E_t^i \) is the endowment (or vector of endowments) of the \( i \)th family in the \( t \)th generation, \( h \) is the degree (or vector of degrees) of "inheritability" of these endowments, and \( \nu_t^i \) measures unsystematic components or luck in the transmission process. We assume that parents cannot invest in their children's endowment (but see section 4).

A priori restrictions on the magnitude or even the sign of the inheritability of endowments are unnecessary since the degree of inheritability can be estimated from accurate information on the earnings of parents and children (and perhaps also grandparents). Yet the assumption that endowments are only partially inherited, that \( h \) is less than unity and greater than zero,
is a plausible generalization to cultural endowments of what is known about the
inheritance of genetic traits. This assumption implies that endowments regress
to the mean: children with well endowed parents tend also to have above aver-
age endowments, but smaller relative to the mean than their parents', whereas
children with poorly endowed parents tend also to have below average endow-
ments, but larger relative to the mean than their parents'.

The term $\alpha_t$ can be interpreted as the social endowment common to all
members of a given cohort in the same society. If the social endowment were
constant over time, and if $h < 1$, the average endowment would eventually equal
$1/(1-h)$ times the social endowment (i.e., $\lim E_t = \alpha/[1-h]$). However, $\alpha$ may
not be constant because, for example, governments invest in the social endow-
ment.

Practically all formal models of the distribution of income that
consider wages and abilities assume that abilities automatically translate into
earnings, mediated sometimes by demands for different kinds of abilities (see,
e.g., Mandelbrot [1962]; Roy [1950]; Tinbergen [1970], Bevan and Stiglitz
[1979]). This is useful in understanding certain gross features of the dis-
tribution of earnings, such as its skewness, but is hardly satisfactory for
analyzing the effect of parents on their children's earnings. Parents not only
pass on some of their endowments to children, but also influence the adult
earnings of their children by expenditures on their skills, health, learning,
motivation, "credentials," and many other characteristics. These expenditures
are determined not only by the abilities of children, but also by the incomes,
preferences, and fertility of parents, public expenditures on education and
other human capital of children, and still other variables. Since earnings are
practically the sole income for most persons, parents influence the economic
welfare of their children primarily by influencing their potential earnings.
To analyze these influences in a simple way, assume two periods of life, childhood and adulthood, and that adult earnings depend on human capital \((H)\), including credentials, and market luck \((I)\):

\[ Y_t = \gamma(T_t, f_t)H_t + f_t \]  \hspace{1cm} (3)

where \(\gamma\), the earnings of one unit of human capital, is determined by equilibrium in factor markets, and depends positively on technological knowledge \((T)\), and negatively on the ratio of the amount of human capital to nonhuman capital in the economy \((f)\). Since we are concerned with differences among families, the exact value of \(\gamma\) is not usually important because that is common to all families. Therefore, we assume that the measurement of \(H\) is chosen so that \(\gamma = 1\).

Although human capital takes many forms, including skills and abilities, personality, appearance, and reputation, and appropriate credentials, we further simplify by assuming it is homogeneous and the same "stuff" in different families. Since much research demonstrates that investments during childhood are crucial to later development (see, e.g., Bloom [1976]), we assume that the total amount of human capital accumulated, including on-the-job training, is proportional to the amount accumulated during childhood. Then adult human capital and expected earnings would be determined by endowments inherited from parents, and by parental \((x)\) and public expenditures \((s)\) on his or her development:

\[ H_t = \psi(x_{t-1}, s_{t-1}, E_t), \text{ with } \psi_j > 0, \ j = x, s, E. \]  \hspace{1cm} (4)
Ability, early learning, and other aspects of a family's cultural and genetic "infra-structure" usually raise the marginal effect of family and public expenditures on the production of human capital; that is,

\[
\frac{\partial^2 H_t}{\partial y_{t-1} \partial E_t} = \psi_y > 0, \quad y = x, s. \tag{5}
\]

The marginal rate of return on parental expenditures \( r_m \) is defined by the equation

\[
\frac{\partial Y_t}{\partial x_{t-1}} = \frac{\partial H_t}{\partial x_{t-1}} = \psi_x = 1 + r_m(x_{t-1}, s_{t-1}, E_t), \tag{6}
\]

where \( \partial r_m / \partial E > 0 \) by inequality (5).

Although the human capital of different persons may be close substitutes in production, each person forms a separate human capital "market" because rates of return depend on the amount invested in him as well as on aggregate stocks of human capital. Marginal rates of return eventually decline as more is invested in a person because investment costs eventually rise as his foregone earnings rise, and benefits decline increasingly rapidly as his remaining working life shortens (see the more extended discussion in Becker [1975]). The decline in marginal returns can be stated as

\[
\psi_{xx} = \frac{\partial r_m}{\partial x} < 0. \tag{7}
\]
The negatively inclined curves HH and H'H' in Figure 1 give the effect of parental expenditures on marginal rates of return for given endowments and public expenditures. H'H' is above HH because the endowment E' exceeds E.

Since nonhuman capital or assets can usually be purchased and sold in relatively efficient markets, presumably returns on assets are less sensitive than returns on human capital to the amount owned by any person. Little is known about the effect of abilities, other endowments, and wealth on returns from different assets, although some theory suggests a positive relation (see Ehrlich and Ben Zion [1976]). Our analysis only requires the reasonable assumption that returns on assets are much less sensitive to endowments and accumulations by any person than are returns on human capital (a similar assumption was made in Becker [1967, 1975]). A simple special case of this assumption is that the rate of return on assets is the same to all persons.

Since much of the endowed luck of children (v_t) is revealed to parents prior to most of their investment in children, we assume that rates of return on these investments are fully known to parents (as long as the social environment (q_t) and public expenditures (s_t-1) are known). Parents must decide how to allocate their total "bequest" to children between human capital and assets. We assume initially that parents can borrow at the asset interest rate to finance expenditures on children, and that this debt can become the obligation of children when they are adults.2

Parents are assumed to maximize the welfare of children when no reduction in their own consumption or leisure is entailed. Then parents borrow whatever is necessary to maximize the net income (earnings minus debt) of their children, which requires that expenditures on the human capital of children equate the marginal rate of return to the interest rate:

$$r_m = r_t, \text{ or } x_{t-1} = g(E_t, s_{t-1}, r_t), \quad (8)$$
with $g_E > 0$ (by eq. (6)), $g_r < 0$, and with $g_s < 0$ \hspace{1cm} (9)

if public and private expenditures are substitutes. Parents can separate investments in children (an example of the Separation Theorem) from their own resources and altruism toward children because borrowed funds can be made the children's obligation.

The optimal investment is given in Figure 1 by the intersection of the horizontal "supply curve of funds," $rr$, with a negatively inclined demand curve ($HH$ or $H'H'$). This figure clearly shows that better endowed children accumulate more human capital; those with the endowment $E$ accumulate $ON$ units of expenditure, while those with $E' > E$ accumulate $ON' > ON$. Therefore, better endowed children would have higher expected earnings because equation (3) converts human capital into expected adult earnings. Since more is spent on better endowed children, the total effect of endowments on earnings, and the inequality and skewness in earnings relative to that in endowments, is raised by the positive covariance between endowments and expenditures.

Clearly, an increase in the rate of interest reduces the investment in human capital, and hence earnings: compare $ON$ and $ON'$ in Figure 1. The effect of an increase in public expenditures is less clear. If public expenditures were perfect substitutes dollar for dollar for private expenditures, the production of human capital would be determined by their sum $(x + s)$ and by $E$; an increase in public expenditures would then induce an equal decrease in private (parental) expenditures, and the accumulation of human capital would be unchanged. Even then, since private expenditures cannot be negative, a sufficiently large increase in public expenditures would raise the accumulation of human capital.
Note that the human capital and earnings of children would not depend on their parents' assets and earnings because poor parents can borrow what is needed to finance the optimal investment in their children. However, the income of children would depend on parents because gifts and bequests of assets and debt would be sensitive to the earnings and wealth of parents. Indeed, wealthy parents would tend to self-finance the whole accumulation of human capital, and add a sizable gift of assets as well.

