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An Indirect Test of Children's Influence on Efficiencies in Parental Consumer Behavior

A statistical test is applied to explore the possibility that children can affect the efficiency with which parents consume. Parents may receive some economic benefits from children in the form of reverse intergenerational transfers that occur because of a positive influence children have on family behavior. Results show that not only do children have an influence on parental consumption, but also that the influence is beneficial. In fact, not accounting for such a benefit could cause an underestimate in such measures as the rate of return to education or the benefits from such governmental programs as Head Start.

The parent-child relationship has generated a considerable amount of research in a variety of disciplines. Interestingly, despite differences in jargon, methodology, and focus, the sociological, psychological, educational, and economic literatures all proceed from the virtually sacrosanct assumption that it is parents who act as influencers and children as the influenced. Within the last decade or so, serious questioning of the validity of this assumption has begun. The most extensive body of results that refutes the parent/child dichotomy of agent/object can be found in the applied behavioral sciences. Psychologists such as Bell (1968, 1971), Harper (1971, 1975), and Yarrow (1971) have shown the literature to be open to reinterpretation and have demonstrated experimentally that, even at the seemingly helpless infant level, the child is capable of modifying the behavior of parents.

If a child can influence the parent-child interaction at as early a

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This research was supported partially by a grant from the Spencer Foundation. We wish to thank Thomas Kniesner and Robert Michael, as well as the Editor and two anonymous referees for especially valuable comments. In addition Patrice Karr, Nancy Kawakita, and Robert Biermann provided excellent computational assistance. Any remaining errors are the authors' responsibility.

The Journal of Consumer Affairs, Vol. 23, No. 1, 1989
0022-0078/89/0001-091 $1.50/0

developmental stage as Bell shows, then it would seem even more plausible that a child's progressive exposure to formal schooling can affect parental behavior considerably as the child grows up. In fact, it is well known that children can influence household consumption (e.g., Prais and Houthakker 1971; Lazear and Michael 1980; Becker 1981), but as yet no one seems to have shown this influence to be positive, leading to greater household efficiency. This paper illustrates a positive benefit of children that enhances the efficiency with which parents consume.

It is argued that parents receive economic benefits from children in the form of reverse intergenerational transfers. These occur because of a positive influence children have on family behavior. The hypothesis is that children, possibly through what they learn in school, cause their parents to become more efficient consumers. The research is important because it tests for a benefit children have on consumer behavior that is currently ignored in the literature. Further, not accounting for such benefits could cause an underestimate in measures such as the rate of return to education or the benefits of such government programs as Head Start.

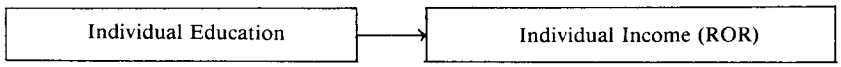
The hypothesis is motivated by Whyte (1957, p. 433), who suggests that schools to which parents send their children "can also help educate parents." Yet more than 30 years later, no systematic investigation of Whyte's original assertion exists, despite the evidence just cited in the developmental psychology literature, which demonstrates experimentally that children are capable of modifying parental behavior.

The next section develops the reverse intergenerational transfer hypothesis by outlining current theory regarding the acquisition of human capital so that the reverse intergenerational transfer (RIT) hypothesis can be introduced as a modification. In the following section an empirical methodology is presented. Results are presented and discussed in the next two sections, followed by the conclusion.

DEVELOPMENT OF THE RIT HYPOTHESIS

Human capital theory takes as its basic proposition that "people enhance their capabilities as producers and as consumers by investing in themselves" (Schultz 1962, p. 1). Education is considered a prime example, although investments in health, information, and on-the-job training are all considered human capital as well. The rates of

FIGURE 1
Educational Rate of Return



return to these investments (ROR) are measured by the percent increase in income resulting from an incremental amount of investment. For schooling this is the percent increase in earnings attributable to an additional year of schooling (see Figure 1).

Michael (1972, 1973), concentrating on education, added another dimension to the human capital model by showing that an increase in market earnings is but one aspect of the returns to the investment and that nonmarket benefits accrue as well. Put simply, he claims that higher levels of education affect the efficiency of an individual's everyday consumption, yielding benefits through time spent in activities including those outside the labor market (see Figure 2).