Although the earnings and human capital of children would not be directly related to parental earnings and wealth, they would be indirectly related through the inheritability of endowments. The greater the degree of inheritability, the more closely related would be the human capital and earnings of parents and children. To derive the relation between the earnings of parents and children, substitute the optimal level of $x$ given by equation (8) into the earnings-generating equation (3) to get

$$Y_t = \psi[g(\mathcal{E}_t, s_{t-1}, r_t), s_{t-1}, E_t] + \lambda_t = \phi(E_t, s_{t-1}, r_t) + \lambda_t,$$

where

$$\phi_E = \psi g_E + \psi_x \frac{\partial Y}{\partial E} + \frac{\partial Y}{\partial x} > 0$$

Since this equation relates $E$ to $Y$, $\lambda$, $g$, and $r$, $E_t$ can be replaced by $E_{t-1}$ from (2), and then $Y_t$ can be related to $Y_{t-1}$, $\lambda_{t-1}$, $\nu_t$, $\lambda_{t-1}$, and other variables:

$$Y_t = F(Y_{t-1}, \lambda_{t-1}, \nu_t, h, s_{t-1}, s_{t-2}, r_t, r_{t-1}, a_t) + \lambda_t.$$
The partial effect of the earnings of parents on the earnings of children can be found by differentiating:

\[
\frac{\partial Y_t}{\partial Y_{t-1}} = \frac{\partial Y_t}{\partial E_t} \frac{\partial E_t}{\partial E_{t-1}} \frac{\partial E_{t-1}}{\partial Y_{t-1}} = \frac{h \phi_{Et}}{\phi_{E_{t-1}}}.
\]

Not surprisingly, the earnings of parents and children are more closely related when endowments are more inheritable \( (h) \). However, the relation between their earnings also depends on the total effect of endowments on earnings \( (\phi_E) \). The earnings of parents and children are linearly related when this effect is independent of the level of endowments \( (\phi_{EE} = 0) \):

\[
Y_t = c_t + \alpha_t \phi_t + h Y_{t-1} + l_t^* ,
\]

where

\[
l_t^* = l_t - h \phi_{t-1} + \phi_E Y_t \text{ and } c_t = c(s_{t-1}, s_{t-2}, r_t, r_{t-1}).
\]

Although the direct relation between the earnings of parents and children would be linear when \( \phi_{EE} = 0 \), \( c_t \) may differ among families if government expenditures \( (s_{t-1}, s_{t-2}) \) differed, and \( l_t^* \) would be negatively related to the market luck of parents.

Holding constant the luck of adults and children \( (l^*) \), earnings of children regress to the mean at the rate of \( 1 - h \). However, the coefficient is biased downward by the generational "transitory" earnings of parents \( (l_{t-1}) \) in an OLS regression of the actual lifetime earnings of children on the actual lifetime earnings of parents \( (Y_t \text{ on } Y_{t-1}) \). If \( c_t \) is the same for all families, the expected value of the regression coefficient would equal
\( b_{t, t-1} = h(1 - \frac{\sigma_x^2}{\sigma_y^2}) \),

(14)

where \( \sigma_x^2 \) and \( \sigma_y^2 \) are the variances of \( x_t \) and \( y_t \). This coefficient is closer to the degree of inheritability, the less important is generational transitory earnings in the total inequality in lifetime earnings.

One major conclusion of this analysis is that the earnings of children from poorer and middle class families regress toward the mean if, and only if, the degree of inheritability is less than unity. If endowments were highly inheritable, the earnings of children from richer families could regress above the earnings of their parents with a sufficiently concave total effect of endowments on earnings\(^3\) (i.e., \( 3y_t/3y_{t-1} > 1 \) if \( \phi_E/\phi_{E_{t-1}} > 1/h \)). The transitory component in generational earnings could be responsible for a sizable estimated degree of regression to the mean even with highly inheritable endowments (see equation (14)).

Families of particular races, religions, castes, or other characteristics suffering from market discrimination earn less than other families, but would a person with these characteristics earn less than a person without them when their parents have the same earnings? If the inheritability of endowments were the same in both sets of families, and if discrimination reduced the variability in permanent earnings relative to the variability in transitory earnings (partly by reducing access to information about market opportunities), the slope of an OLS regression of children's lifetime earnings on parents' lifetime earnings would be lower in families subject to discrimination. The
true intercept would tend to be lower in families suffering from discrimina-
tion, but the estimated intercept could be higher because of the greater down-
ward "bias" in the estimated slope for these families.

b. Imperfect Access to Capital

Access to capital markets to finance investments in children sepa-
rates the transmission of earnings from the generosity and resources of
parents. Economists have argued for a long time, however, that human capital
is poor collateral to lenders. Children can "default" on the market debt
contracted for them by working less energetically, or by entering occupations
with lower earnings and higher psychic income. Such "moral hazard" from the
private nature of information about work effort and employment opportunities
can greatly affect the earnings realized from human capital. Moreover, most
societies are reluctant to collect from children debts contracted by their
parents, perhaps because the minority of parents who do not care much about the
welfare of their children would raise their own consumption by leaving large
debts to children.

To bring out sharply the effect of imperfect access to debt con-
tracted for children, we assume that parents must finance investments in
children either by selling assets, by reducing their own consumption, by reduc-
ing the consumption by children, or by raising the labor force activities of
children. Consider parents without assets who have to finance the efficient
investment in human capital (say ON in Figure 1) partly by reducing their own
consumption because they cannot contract debt for their children. Since the
marginal utility of their consumption would then be raised relative to the
marginal utility of resources invested in children, they would be induced to
 cut back their expenditure on children. Consequently, both the amount invested
in children and parental consumption would be reduced by limitations on the
debt contractable for children.
Further reductions in parental consumption are encouraged as less is invested because the marginal return from investments in children is raised. If parents maximize expected utility, the first-order condition requires that the expected marginal utility from expenditures on children equals the marginal utility of parental consumption (assumed to be known) discounted by the known marginal return on investments in children. If leisure is ignored, if children do not work while investing, and if the utility of parents is a separable and additive function of their own consumption and various characteristics of children, including their adult income, then the first-order condition is

\[
\varepsilon_{t-1} \frac{\partial w}{\partial Y_t} (R_t, Y_t)(1 + r_m) = u'(Z_{t-1}),
\]

(15)

where \( R_t \) measures other relevant characteristics of children (see the further discussion in section 4), \( w \) measures the utility from children, \( Z_{t-1} \) is parents' consumption, and \( \varepsilon_{t-1} \) are expectations conditional on the information available to parents, and \( r_m \) is the marginal rate of return on their foregone consumption \((1 + r_m = -dY_t/dZ_{t-1})\).

Therefore, expenditures on children by parents without assets depend not only on endowments of children and public expenditures, as in equation (8), but also on earnings of parents \( (Y_{t-1}) \), their generosity toward children \( (w) \), and uncertainty \( (\varepsilon_{t-1}) \) about the luck of children and later descendants, as in

\[
\hat{x}_{t-1} = g^*(E_t, s_{t-1}, Y_{t-1}, \varepsilon_{t-1}, w), \text{ with } g^*_x > 0.
\]

(16)

If public and private expenditures were perfect substitutes, \( g^* \) would depend on the sum of \( s_{t-1} \) and \( Y_{t-1} \) because an increase in public expenditures would then
be equivalent to an equal increase in parental earnings. The effect of children's endowments on investments is now ambiguous ($g_E^* < 0$) because an increase in their endowments raises the resources of children as well as the productivity of investments in their human capital. Expenditures on children are discouraged when they are expected to be richer because parents must reduce their own consumption when they spend more on children.

The demand curves for expenditures in Figure 2 are similar to those in Figure 1, and are higher in families with better endowed children. The cost of funds to a family is no longer constant because increased expenditures on children lower the consumption by parents, and thereby raise their subjective discount rate (the shadow cost of funds). Moreover, supply curves are no longer the same for all families because the subjective cost of given expenditures is smaller to parents with higher earnings or with more poorly endowed children. Expenditures on children in each family are determined by the intersection of the supply and demand curves for that family. An increase in parental earnings shifts the supply curve to the right and induces greater expenditures on children. The distribution of intersection points determines the distribution of investments and rates of return, and hence, as shown in Becker [1967, 1975], the inequality and skewness in the distribution of earnings.

Substituting equation (16) into the earnings-generating equation (3) yields

$$Y_t = \psi(g^*(E_t, Y_{t-1}, r_{t-1}), S_{t-1}, E_t) + \zeta_t$$

$$= \phi^*(E_t, Y_{t-1}, r_{t-1}) + \zeta_t,$$

(17)
where $r_{t-1}$ includes $s_{t-1}$, $c_{t-1}$, and $w$. Earnings of children now depend directly on the earnings of parents as well as indirectly through the transmission of endowments. Some authors (e.g., Bowles [1972], Meade [1976], or Atkinson [1983]) argue for a direct effect because "contacts" of parents are said to raise the opportunities of children; others argue for a direct effect because parents receive utility from the human capital of children. Fortunately, the effect of parental earnings on access to capital can be distinguished analytically from its effect on "contacts" or "utility."

The indirect effect of parents' earnings on the earnings of children operates through the transmission of endowments, and can be found by substituting $E_{t-1}$ for $E_t$, and then using equation (17) for $E_{t-1}$:

$$Y_t = F(Y_{t-1}, Y_{t-2}, \ell_{t-1}, v_t, h, \alpha_t, r_{t-1}, r_{t-2}) + \mu_t.$$  \hspace{1cm} (18)

The partial effect of the earnings of parents is

$$\frac{\partial Y_t}{\partial Y_{t-1}} = \phi^*_Y_{t-1} + \frac{h\phi^*_E_t}{\phi^*_E_{t-1}} > 0,$$ \hspace{1cm} (19)

while the partial effect of the earnings of grandparents is

$$\frac{\partial Y_t}{\partial Y_{t-2}} = -h\phi^*_Y_{t-2} - \frac{\phi^*_E_t}{\phi^*_E_{t-1}} < 0.$$ \hspace{1cm} (20)

Earnings of grandparents and grandchildren are directly linked because of the constraints on financing investments in children; earnings of parents are not sufficient to describe the effects on children of both the
resources and endowments of parents. Equation (20) shows that an increase in the earnings of grandparents lowers the earnings of grandchildren when parents’ earnings and grandchildren's luck are held constant. Therefore, restrictions on borrowing to finance investments in children introduce a negative relation between the earnings of grandparents and grandchildren, and raise the effect of parents on children.

If \( Y_t \) were approximately linearly related to \( E_t \) and \( Y_{t-1} \), then

\[
Y_t = c_t' + (\beta + h)Y_{t-1} - \rho Y_{t-2} + \epsilon_t, \quad \text{with } \beta = \frac{\phi_Y}{5}.
\]

(21)

The coefficient of parents' earnings exceeds the degree of inheritability by the marginal propensity to invest in children (\( \beta \)). As in equation (14), OLS estimates of the coefficient of \( Y_{t-1} \) are biased downward by the transitory component of generational earnings. OLS estimates of the simple relation between \( Y_t \) and \( Y_{t-1} \) would tend toward

\[
\beta \leq b_{t,t-1} = \frac{b_{t,t-1 \cdot t-2}}{1 + h\beta} \leq \min (1, \beta + h, b_{t,t-1 \cdot t-2}).
\]

(22)

where \( b_{t,t-1 \cdot t-2} \) is the partial regression coefficient between \( Y_t \) and \( Y_{t-1} \.

Therefore, both partial and simple regression coefficients between the lifetime earnings of parents and children provide upper limits of the effect of capital market constraints on investments in children. The biases in OLS estimates can be overcome by using instruments for the lifetime earnings of parents, such as the lifetime earnings of uncles or great-grandparents (see Goldberger [1979] and Behrman and Taubman [1983b]).
If families suffering from discrimination in the market for earnings also suffer in the market for funds, their investments in the human capital of children would be reduced further, which lowers their propensity to invest ($\beta$). As a result, the slope between the earnings of parents and children in families suffering discrimination would be reduced even further (see section 2a).

The direct relation between the earnings of parents and children in equation (17) is likely to be concave rather than linear because obstacles to self-financing investments in children are reduced as parents' earnings increase. When investments are sufficient to lower marginal rates of return to the rate on assets, further increases in parents' earnings would have no effect on the amount invested (if rates of return on assets are independent of parents' earnings), but would raise the assets bequeathed to children. Presumably, direct effects of parental earnings on the earnings of children through "contacts" of parents (or utility to parents from the human capital of children) have more rather than less importance in richer families. Hence capital constraints have different implications for the curvature of the direct relation between the earnings of parents and children than do these alternative explanations.

Rich families can more readily self-finance investments in children than can poor and middle level families. Since our analysis implies that richer children have better than average endowments, presumably either the variability in transitory earnings substantially exceeds the variability in the effect of endowments on earnings, or endowments regress significantly to the mean so that the endowments of richer children are much below those of their parents, or both. If returns on assets are not highly sensitive to earnings and endowments, equilibrium marginal rates of return on investments in children would be lower in richer families than in constrained poor and middle level
families, even though endowments and average rates of return are higher in richer families. Therefore, poorer children are at a disadvantage both because they inherit lower endowments, and because capital constraints prevent their parents from maximizing the market value of the endowments they do inherit. Equilibrium marginal rates would tend to decline, but perhaps not monotonically, as earnings rise. Eventually, marginal rates on human capital would equal the rate of return on assets, and then marginal rates would be relatively constant as earnings rose.

If marginal rates were lower in richer families, a small redistribution of human capital away from these families and toward children from less advantaged families would raise the average marginal rate of return, and hence would raise efficiency (assuming human capital raises productivity), even though endowments and the average productivity of investments in children were greater in richer families (see also Becker [1967, 1975]). The usual conflict between "equity" (measured by inequality) and efficiency is absent because a redistribution of investments toward less advantaged children has a similar effect to an improvement in the efficiency of capital markets.

Larger public expenditures on the human capital of children does not raise their total capital when the efficient amount has been invested in children and when public and private expenditures are perfect substitutes: parental expenditures would be reduced dollar for dollar of the increased public expenditures. However, if parental expenditures are constrained by limited access to capital, increased public expenditures would raise the human capital of children by raising family resources (assuming taxes to finance these public expenditures are imposed on other families). The increase is shared between parents and children in a ratio determined by the marginal propensity to invest in children (β).
Some have argued that Head Start and other programs to raise the achievements of poor children are doomed to failure because of the relatively low abilities and other endowments of the children participating (see, e.g., Jensen [1969]). Although our analysis does imply that endowments and the average productivity of expenditures on human capital are lower in poor families, it also implies that marginal rates of return may well be higher in poor families. This implication appears to suggest that compensatory programs for the poor, if administered reasonably well, would raise the achievements of participants.

Such a conclusion, however, neglects "compensatory" responses by parents. To further equity toward other members, parents redistribute their time and expenditures away from participants to siblings and themselves, which would offset the effects of these programs on participants. Parental compensatory responses apparently offset the effect of public health programs, food supplements to poorer pregnant women, and social security programs as well as perhaps some Head Start Programs (see the discussion in Becker [1981, pp. 125-26, 251-53]). If public and private expenditures on the human capital of children were perfect substitutes, the effect of public expenditures on earnings would be determined by the propensity of parents to invest in children ($\beta$). The evidence discussed later (section 6) suggests that compensatory public expenditures are largely offset by reduced parental expenditures because the propensity to invest does not appear to be large.

Children from poorer families acquire less education and other human capital partly because of lower endowments and partly because of more limited access to funds. Some interpretations of the positive relation between family background and human capital stress differences in endowments while others
stress differences in funds (see Becker [1967, 1975]). Although both interpretations imply that poorer children have less human capital and earn less, they have different implications for equilibrium marginal rates of return on investments in children: these tend to fall as parents' earnings rise only when limited access to funds is important. Moreover, equation (22) shows that an upper bound to the propensity to invest in human capital ($\theta$), a measure of the restraint on access to funds, can be determined from OLS regressions of lifetime earnings of children on lifetime earnings of parents.

Parents can reduce their life cycle savings rather than their consumption to finance expenditures on children if children would care for their aging parents. In many societies, poorer and middle level parents are supported during old age by children instead of by selling gold, jewelry, rugs, land, houses, or other assets that could be accumulated at younger ages. Our analysis suggests that they choose not to accumulate assets but to rely on children because rates of return on investments in children are higher than on other assets.

In effect, poorer and middle level parents and children have an implicit contract, enforced imperfectly by social sanctions, that parents invest in children in return for support during old age. Both parents and children would be made better off by such contracts if investments in children yield a high return, including in the yield insurance provided by children against an unusually long old age (see the paper in this volume by Kotlikoff, Shoven, and Spivak [forthcoming]). Parents ease the burden of financing investments in children in other ways as well, including access to the earnings of children while in school or before they leave home (See Goldin and Parsons [1984]). We do not model such implicit contracts between parents and children, although they are important, especially in less developed countries.
3. Assets and Consumption

Bequests (and gifts) of assets to children do not rise rapidly until subjective discount rates of parents, and hence marginal rates of return on investments in children, are reduced to the rate on assets. Further increases in the wealth of children would then mainly take the form of assets rather than human capital because returns on assets are much less sensitive to the amount accumulated. Consequently, most bequests to children would be found in a small number of rich families, and the ratio of assets to human capital would rise as a person's wealth rose. The evidence clearly indicates that the relative importance of assets and income from nonhuman capital is much greater in richer than in poorer families.

Empirical studies indicate that the proportion of income saved remains reasonably constant or rises as incomes, including "permanent" incomes, increase (see the studies reviewed in Mayer [1972]). However, these studies provide flawed measures of intergenerational savings because investments in human capital and "capital gains or losses" from intergenerational changes in endowments are not considered savings. Since lower and middle income families invest primarily in their children's human capital, and since changes in the value of endowments tend to be positive at lower income levels and negative at higher levels because of regression to the mean in endowments, empirical studies understate effective savings by lower and middle income families. We believe that an appropriate concept of savings is likely to show that the intergenerational propensity to save declines as permanent income rises because subjective discount rates, and hence rates of return on investments in children, tend to decline as income increases. Indeed, income inequality would tend to grow over time unless the fraction saved was lower at higher incomes.
Our conclusion that most bequests and intergenerational accumulations of assets are found in a relatively small number of richer families does not presuppose "class" differences in altruism or other fundamental class differences in the propensity to save (as in Kaldor [1956] or Pasinetti [1962], or as used in Atkinson [1983]). All families have the same intrinsic tendency to save and leave estates because they are assumed to have the same altruism toward children (but see later on in this section). "Class" differences in savings appear to exist because poorer families save mainly in the human capital of children, which are not recorded as savings or bequests. They do this not because their preferences differ, but because the upward regression in endowments of their children raises their subjective discount rates and rates of return on any investments in the human capital of their children.