In addition to the personal effect of an individual's education, the human capital literature deals with intergenerational transfers, that is, how parental characteristics impact upon children. Leibowitz (1974a, 1974b) has shown that "characteristics of the father and mother are systematically related to the investments in time and goods that they make in their children" (1974b, p. 433). Thus, a vari-

FIGURE 2
Education and Consumption

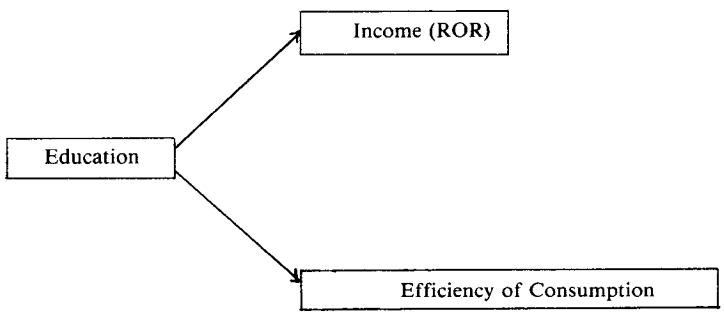
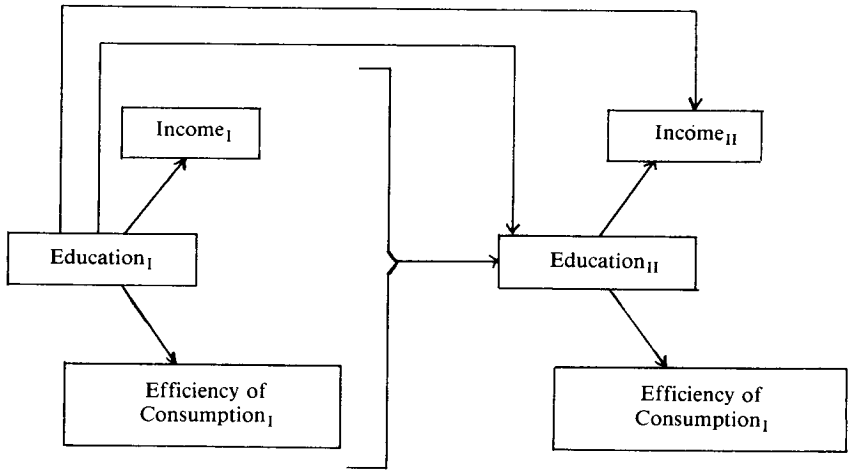


FIGURE 3
Education and Intergenerational Transfer



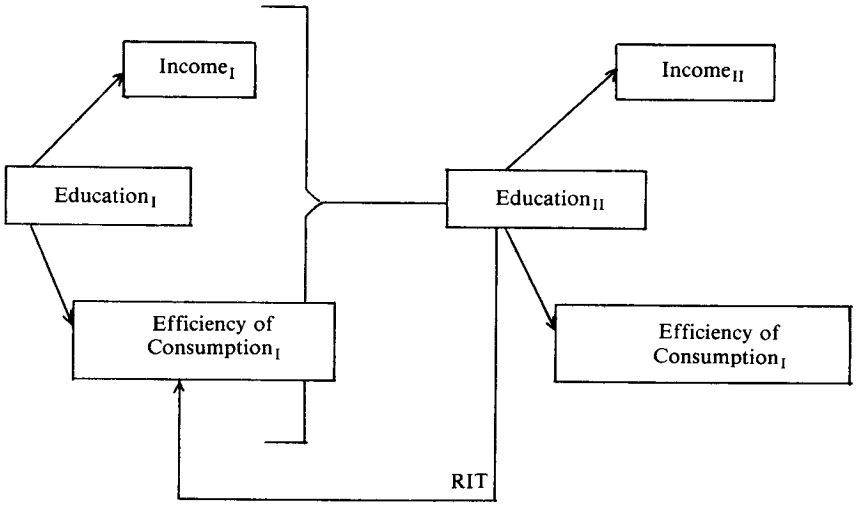
where I = parent and II = child.

able such as the parent's education affects not only the parent's own income, but also the schooling and income level that their child attains. If elements of the intergenerational transfer scenario are incorporated into the existing schematic diagram, one arrives at the following model, with all the new arrows being part of the "Leibowitz Effect" representing intergenerational transfer (see Figure 3).[1]

This framework implies that economics of education models, including those of intergenerational transfers, have been strictly unidirectional; any transfer of human capital has always been from parent to child. However, it is equally feasible to posit that reverse intergenerational transfers may also occur so that the parent derives positive benefits from the child's educational development. As children grow up they learn how to consume. Part of this is taught in school, and part is acquired from other sources. Growing up involves

[1]A more detailed visualization of the intergenerational transfer model can be found in Leibowitz (1974b, p. 434) where she discusses how parental I.Q. and heredity fit into the total picture, but for present purposes inclusion of these factors would needlessly complicate matters.