Assets are determined by inheritances from parents and life cycle accumulations. Parents are assumed to choose bequests by maximizing their expected utility, subject to the earnings potential and the expected life cycle accumulation of assets by children. To develop further our analysis of bequests, we must turn to an explicit treatment of utility maximization by parents.

Suppose the utility function of parents is additively separable in their own consumption ($Z_p$) and in various characteristics of children ($R_c$):

$$U_p = u(Z_p) + v(R_c).$$

(23)

We continue to assume until the next section that each adult has one child without marriage. Most of our analysis does not depend on a specific specification of $R_c$, as long as it is related to the resources of children. How
ever, the relation between the consumption by parents and children is considerably simplified by assuming that \( R_c \) equals the utility of children \( U_c \), and that \( V(R_c) \) can be written as

\[
V = \delta U_c ,
\]

where \( \delta \) is a constant measuring the altruism of parents.

If the preference function given by equations (23) and (24) is the same for all generations, and if consumption during childhood is ignored, then the utility of parents indirectly would equal the sum of the discounted values of the utilities from the consumption of all members of their dynastic family:

\[
U_t = \sum_{i=0}^{\infty} \delta^i u(Z_{t+i}) .
\]

The utility of parents depends directly only on children, but it depends indirectly on all descendants because children are concerned about their descendants.

We assume that parents succeed in maximizing their utility, represented by equation (25). This rules out bargaining by children to obtain larger transfers than those maximizing parental utility. A more general assumption is that parents are forced to maximize a weighted average of their own and their children's utility, with weights determined by bargaining power (see the normative use of this assumption in Nerlove, Razin, and Sadka [1984]); however, this generalization too would not change any major conclusions. With perfect certainty about rates of return and incomes in all generations, the first order conditions to maximize utility are
\[ u'(Z_{t+1}) = \delta^{-1} \lambda_t \prod_{j=1}^{i} \frac{1}{1+r_{t+j}}, \quad u'' < 0, \quad \text{(26)} \]

where \( r_{t+j} \) is the marginal return in the jth generation, and \( \lambda_t \) is the marginal utility of dynastic wealth to parents.

With a constant elasticity of substitution in consumption (i.e., constant relative risk aversion),

\[ u'(Z) = aZ^{-\sigma}, \quad \text{where} \quad a, \sigma > 0. \quad \text{(27)} \]

Equation (26) immediately implies that

\[ \ln Z_{t+1} = \frac{1}{\sigma} \ln (1 + r_{t+1})\delta + \ln Z_t \quad \text{(28)} \]

With an exponential utility function (constant absolute risk aversion),

\[ u'(Z) = e^{-pZ}, \quad p > 0. \quad \text{(29)} \]

Equation (26) implies that

\[ Z_{t+1} = \frac{1}{p} \ln (1 + r_{t+1})\delta + Z_t \quad \text{(30)} \]

Consumption changes over generations at a relative or absolute rate determined by the marginal rate of return, the degree of altruism, and parameters of the utility function.
If all parents could effectively finance expenditures on themselves or their children with debt that becomes the obligation of children, the marginal cost of funds in all families would equal the rate on assets. Then according to equation (29) or (30), the change in consumption would be the same in families that were equally altruistic and equally risk averse. Each family would maintain its relative consumption level over generations, and consumption would not regress to the mean. Stated differently, any degree of inequality in consumption in the parents' generation is fully transmitted to the children's generation.

On the other hand, the relation between earnings of parents and children would regress to the mean as long as endowments are not fully inherited by children (see section 2a), regardless of how altruistic parents are. Consumption does not automatically regress to the mean when earnings do because well endowed parents can anticipate that their children tend to earn less than they do. They could offset the expected regression in earnings by reducing the debt or raising the assets bequeathed. As a consequence, much of the investment in children who are well endowed relative to their parents would be financed by debt that becomes the children's obligation.

Therefore, although earnings quickly regress to the mean when endowments are not highly inheritable, well-being as measured by consumption would not regress at all if parents have full access to capital markets to finance investments in their children's human capital. The assets bequeathed to children would rise and the debt bequeathed fall as parental earnings rose. This crucial distinction between regression across generations in earnings and consumption has been ignored in the extensive literature on the mobility of families.
Assets of parents and children are more closely related than their human capital because returns on assets are assumed to be independent of endowments, and hence do not regress to the mean as do returns on human capital. Since total wealth is the sum of human capital and assets, it would regress more slowly to the mean than human capital, especially among richer families.\(^7\)

Consumption would even regress away from the mean if differences among families in altruism were partially or fully transmitted to descendants. Equations (28) and (30) imply that the consumption of more altruistic families increases more rapidly over time, so that, eventually, they become wealthier than other families. Consumption would regress away from the mean because wealthier families would then save more (see the fuller analysis in Becker and Tomes [1979]).

Consumption is fully separated from earnings only when children can be obligated for debts created by parents. If debt cannot be created for children (see the discussion in section 2b), parents without marketable assets could not offset any upward regression in the endowments and earnings of their children. Parents would solve a complicated maximization problem, where capital constraints may not be binding for some descendants. The result of the maximization can be summarized by endogenously determined subjective discount rates and marginal rates of return for each generation that guide as well as reflect the decisions for each generation. These shadow prices exceed the rate on assets whenever descendants are constrained by limited access to debt that prevents borrowing to offset the greater earnings and potential consumption of their children. Since (richer) parents with sufficient assets can raise or lower their bequests to children to offset any downward or upward regression in endowment, the discount rates of these parents would equal the rate on assets.

Consequently, as argued in section 2b, marginal rates of return and discount rates tend to decline as the incomes of parents increase until these
rates equal the rate on assets. Equations (28) and (30) imply that the growth in consumption between generations would decline as discount rates declined and incomes increased; however, the growth in consumption between generations would be constant among richer families with assets (given the utility function in equation (27) or (29)). Therefore, the consumption by children would regress more rapidly to the mean in poor and middle level families than in rich families. The result is a convex relation between parents and children (see ZZ in Figure 3), which raises the positive skewness in the distribution of children's consumption. Although the consumption of richer families need not regress toward the mean, it would if the accumulation of assets reduced the return on assets sufficiently below their degree of altruism (as in Figure 3).

Bequests of assets to children in richer families act as a buffer to offset any regression to the mean in the earnings of children. The richest families could maintain their consumption over time compared to less rich families only by increasing their bequests relative to these families to offset the stronger downward regression in the earnings of the richest children. Hence bequests might well regress away from the mean. As a buffer, bequests fill the gap for children between the expected changes in their consumption compared to their earnings and accumulated assets.

Our discussion of consumption has assumed perfect certainty, even though the luck of children in their adulthood, and the luck of all later generations in childhood and in adulthood, is not likely to be known to parents. We assume, as is reasonable because of various moral hazards (see section 2b), that intergenerational risk is not fully insurable or diversifiable by say borrowing the expected value of the earnings of subsequent generations, and investing that amount at the riskless asset rate (see the general discussion in Grossman and Weiss [1984]). If expected utility is maximized, and if
each generation knows the yields on transfers to children, the first-order conditions with such uncertainty can be written as

\[ \epsilon_t u'(Z_{t+1}) = \frac{\delta^{-1}}{1 + r_{t+1}} u'(Z_t) \]  \hspace{1cm} (31)

where \( \epsilon_t \) refers to expectations taken at generation \( t \) before any new information about earnings and other wealth of descendants is acquired between \( t \) and \( t+1 \). Expanding \( \epsilon_t u'(Z_{t+1}) \) around the expected value of \( Z_{t+1} \),

\[ \epsilon_t u'(Z_{t+1}) = \epsilon_t [u'(\hat{Z}_{t+1}) + u''(\hat{Z}_{t+1})n_{t+1} + \ldots + \frac{[u]^m(\hat{Z}_{t+1})}{(m-1)!} n_{t+1}^{m-1}], \]  \hspace{1cm} (32)

where \( n_{t+1} \) gives the distribution of fluctuations in \( Z_{t+1} \) around \( \hat{Z}_{t+1} \), and \([u]^m\) is the \( m \)th derivative of \( u \).

With the exponential function, the first-order condition in equation (31) implies

\[ Z_{t+1} = c + \frac{1}{p} \ln (1 + r_{t+1}) \delta + Z_t + n_{t+1}, \]  \hspace{1cm} (33)

where \( c \) is a positive constant, and \( n_{t+1} \) does not depend on \( Z_t \). Since uncertainty would stimulate investments in children and other intergenerational savings, it would lower equilibrium discount rates and marginal rates of return on investments. Still, equation (33) indicates that with constant absolute risk aversion, uncertainty does not have any obvious effect on the degree of regression to the mean in consumption.