FIGURE 4
Education and Reverse Intergenerational Transfers



the development of human capital in several forms—physical, intellectual, and emotional are three of the most obvious. Development of these human capital stocks enables children to assume greater roles in a variety of household consumption/production activities, two of which are directly relevant to the RIT hypothesis.

First, children assume increased responsibility for personal care and other household-production activities as they get older. This increasingly releases parental time that otherwise would have to be devoted to these tasks. More parental time implies more time searching for and consuming the desired commodities, which leads to greater consumptive efficiency as children age. Second, of even greater significance, children learn skills in school that also make them better consumers. Quantitative, spatial, verbal, and science skills enable them to evaluate alternative products better so they can make informed judgments about product price and quality. These skills not only enhance own consumption efficiency, but also imply increasing capacity to influence parental consumption efficiency through a variety of verbal and nonverbal communication processes. Both these effects constitute reverse intergenerational transfers. These reverse intergenerational transfers (RIT) can be seen in Figure 4.

EMPIRICAL METHODOLOGY

Estimating rates of return to education, as well as confirming the existence of intergenerational transfers, has been achieved directly via regression analysis. For a good survey see Haveman and Wolfe (1984). On the other hand, measurement of the impact of schooling on consumption efficiency is more difficult because there are no direct measures for consumption efficiency. Whereas there are data on commodity purchases, no information exists on the efficiency with which the more educated consume.

In general, both time and price constitute the full cost of any commodity purchased. Holding income constant, more efficient consumers pay lower time and money prices for each commodity so that they may consume more commodities, as if they had more income. Because no data exist on either the time or money paid by consumers of various education levels, no direct tests can be performed on the impact of education on consumer efficiency. For this reason Michael (1972, 1973) developed an indirect test.

For each commodity, education elasticity is defined as the percent increase in expenditures relative to the percent increase in education. As indicated, if education acts as an efficiency parameter, then having more education is comparable to having more income. Increasing education should then change consumption patterns in a fashion similar to increasing income.

Because income elasticity measures changes in consumption patterns resulting from changes in income and because education elasticity measures changes in consumption patterns resulting from changes in education, if the Michael hypothesis is valid, then these two elasticities should be correlated positively across commodities. It is precisely in this fashion—calculating the income and education elasticities for each commodity and correlating them—that Michael tests his hypothesis and finds that this indeed is the case.

Whereas Michael demonstrated the relation between education of head of household and efficiency of consumption, his methodology can be adapted to test the hypothesis that children, possibly through their education, act to increase the parents' efficiency of consumption. Define *child's human capital elasticity* as the percent change in parent's expenditure on a given commodity, given a percent change in human capital of the child. If in fact child's human capital affects parental consumption by making it more efficient, then these newly

computed child human capital elasticities should be correlated positively with parental income elasticities. This is the hypothesis to test. A description of our methodology follows.

Each of these elasticities can be obtained by means of multiple regression analyses of the following form relating family income (I_p), the family head's education (E_p), and the child's human capital (E_c) to expenditures on each commodity (X_i). Race (R), geographic region (L), city size (C), parental occupation (O), dwelling characteristics (D), parental age (A), and sex composition (NBOY) are included to standardize for interfamily demographic differences. Thus:

$$X_{it} = c + \alpha_{i1} I_{pt} + \alpha_{i2} E_{pt} + \alpha_{i3} E_{ct} + \beta_{i1} R_t + \beta_{i2} L_t + \beta_{i3} C_t + \beta_{i4} O_t + \beta_{i5} D_t + \beta_{i6} A_t + \gamma_i NBOY_t + \epsilon_{it} \quad (1)$$

where $i = 1, \ldots N$, N = number of commodities, and t = a family index such that $t = 1, \ldots T$, where T = the number of families in the sample. A linear specification is used to simplify comparisons to Michael's methodology, as well as to compute point elasticities more easily.

The β coefficients represent the effects of family demographic characteristics. The α coefficients can be interpreted as the impact of parental income, and both parental as well as child's human capital on family expenditure patterns. A positive coefficient implies that dollar expenditures on commodity i increase with increases in parental income or education, while a negative coefficient implies a decrease in dollar expenditures. These regressions are computed N times, once for each of the N commodities in the sample. A simultaneous equations system is not used because by omitting savings the adding up constraint is not binding. The coefficients, but not the standard errors, are identical to seemingly unrelated least-squares (SUR). Further, because number of children and the presence of a spouse increase the value of parental time, one might expect the number of children to affect parental consumption patterns independently. To avoid compounding child human capital effects from effects of number of children, the sample is stratified into groups differing both by number of children and number of adult family members. Omitting the impact of expenditure changes caused by family size enables one to concentrate solely on child human capital effects. In addition, a children's sex composition variable (NBOY) is added to test whether or not male children affect consumption differently than

females. The resulting elasticity of expenditures with respect to sex composition is denoted as (ϵ_{NBOY}). Thus for each family size group (from one to three children and for families headed by one adult or two), N regression equations are estimated, one for each commodity. Elasticities (at the mean) are derived from the above equations in order to measure the relationships between commodity expenditures in percent rather than dollars.

In principle the coefficients of regressions run in log-log format yield direct estimates of elasticity. This technique was not used here because several commodity categories (such as luxury items and consumer durables) had a significant number of consumers who made no purchases. Because of the impossibility of taking the logarithm of zero (expenditures), these families would have had to be removed from the data. For this reason the linear format of equation (1) with elasticities calculated at the mean is used. Nevertheless, log-log elasticities were computed also and yielded results almost comparable to results based on elasticities at the mean. In addition, experimentation with Tobit regressions yielded minute changes in parametic estimates. Thus, OLS results are presented.[2]

The Michael hypothesis implies that because more education is comparable to more income, family income elasticity (ϵ_{Ip}) is positively correlated with head's education elasticity (ϵ_{Ep}). The RIT hypothesis suggests that because children's human capital endowments enhance parental consumption, parents act as if they had more income; hence family income elasticity (ϵ_{Ip}) is correlated positively with child's human capital endowment elasticity (ϵ_{Ec}). In addition, the correlation of head's education elasticity (ϵ_{Ep}) and the child's human capital endowment elasticity should also be positive.

In each case it should be noted that income refers to that of *both* parents. Thus, any bias introduced, for example, by using only husband's income is eliminated. Further, to minimize the impact of the effects of older children's earnings, the sample is restricted to families with children less than or equal to 16 years of age.

[2]Heteroscedasticity often plagues consumer expenditure function estimates (e.g., Prais and Houthakker 1971, pp. 55-62). Heteroscedasticity raises coefficient standard errors, often yielding mistakenly insignificant coefficients. To overcome this, researchers often adopt weighted least squares and other estimation techniques. In the present case OLS yielded significant coefficients for the pertinent variables. Thus, no adjustments were made for possible heteroscedasticity.

RESULTS

No data set completely satisfies the requirements. The Bureau of Labor Statistics Cross-sectional Consumer Expenditure Survey, which Michael used,[3] is the best and has now been updated twice, first for 1972-1973 and second for 1980-1984, with the latter being a rotating panel in which one-fifth of the sample is dropped and a new group added every quarter.[4] The Consumer Expenditure Survey is a survey of family consumer expenditures by commodity originally designed primarily to revise the weights associated with the consumer price index. For pragmatic reasons the 1972-1973 survey is used, which consists of a sample of about 20,000 consumer units surveyed in either 1972 or 1973 and contains a detailed listing of their expenditures for over 2,250 commodities. To avoid computational extravagance and to avoid large numbers of commodities with zero expenditures, the commodities are aggregated into 26 commodity classes.[5] In addition, the survey includes income and asset sources as well as family characteristics such as size, number, age, and sex of children. The strength of the data lies not only in its exhaustive list of commodities, but also in the large number of family units surveyed, so the possibility of drawing a conclusion based on too small a sample is minimized.

The weakness of the data lies in the relatively limited demographic information used as background for each family. While race, geographic region, city size, and dwelling characteristics are given, precise data on children's schooling is not, so that the child's age is used to measure child's level of human capital. Therefore, the literal

[3]Chapters 4 and 5 of Michael's book go into great detail describing the 1960 BLS survey (pp. 33-71). Furthermore, a sample of the new survey questionnaire, released as of May 15, 1977, is available through the U.S. Department of Labor, Bureau of Labor Statistics; explanations can be found in Report 448-2, 448-3, and 455-3.