If the intergenerational capital market permitted all families to finance the wealth-maximizing investments in their children (but they could not
use the capital market to eliminate all intergenerational uncertainty), then
\( r_{t+1} = r_a \) in all families, where \( r_a \) is the asset rate. Since equation (33)
then implies that generation consumption follows a random walk with drift, the
inequality in consumption would continue to increase over time (Kotlikoff,
Shoven, and Spivak [forthcoming] derive a similar result when the length of
life is uncertain).

If poorer and middle level families must self-finance investments in
children, their marginal rates would exceed the rate on assets, and would tend
to decline as parental incomes rose until they equaled the asset rate. The
relation between the consumption by parents and children would be convex, and
random stochastic variation would be added to the curve in Figure 3. Even with
constant absolute risk aversion, expected consumption would regress to the mean
at all income levels if \( 1 + r_a < 1/\delta \); however, inequality in the consumption
by richer families with assets would grow over time because their consumption
would follow a random walk with downward drift. Fortunately, this unrealistic
implication does not hold after fertility and marriage are introduced into the
analysis.

Note that a second-order approximation to the expansion in equation
(32) readily shows that if utility functions have constant relative risk aver-
sion, uncertainty would increase the regression toward the mean in the logs of
consumption, even in rich families. More generally, the effect of uncertainty
on regression toward or away from the mean depends on the signs and magnitudes
of second- and higher-order derivatives of the utility function. Clearly,
uncertainty can induce regression toward the mean in consumption even when
there would be none with certainty. Moreover, the degree of regression might
be substantial since noninsurable uncertainty across generations is likely to
be substantial.
However, the effect of uncertainty on the direction and degree of regression in consumption depends on unknown properties of utility functions, such as fourth-order derivatives. Uncertainty would induce regression away from the mean, or greater rates of regression toward the mean at higher than at lower levels of consumption, with utility functions that otherwise seem as empirically relevant as those having opposite implications. Consequently, we are reluctant to make any strong statement concerning the effect of uncertainty on the degree of regression toward the mean in the consumption by children and take the neutral case in equation (33) only as a first approximation.

4. Fertility

We now drop the assumption that all parents have only one child, and generalize the utility function in equation (24) to

$$U_p = u(Z_p) + a(n) \sum_{j=1}^{n} U_{c,j}.$$  \(34\)

The utility of parents depends on the utilities of \(n\) children, where \(U_{c,j}\) is the utility of the \(j\)th child, and \(a(n)\) is the degree of altruism per child, with \(da/dn < 0\) because of diminishing marginal utility to parents from additional children. Initially, all children are assumed to be identical; then

$$U_p = u(Z_p) + a(n)nU_c, \text{ with } a' < 0.$$ \(35\)

where \(U_c\) is the utility of each child.

The first-order condition for the optimal number of children is that the marginal utility \(\text{MU}_n\) and marginal costs \(\text{MC}_n\) of children are equal:
\[ \text{MU}_n = (a + a'n)U_c = a(1 - \varepsilon_n)U_c = \lambda_p MC_n, \quad (36) \]

where \( \lambda_p \) is the marginal utility of wealth to parents, and \(-\varepsilon_n\) is the elasticity of \( a \) with respect to \( n \). The marginal cost of children to parents equals net expenditures on children, including bequests and other gifts, and is determined by the circumstances and decisions of parents.

To show in a simple way how economic circumstances determine fertility, assume that bequests cannot be negative (parents cannot bequeath debt), that endowments directly translate into earnings without investments in human capital, and that costs of bearing and rearing children are nil. Then the cost of children to the poorer and middle level families who do not leave bequests is zero, and they have either the biologically determined maximum number of children, or the number that reduces the marginal utility of children to zero. Richer families have fewer children because the cost of children to families who leave bequests is positive and perhaps substantial. The degree of regression to the mean in earnings is unaffected by fertility because earnings are assumed to depend only on endowments, a "family good" that does not depend on the number of children.

This last statement is no longer valid if the assumption that endowments are entirely exogenous is replaced by the perhaps more reasonable assumption that endowments are partly exogenous and partly induced by parental investments in their environment that raise the endowments of all children. Parents with higher fertility would tend to invest more in endowments because rates of return on "family goods" are greater when the number of beneficiaries is greater. Therefore, if poorer families have greater fertility, they would have more incentive to invest in endowments, which would raise the earnings of their children relative to children from richer families.
These results are basically the same when parents can readily leave debt to children, and earnings are augmented by investments in human capital. Again, earnings are not affected by fertility (aside from investments in endowments) because all marginal rates of return on investments in human capital would be equated to the market interest rate. Debts left to children by poorer and middle level families reduce the net cost of children, perhaps to negative levels, which raises their fertility even further (if possible).

If parents cannot leave debt to children but can augment the earnings of children by investing in their human capital, poorer and middle level families must trade off between greater earnings of each child, additional children, and greater parental consumption. The earnings of each child would then tend to be negatively related to the number of siblings (again aside from investments in endowments), which lowers the degree of regression to the mean in earnings when fertility is negatively related to parental earnings. However, the negative relation between fertility and parental earnings is also affected by restrictions on debt. Poorer families would be induced to reduce their fertility, perhaps below the fertility of richer families, because resources would thereby be made available for their own consumption and for investments in each child. Note that given the relation between fertility and parental earnings, a general decline in the level of fertility would reduce the burden to poorer families of investing in children.

The previous section showed that the consumption (and hence total wealth) of wealthy families may not regress down because they can offset the downward regression in the earnings of their children by sufficiently large gifts and bequests. Fortunately, this unrealistic implication does not hold when fertility is endogenous because fertility tends to be positively related to the assets of parents (see the discussions in Barro and Becker [1985] and
Becker and Barro [1985]). Equation (35) implies that the consumption of each child is reduced by an increase in fertility because the degree of altruism per child is negatively related to the number of children \( a'(n) < 0 \). Therefore, when fertility is endogenous, consumption (and perhaps even assets) per child in very wealthy families would regress down relative to that in families with less wealth but with similar earnings of parents.

We do not have much to add to our previous analysis (see Becker and Tomes [1976], Becker [1981], or Tomes [1981]) of parental responses to differences between children. Richer families would invest more human capital in better endowed children and compensate other children with larger gifts and bequests, whereas poorer families primarily investing in human capital face a conflict between the efficiency of investing in better endowed children and the equity of investing in the others.

Some have claimed that observed differences between siblings in say earnings is helpful in determining the degree of intergenerational mobility. For example, Brittain's estimate of mobility [1977, pp. 36-37] is derived entirely from evidence on inequality in earnings between brothers relative to the inequality between families. Jencks, et al. [1972] wrote, "there is still an enormous amount of economic mobility from one generation to the next. Indeed, there is nearly as much economic inequality among brothers raised in the same home as in the general population." [pp. 7-8].

Despite such claims, there is no necessary relation between the inequality among siblings and the degree of intergenerational mobility. Suppose, for example, that all parents fully compensate their less endowed children, and completely eliminate differences in the consumption or earnings of siblings. Would this imply anything about the relation between the consumption or earnings of parents and children? The answer is no, essentially because the
incentive to compensate is determined by characteristics within a single generation of a family, such as the ease of substituting between siblings in the utility function of parents, whereas intergenerational mobility is determined by differences across generations, such as in endowments (for a further discussion, see Tomes [1984]).

5. Marriage

 Practically all discussions of the effects of imperfect assortative mating (Stiglitz [1969], Pryor [1973], Blinder [1976], Atkinson [1983]) on the rise and fall of families neglect the influence of parental expectations about children's marriages on contributions to children. However, the effects of imperfect sorting, like those of imperfect inheritability of endowments, are greatly altered if parents offset the expected sorting pattern by gifts (including debt) to children.

 A simple formulation gets at the main issues. Let the attributes of men and women be sorted in marriage markets by a stochastic equation:

 \[ A_f = k + sA_m + \phi, \]  

(37)

where \( A_m \) and \( A_f \) are the characteristics of male and female participants, \( \phi \) measures the incidence of marital luck, and \( s \), the degree of assortative mating, is assumed to be positive and imperfect (0 < \( s \) < 1). The value of \( s \) is mainly determined by the information available to each participant about the attributes of other participants (see Becker, Landes and Michael [1977], Becker [1981, chapters 4 and 10], and the model in the Appendix). The degree of positive sorting should be weaker (\( s \) should be smaller) for human capital than for assets since information about ability, ambition, potential for growth,
reactions under pressure, and other human capital attributes is much less reliable than information about family background and assets.

To eliminate the incentive for spouses to free ride, assume that the utility of each parent depends on their combined consumption because they are in "love" (parent conflict is discussed, e.g., in Becker [1981, p. 188], and extensively in Weiss and Willis [1984]). Their utility function can be represented by the additive function in equation (25), where \( Z_t \) now refers to the combined consumption by parents, and \( Z_{t+1} \) to the combined consumption of a child and his spouse.

The total return from parental contributions of human capital or assets to children depends not only on the direct return, but also on their effect on the marriages of children; this effect is stronger when the degree of assortative mating is higher. Therefore, sorting in marriage markets would influence gifts and also investments in the human capital of children. Boulier and Rosenzweig [1984] have indirect evidence for a developing country that the education of daughters depends on their marital prospects (also see Behrman and Wolfe [1983]).

If poorer parents can finance the optimal investment in children, marginal rates of return in all families would equal the rate of return on assets transferred to children. Although the common rate might depend on the degree of assortative mating, the relation between the expected consumption by parents and children would be the same in all families with equal fertility if in-laws can match their gifts. This last clause is needed because parents are tempted to reduce their gifts and bequests to married children in the expectation that their in-laws would then give more. Since both sets of parents are tempted, they try to avoid the resulting undergiving by bargaining for matched dowries, bride prices, and other gifts and bequests.
6. **Empirical Studies**

Unfortunately, only a few empirical studies link the earnings or wealth of different generations, partly because of difficulties in gathering such information, and partly because of insufficient interest by social scientists. Tables 1 and 2 present estimates from several studies of the degree of regression to the mean in earnings, income, and wealth, with coefficients of determination (when available), the number of observations, and notes about other variables (if any) included in each regression.

Table 1 has evidence on the earnings or incomes of sons and fathers from three studies based on separate data sets for the United States, and one each for England, Sweden, Switzerland, and Norway. Although the average age of fathers and sons is quite different except in the Geneva study, both Atkinson [1981] and Behrman and Taubman [1983a] present evidence that such differences in age do not greatly affect the estimated degree of regression to the mean.

All the studies have small regression coefficients and coefficients of determination. The point estimates for most of the studies indicate that a 10 percent increase in father's earnings (or income) raises son's earnings by less than 2 percent. The highest point estimate was for York, England where son's hourly earnings appear to be raised by 4.4 percent. However, the confidence intervals are sizable because fathers' earnings "explain" a small fraction of the variation in the earnings of sons (except in the Malmo study). Moreover, response errors and the transitory component in father's earnings (or income) bias these regression coefficients downward. Furthermore, the analysis in section 2 indicates that transitory variations in lifetime earnings and omission of the earnings of grandparents also bias regression coefficients
downward, although the error from omitting grandparents' earnings would be small if parents earnings do not have a large effect (see equation (21)).

Hauser et al. [1975] reduce response errors and the transitory component by using a four-year average of parents' income and a three-year average of son's earnings, while Hauser [forthcoming] uses a four-year average of parents' income and a five-year average of son's earnings during his initial period of labor force participation. Tsai [1983] not only averages incomes of parents over several years, but also uses a retrospective report on their income in 1957. At Hauser's suggestion, we have corrected for response errors in son's earnings using the analysis in Bielby and Hauser [1977]. For the United States, Behrman and Taubman [1983a] exclude sons having less than four years of work experience since their earnings do not well represent their lifetime earnings. Freeman [1981] and de Wolff and van Slijpe [1973] reduce the importance of the transitory component by using average income in father's occupation as an estimate of his lifetime earnings.

Despite these adjustments for response errors and transitory fluctuations, point estimates of the degree of regression to the mean in earnings and incomes are high in all of the studies 14 (except for large incomes in Sweden). Moreover, a study in progress by Elizabeth Peters using data from the National Longitudinal Survey (the same survey used by Freeman) also finds a small coefficient (below .2) when a simple average of four years of son's earnings is regressed on a simple average of four years of father's earnings (oral communication from Elizabeth Peters).

Some indirect evidence of sizable regression toward the mean in lifetime earnings is provided by lifecycle variations in earnings. Since endowments do not change much during the prime adult years, endowments can be called a "fixed effect". Therefore, earnings should be more closely related
over the life cycle than across generations because endowments are imperfectly transmitted from parent to child (endowments are not a "fixed effect" across generations). Stated differently, relative to other members of his cohort, a person is usually more like himself at different ages than are a father and son at the same age.

Although the correlation coefficient between the "permanent" component of male earnings at different ages has been estimated to be about .7 in the United States (see Lillard and Willis [1978, Table 1]), this estimate is probably higher than the true correlation because it is based on a panel of only 7 years (I owe this comment to Robert Willis). If the "permanent" component is a measure of the inheritability of endowments from year to year, then the inheritability of endowments from fathers to sons is surely less, perhaps much less.

The evidence in Table 1 is consistent with this conclusion. If as suggested by this evidence, the true elasticity between fathers' and sons' lifetime earnings is no larger than .4, neither the inheritability of endowments by sons (h) nor the propensity to invest in children's human capital (β) because of capital constraints could be large. For example, if the transitory variance in lifetime earnings were less than one-third of the variance in total lifetime earnings, and if h = β, then both would be less than .28; if β = 0 then h ≤ .6; and β ≤ .4 if h = 0 (see footnote 6).

If capital constraints completely disappeared, would the same families dominate the best-paid and most prestigious occupations (for this fear, see, e.g., the often cited article by Herrnstein [1971])? Since our evidence indicates that h is less than .6 (probably much less), the families in the best occupations would change frequently even in "meritocracies" because endowments
relevant to earnings are not highly inheritable (whatever may be the inheritability of "intelligence").

Another way to see this is by noting that if the elasticity between lifetime earnings were no larger than .4, practically all of the advantages or disadvantages of ancestors would tend to disappear in only three generations: "from shirtsleeves to shirtsleeves in three generations." Since parents in such "open" societies have little effect on the earnings of grandchildren and later descendants, they have less incentive than do parents in closed societies to pay close attention to the well-being of these descendants.

The evidence on the permanent component of lifecycle earnings suggests that persons who are poor at one stage of life are likely also to be poor at other stages because their characteristics are fixed over their adult lifetimes. However, any lifetime "culture of poverty" tends to disappear between generations because characteristics determining earnings are variable between generations. For example, children of parents who earn only half the mean can expect to earn above 80 percent of the mean in their generation, and their own children can expect to earn only slightly below the mean.

And yet family background would still be important. For example, even if the degree of regression to the mean were 80 percent, children of parents whose earnings are twice the mean tend to earn 30 percent more than the children of parents whose earnings are only 50 percent of the mean. A 30 percent premium is large relative to say the 10 to 15 percent premium from union membership (see Lewis [1963]) or the 16 percent premium from two additional years of schooling (Mincer [1974]). Consequently, even in rich countries, children from successful families have a significant economic advantage.

Children of immigrants usually advance rapidly in countries like the United States because of the many opportunities to regress upward. However,
families who are poor partly because of discrimination against their race, caste, or other "permanent" characteristics advance more slowly, if at all. Clearly, blacks in the United States have advanced much more slowly than immigrants, partly because of public and private discrimination against blacks.

Although many have studied changes over time in the average position of blacks relative to whites (see, for example, Becker [1971], and the excellent recent study by Smith [1984]), few have studied the relation between earnings of sons and fathers in black families. The results in Table 1 suggest that older, but not younger, blacks regress more rapidly to the mean than whites, although the results may be spurious because response errors are higher and apparently more complicated for blacks (see Bielby, Hauser and Featherman [1977]). Since opportunities for younger blacks improved during the last twenty years (see the discussions in Featherman and Hauser [1976], and Hout [1984]), the evidence for blacks is consistent with the implication that discrimination lowers the regression coefficient between fathers and sons (see section 2).

Table 2 presents evidence from three studies for the United States and Great Britain on the relation between the assets of parents and children. Menchik [1979] and Harbury and Hitchens [1979] use probates of wealthy estates, while Becker and Tomes use taxes levied on assets during the colonial period. The estimated elasticity between the assets of fathers and sons is about .7 in the United States both for probated assets in recent years and taxed assets in the eighteenth century, and appears to be smaller (.5 to .6) for probated assets in Britain.

Since parents bequeath assets to children partly to buffer the total wealth and consumption by children against regression in their earnings, our analysis implies that assets regress more slowly than earnings unless wealthier
parents have many more children. A comparison of Tables 1 and 2 indicates that assets do appear to regress much more slowly in the United States, and only a bit more slowly in Britain. Our analysis also implies that consumption regresses more slowly than earnings and more rapidly than assets, but we have not found evidence to test this.

Capital constraints on investments in children probably declined significantly during this century because family size declined greatly, incomes rose rapidly, and government subsidies to education and to social security grew rapidly (see the interpretation of social security in Drazen [1978]). Evidence in Goldin and Parsons [1984] is consistent with sizable capital constraints on poorer families in the United States during the latter part of the nineteenth century. Apparently, these families raised the contribution of teenage children to family earnings by withdrawing them from school. A weakening of constraints over time in the United States is also indicated by the decline in inequality in years of schooling, by the decline in residual inequality after adjustment for changes in various family background variables, and by the declining influence of background on educational attainment (Featherman and Hauser [1976]).