[4]See Carlson (1974) and Gieseman and Rogers (1966) for an excellent description and historical perspective of the survey.

[5]The commodities are (1) food, (2) alcoholic beverages, (3) tobacco products, (4) shelter, (5) fuel and utilities, (6) household operations, (7) house furnishings and equipment, (8) dry cleaning and laundry, (9) clothing: men's, 16 years and over, (10) clothing: boy's, 2-15 years old, (11) clothing: women's, 16 years and over, (12) clothing: girl's, 2-15 years old, (13) clothing: infant's, under 2 years old, (14) clothing material, (15) transportation, (16) health care, (17) personal care, (18) recreation: owned vacation home, (19) recreation: vacation trips, (20) recreation: boats, aircraft, and wheel goods, (21) recreation: other, (22) reading, (23) education, (24) miscellaneous current consumption, (25) personal insurance and pensions, and (26) gifts and contributions.

hypothesis to be tested is that older children increase consumption efficiency of parents. Whereas some may argue that age differences are not related to human capital differences, variants of age (e.g., age, age-squared, or age minus education minus six) are the sole measures of human capital in practically all earnings-function studies (e.g., Mincer 1974). For children, no on-the-job training exists so age differences in children's human capital are hypothesized to be caused mostly by schooling differences, but a more precise test of this hypothesis is discussed later with the empirical results.

An alternative hypothesis is that children's age proxies income. If richer parents have children earlier, then children's ages represent income, and the coefficients (α_3) are really alternative income elasticity measures. This hypothesis is comparable to criticizing Michael's original work on the grounds that his educational elasticity may be proxying an income elasticity, thereby causing a spurious correlation. This is not the case here because the relationship (as inferred by Hotz and Miller 1988) between age when the first child is born and income is weaker than the relationship between schooling level and parental income. If there is a spurious correlation, it is weaker in our case than in Michael's.

Another possibility is that young children are intensive in goods with low income elasticities, such as food and health care, while older children are intensive in goods with higher income elasticities, such as automobiles, travel, and education. To test for this, note that the Michael methodology is potentially plagued by the same problem, only with respect to education: the more educated might have taste inclinations toward luxury goods. However, if the hypothesis that young children are intensive in low income elasticity goods is true, then the observation both that the educated consume more income-elastic commodities and that older children consume more income-elastic commodities would be unexpected. The reason, of course, is that those with more education have younger children, holding age of head constant, so they should consume less income-elastic goods, not more income-elastic goods, as observed. Nevertheless, an alternative test is to look at the magnitude of the correlation between family income (ϵ_{Ip}) and child age (ϵ_{Ec}) elasticities, stratified by parental education. A larger correlation for less educated parents is consistent with the RIT hypothesis.

Regressions were calculated for family expenditures on a commodity by commodity basis for single- and two-parent families with

TABLE 1
Correlation of Elasticities[a]
(Households with Husband and Wife Present)

	Column 1 Head's Education (ϵ_{Ep})		Column 2 Child's Human Capital (ϵ_{Ec})		Column 3 Child Gender (ϵ_{NBOY})	
	(1)[b]	(2)[c]	(1)[b]	(2)[c]	(1)[b]	(2)[c]
One-Child Families						
Family Income (ϵ_{Ip})	.65*	.74*	.40**	.46**	-.04	.13
Head's Education (ϵ_{Ep})			.26***	.48**	-.04	-.15
Child's Human Capital (ϵ_{Ep})					.04	.03
Two-Child Families						
Family Income (ϵ_{Ip})	.50*	.47*	.49**	.31	-.27	-.44**
Head's Education (ϵ_{Ep})			.45**	.44**	-.40	-.68*
Child's Human Capital (ϵ_{Ep})					-.10	-.21
Three-Child Families						
Family Income (ϵ_{Ip})	.47**	.48**	.10	.09	.09	.37***
Head's Education (ϵ_{Ep})			.41**	.49**	.11	-.05
Child's Human Capital (ϵ_{Ep})					-.17	-.12

[a]Elasticities computed from regressions with family income.

[b]Correlation of indicated elasticities based on 26 commodities.

[c]Correlation of indicated elasticities omitting commodities 10, 12, and 13.