If capital constraints did decline significantly over time and if the inheritability of endowments did not change, then earnings of parents and children would have been more closely related in the nineteenth century. Little quantitative evidence is available for that century on the earnings of fathers and sons, although their earnings are not closely related among Mormons in Utah.15
7. **Summary and Conclusions**

This paper develops a model of the transmission of earnings, assets, and consumption from parents to children and later descendants. The model is based on utility maximizing by parents concerned about the welfare of their children. The degree of intergenerational mobility, or the rise and fall of families, is determined by the interaction of utility maximizing behavior with investment and consumption opportunities in different generations, and with different kinds of luck.

In most of the paper, cultural and genetic endowments are assumed to be automatically transmitted from parents to children, with the relation between the endowments of parents and children determined by the degree of "inheritability." The intergenerational mobility of earnings depends on the inheritability of endowments; indeed, if all parents can readily borrow to finance the optimal investments in children, the degree of intergenerational mobility in earnings essentially would equal the inheritability of endowments.

However, poor families often have difficulty financing investments in children because loans to supplement their limited resources are not readily available when human capital is the collateral. Such capital market restrictions lower investments in children from poorer families. Intergenerational mobility in earnings then depends not only on the inheritability of endowments, but also on the willingness of poorer families to self-finance investments in their children.

The degree of intergenerational mobility in earnings is also determined by the number of children in different families. Additional children in a family reduce the amount invested in each one when investments must be financed by the family. Consequently, the negative relation between family size
and the earnings of parents implied by our analysis would also reduce the intergenerational mobility of earnings.

Assets can act as a buffer to offset regression to the mean in the endowments, and hence in the earnings, of children because assets are traded in markets with similar rates of return to well-endowed and less well-endowed persons. In particular, successful families bequeath assets to children to offset the expected downward regression in earnings.

Parents with good access to capital markets can transfer assets or debt to nullify any effect on the consumption by children of regression to the mean in earnings. This effectively separates the relation between the consumption by parents and children from inheritability of endowments and regression to the mean in earnings. However, the consumption by parents and children in poorer families without much access to debt would depend mainly on their earnings and public transfers. Moreover, intergenerational mobility of per capita assets and consumption in rich families would be raised by the positive relation between fertility and assets implied by our analysis.

Parents try to offset imperfect assortative mating in the marriages of children by transfers of assets or debt. How effective they are depends on whether debt can be contracted for children, the degree of altruism between spouses (and toward children), and other factors. The main lesson from our analysis of marriage is that consequences of imperfect assortative mating are more complex than often believed; for example, parents can eliminate any consequences for intergenerational mobility in consumption.

We have examined about a dozen empirical studies relating the earnings, income, and assets of parents and children. Aside from families victimized by discrimination, regression to the mean in earnings in the United States and other rich countries appears to be rapid, and wipes out in three
generations almost all advantages and disadvantages of ancestors. Hence, poverty is not a "culture" that persists for several generations. Such rapid regression to the mean in earnings also implies that inheritability of endowments and capital constraints on investments in children are not large. Presumably, these constraints became less important over time as fertility declined, and as incomes, subsidies to education, and transfer payments to poorer families grew.

Assets of parents and children are more closely related than earnings because assets buffer consumption against regression in earnings. Consumption should regress at a rate between the rates for earnings and assets, but we have not found evidence on the adult consumption of different generations.

Major empires in the past have frequently been replaced by more primitive and sometimes "barbaric" peoples. Prominent examples include replacement of the Roman Empire by the Germans, the Ottoman Empire by Europeans, and the Islamic and Chinese Empires by Mongols. Although our analysis deals only with the rise and fall of families, we are tempted to speculate whether the same framework is applicable to the rise and fall of empires.

From this perspective, the replacement of empires by upstarts is no more surprising than the replacement of leading families by the nouveau riche. Perhaps the incidence of good and bad luck is as important in international relations as in different families. Moreover, characteristics determining the economic performance and military success of empires may be quite imperfectly transmitted to succeeding generations, just as endowments are imperfectly transmitted to children. Our model of the rise and fall of families may stimulate efforts to analyze systematically the grand problems related to the rise and fall of empires and civilizations.
8. Appendix on The Marriage Market

Assume that the single attribute of each participant in the marriage market is observed by other participants with error

\[ A_o = A_a + \phi \]  \hspace{1cm} (A.1)

where \( A_o \) and \( A_a \) are observed and actual attributes, and \( E\phi = 0 \). Although errors of observation can usually be affected by dating and other investments in information, we simply assume that its incidence is normally distributed with zero mean and given variance. Observed attributes tend to be above average if either actual attributes are above average or errors of observation are favorable. If \( A_a \) were normally distributed and independent of \( \phi \), the relation between observed and expected actual attributes is simply

\[ E(A_a | A_o) = \frac{\sigma^2_u}{\sigma_o^2} + \frac{\sigma^2_A}{\sigma_o^2} = k + sA_o \]  \hspace{1cm} (A.2)

where \( u \) is the mean of \( A_a \), \( \sigma^2_\phi \) and \( \sigma^2_a \) are the variances of \( \phi \) and \( A_a \) respectively, \( \sigma^2_o = \sigma^2_a + \sigma^2_\phi \), and \( 0 < s < 1 \) if \( \sigma^2_\phi > 0 \).

An efficient marriage market with complete information about attributes tends to match participants with the same ranking in the distribution of attributes for their sex (see the analysis in Becker [1981, chapter 4]). A reasonable first generalization from complete to incomplete information about attributes is that an efficient market matches participants with the same expected ranking in the distribution of actual attributes. If \( u_m = u_r \),
\[ \sigma^2_{a,m} = \sigma^2_{a,f}, \quad \text{and} \quad \sigma^2_{\phi,m} = \sigma^2_{\phi,f}, \] where \( m \) and \( f \) refer to male and female participants, expected rankings of actual attributes are matched when observed attributes are matched. By equation (A.2),

\[
E(A_{a,m} | A_{a,f} = A'_{a,f}) = k + SE(A_{o,m} | A_{a,f} = A'_{a,f}). \tag{A.3}
\]

Since (A.1) implies that

\[
E(A_{o} | A_{a} = A'_{a}) = A'_{a}, \tag{A.4}
\]

and since the matching of observed attributes means that \( A_{o,m} = A_{o,f} \), then

\[
E(A_{a,m} | A_{a,f} = A'_{a,f}) = k + SE(A_{o,f} | A_{a,f} = A'_{a,f}) = k + sA'_{a,f}. \tag{A.5}
\]

Hence

\[
A_{a,m} = k + sA_{a,f} + \phi', \tag{A.6}
\]

where

\[
\sigma^2_{\phi'} = (1 - s^2)\sigma^2_{a}. \tag{A.7}
\]


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FOOTNOTES

1Among the important contributors to this literature are Atkinson [1983], Behrman and Taubman [1976], Bevan [1979], Blinder [1974], Conlisk [1974], Laitner [1979], Loury [1981], Meade [1976], Menchik [1979], Shorrocks [1979], and Stiglitz [1969].

2However, the debt "bequeathed" to children is smaller than parental expenditures on their human capital when altruistic parents have the utility-maximizing number of children (see Barro and Becker [1985] and Becker and Barro [1985]).

3By differentiating the expression for \( \phi_E \) in equation (10),

\[
\phi_{EE} = \psi_{EE} + \psi_g g_{EE} + \psi g g_{E}^2.
\]

Since \( \psi_g < 0 \) because of diminishing returns from parental expenditures, \( \phi_{EE} < 0 \) unless either \( \psi_{EE} \) or \( g_{EE} \) is sufficiently positive.

4Even parents who accumulate assets over their lifetime may lack assets while investing in children (see the discussion of the lifecycle later in this section).

5A similar equation is derived in Becker and Tomes [1979, equation (25)]; however, the coefficient called \( \beta \) there refers to the propensity to bequeath all capital, including debt, to children, not the propensity to invest in the human capital of children by parents who cannot leave debt.

The approximation in equation (21) would be linear in the logs of the earnings of children, parents, and grandparents if the endowment and earnings-generating equations were assumed to be linear in logs. Then \( \beta + h \) gives the
percentage increase in the earnings of children per one per cent increase in the earnings of fathers, and so on.

Equation (21) implies that

\[ b_{t,t-1} = \beta + h - h(b_{y_{t-2} + t-1} + y_{t-1}) \]

\[ = \beta + h - \frac{h\sigma^2}{\sigma^2_y} - h\beta b_{t-1,t} \cdot \]

If the economy is in long-run equilibrium (see Becker and Tomes [1979]), then \( b_{t,t-1} = b_{t-1,t} \), \( \sigma^2_y = \sigma^2_y \), and the equality in (22) follows. The relation between \( b_{t,t-1} \) and the right hand side of (22) is derived in Becker and Tomes [1979, Appendix E].

Let

\[ I = E + A, \]

where \( I \) is total wealth and \( A \) are assets. If

\[ E_c = d_e + b_e E_p + u_e , \]

and

\[ A_c = d_a + b_a A_p + u_a , \]

where

\[ b_a = b_e + \gamma, \quad \gamma > 0 , \]

then

\[ I_c = d + b_e I_p + \gamma A_p + u. \]
Hence \[
\frac{dI_c}{dI_p} = b_I + \gamma \frac{dA_p}{dI_p} > b_I \quad \text{because} \quad \frac{dA_p}{dI_p} > 0.
\]

Moreover, \( b_I \) would be larger in richer families because \( \frac{dA_p}{dI_p} \) is larger there.

If \( r_{t+1} \) were constant, the second-order approximation to \( u_{t+1} \) gives

\[
\frac{dZ_{t+1}}{dZ_t} = \frac{u''_t}{u'_t} \left( \frac{u'_t}{u_{t+1}} + \frac{V(u_{t+1})^3}{2} \right) - \frac{u''_{t+1}}{u_{t+1}^2} \frac{V(u_{t+1})^4}{2},
\]

where \( V \) is the given variance of \( n_{t+1} \) around \( \hat{Z}_{t+1} \). This is more likely to be less than 1 (regression toward the mean) when \( \{u\}^4 \) and \( u' \) are larger relative to \( \{u\}^3 \) and \( u'' \).

For an extensive analysis of fertility that builds on this utility function, see Barro and Becker [1985] and Becker and Barro [1985].

Becker [1981, chapter 7] does include these expectations in a model based on Becker and Tomes [1979].

We are indebted to Robert Hauser for bringing to our attention several studies of intergenerational mobility from data on Wisconsin high school graduates, and for guiding us through various adjustments for response and measurement errors in these studies.

These estimates may also be biased because information is not available on hours worked and non-pecuniary income from employment. However, the direction of bias depends on how hours and non-pecuniary income are affected by wage rates and assets, and on the relation between the wage rates and assets of parents and children. For example, wages would regress more than earnings if leisure and non-pecuniary income from employment are positively related to wages and assets, and if both wages and assets regress to the mean. Atkinson [1981, Table 1] finds that weekly earnings regress slightly more than hourly earnings, possibly because hourly earnings are more accurately measured (they are based on employers' records).

Note that the point estimates in different studies are also biased, usually downward, by various exclusions, e.g., the Wisconsin data only include persons who graduated high school between 1965-67.

Regression coefficients between the earnings and assets of fathers and sons in nineteenth century Mormon Utah were about .1 and .15, respectively (see Kearl and Pope [this volume]). Although the coefficient for assets is higher than that for earnings, as in the data for the twentieth century in Tables 1 and 2, this coefficient for assets is much lower than those in Table 2. Consequently, the degree of regression to the mean among these Mormon families may not be typical of other families in the United States during the nineteenth century.

We benefitted greatly from notes by Stephen Stigler.
Table 1

Regressions of son's income or earnings on father's income or earnings

In linear, semi-log, and log-linear form

<table>
<thead>
<tr>
<th>Location</th>
<th>Son's year</th>
<th>Father's year</th>
<th>Variables</th>
<th>Coeff.</th>
<th>t</th>
<th>( R^2 )</th>
<th>N</th>
<th>e</th>
<th>Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wisconsin</td>
<td>1965-67</td>
<td>1957-60</td>
<td>E IP none</td>
<td>.15</td>
<td>8.5</td>
<td>.03</td>
<td>2069</td>
<td>.13</td>
<td>Hauser, Sewell, and Lutterman (1975)</td>
</tr>
<tr>
<td></td>
<td>a 1957-60</td>
<td></td>
<td>log E IP none</td>
<td>.0006</td>
<td>10.6</td>
<td>.05</td>
<td>2727</td>
<td>.09</td>
<td>Hauser (forthcoming)</td>
</tr>
<tr>
<td></td>
<td>1974</td>
<td>1957-60</td>
<td>log E log IP none</td>
<td>.28</td>
<td>15.7</td>
<td>.09</td>
<td>2493</td>
<td>.28</td>
<td>Tsai (1983)</td>
</tr>
<tr>
<td>United States</td>
<td>when son was 14</td>
<td></td>
<td>log H log I3 e</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Freeman (1981)</td>
</tr>
<tr>
<td>Young White</td>
<td>1969</td>
<td></td>
<td></td>
<td>.16</td>
<td>3.2</td>
<td>.06</td>
<td>1607</td>
<td>.16</td>
<td></td>
</tr>
<tr>
<td>Older White</td>
<td>1966</td>
<td></td>
<td></td>
<td>.22</td>
<td>7.3</td>
<td>.03</td>
<td>2131</td>
<td>.22</td>
<td></td>
</tr>
<tr>
<td>Young Black</td>
<td>1969</td>
<td></td>
<td></td>
<td>.17</td>
<td>1.9</td>
<td>.02</td>
<td>634</td>
<td>.17</td>
<td></td>
</tr>
<tr>
<td>Older Black</td>
<td>1966</td>
<td></td>
<td></td>
<td>.02</td>
<td>0.4</td>
<td>.01</td>
<td>947</td>
<td>.02</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>log W log H none</td>
<td>.36</td>
<td>3.3</td>
<td>.03</td>
<td>307</td>
<td>.36</td>
<td></td>
</tr>
<tr>
<td>Malmo Sweden</td>
<td>1963</td>
<td>1930</td>
<td>log I ICD none</td>
<td>.08</td>
<td>1.8</td>
<td>.19</td>
<td>545</td>
<td>.17</td>
<td>de Wolff and van Slijpe (1973)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.12</td>
<td>2.4</td>
<td>.13</td>
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<td>10.9</td>
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<tr>
<td>Sarpsborg</td>
<td>1960</td>
<td>1960</td>
<td>log I log I none</td>
<td>.14</td>
<td>1.2</td>
<td>.01</td>
<td>115</td>
<td>.14</td>
<td>Soltow (1965)</td>
</tr>
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<td>Norway</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**Abbreviations:**
- \( e \): Elasticity of son's income or earnings with respect to father's income or earnings
- \( t \): Earnings
- \( H \): Hourly earnings
- \( I \): Income
- \( I3 \): Income in three-digit occupation
- \( ICD \): Income class dummy
- \( IHH \): Household income
- \( IHHI \): Parents' income
- \( W \): Weekly earnings

- \( a \) first five years in the labor force
- \( b \) and letter (Oct. 2, 1984) from Robert M. Hauser
- \( c \) adjusted for response variability
- \( d \) adjusted for work experience. Sons with work experience of 4 years or less were excluded. The regression was weighted so that each father had equal weight.
- \( e \) work experience, 3 dummies for region of residence at age 14, 5 dummies for type of place of residence at age 14, and a dummy for living in one parent/female home at age 14.
- \( f \) the elasticities are values between pairs of income classes.
Table 2
Regressions of son’s wealth on father’s wealth in log-linear form

<table>
<thead>
<tr>
<th>Location</th>
<th>son’s year</th>
<th>father’s year</th>
<th>Other variables</th>
<th>Coeff.</th>
<th>t</th>
<th>R²</th>
<th>N</th>
<th>Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>up to 1976</td>
<td>1930-46</td>
<td>a</td>
<td>.69</td>
<td>7.5</td>
<td>.29</td>
<td>173</td>
<td>Menchik (1979)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>none</td>
<td>.76</td>
<td>8.3</td>
<td>.25</td>
<td>199</td>
<td></td>
</tr>
<tr>
<td>Hingham, U.S.</td>
<td>1779</td>
<td>1749</td>
<td>b</td>
<td>.68</td>
<td>8.5</td>
<td>.34</td>
<td>202</td>
<td>Becker and Tomes</td>
</tr>
<tr>
<td>Great Britain</td>
<td>1934</td>
<td>1902</td>
<td>none</td>
<td>.48</td>
<td>3.7</td>
<td></td>
<td></td>
<td>Harbury and Hitchens (1979)</td>
</tr>
<tr>
<td></td>
<td>1956-57</td>
<td>1924-26</td>
<td></td>
<td>.48</td>
<td>5.3</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>1956-57</td>
<td>1916</td>
<td>none</td>
<td>.48</td>
<td>5.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1965</td>
<td>1928</td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>1973</td>
<td>1936</td>
<td>none</td>
<td>.59</td>
<td>8.4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\textsuperscript{a} number of years between death of parents and child, number of child’s siblings + 1, stepchild dummy

\textsuperscript{b} son’s age, father’s age, 1680 ancestor dummy. The data were made available by Daniel Smith of the University of Illinois at Chicago. The regression coefficient on the ancestor dummy was -.06 (t = -.3).
Figure 1

Rates of Return on Parental Expenditures on Children
Figure 2

Parental Expenditures on Children, with Capital Constraints
Figure 3

Relation Between Consumption by Parents and Children, with Capital Constraints