*Statistically significant at $\alpha \leq .01$.
**Statistically significant at $.01 \leq \alpha \leq .05$.
***Statistically significant at $.05 \leq \alpha \leq .10$.

one, two, and three children. As indicated, this yields one equation for each commodity of the linear expenditure system implied by equation (1). An example of these regressions for only one commodity is given in Appendix A. By and large, F-tests looking at all categories of the dummy variable simultaneously indicate statistical significance. The coefficients of child's age, head's education, and family income are used to compute the respective elasticities for each of these variables. These elasticities are given in Appendix B, and most are statistically significant.

In all there are 26 sets of elasticities for each family size grouping—one for each commodity.[6] Each elasticity set contains a family in-

[6]Three of the commodities (clothing: boy's, 2-15 years old; clothing: girl's, 2-15 years old; and clothing: infants) are clearly age specific and dependent on the number of male and female children. Inclusion of elasticities for these commodities, consequently, could bias correlations to be presented in this paper's tables. For this reason all the correlations testing RIT and the Michael hypotheses were performed both including and excluding these commodities. As expected, the results turn out slightly stronger when these commodities are excluded.

come elasticity, a head's education elasticity, and a child's age elasticity. Correlation coefficients between income and head's education elasticities, between income and child's age elasticities, and between head's education and child's age elasticities were computed for each family size.[7] Augmenting these is a set of correlations between the children's sex composition elasticity (ϵ_{NBOY}) and the other elasticities (ϵ_{Ip}, ϵ_{Ep}, ϵ_{Ec}).

Table 1 contains the results of these computations. Each correlation coefficient has the predicted sign. The first of these (column 1 between ϵ_{Ep} and ϵ_{Ip}) should be positive according to the Michael hypothesis, and the second two (column 2) should be positive according to the RIT hypothesis. Indeed, income elasticities are correlated positively with head's education elasticities (.65, .50, and .47 or .74, .47, and .48), and children's human capital elasticities are correlated positively with both family income elasticities (.40, .49, and .10 or .46, .31, and .09) and head's educational elasticities (.26, .45, and .41 or .48, .44, and .49).

In terms of relative magnitudes, the Michael-generated correlation is slightly more positive than the RIT-generated correlations: .65 versus .40, .50 versus .49, and .47 versus .10 (not significant). One interpretation of this finding may be higher returns (in terms of consumption efficiency) to own versus children's human capital, a result that seems entirely plausible.

SUBSIDIARY EMPIRICAL TESTS

The set of correlations presented in Table 1 (column 3) serves as a check for the assertion that the source of child human capital lies within the school system rather than merely in the aging process. Suppose child's age is not a proxy for human capital but instead indexes child maturity. Then, conclusions with regard to consumption efficiency achieved vicariously through children's educational benefits may be erroneous. Rather than measuring the effect of "children's schooling," the effects of children's age or maturity

[7]In families with two or more children, the mean age of the children is used for the child's age variable. An alternative, and perhaps better procedure, would have been to use the age of the oldest child. The use of mean child's age tacitly restricts the age elasticities of both children to be equal.

TABLE 2
Correlation of Income and Child's Human Capital Elasticities Stratified by Parental Education

Head's Education	Correlation between Family Income and Child-Human Capital Elasticities	
	One-Child	Two-Children
12 years or less	.18	.30
12 years or more	.16	.19

should be measured. However, if this were the case, assuming that girls mature more quickly than boys,[8] then a negative correlation should be observed between ϵ_{NBOY} and the other elasticities.

The results do not bear this out. The correlations given in column 3 are essentially zero. Changes in commodity expenditures associated with child gender are uncorrelated with expenditure changes motivated by family income, head's education, or child's age. Because of the inability to confirm that a child's age rather than educational level reflects maturity, the conclusion is that child-induced efficiencies in consumption are more likely to result from the educational process than from children aging, although there is no guarantee that maturity differences are great enough to cause the differences in hypothesized elasticities. For this reason another test was conducted.

The sample was divided into two groups: one with head's education 12 years or less and the other with parental education 12 years or more. Within each of these groups, family income and child age elasticities are correlated (Table 2). In both one- and two-child families, the correlations are greater the lower the level of head's education. Although not conclusive, the result is consistent with greater reverse intergenerational transfers for less educated parents. Children's education has a greater impact on parental consumption efficiency the less educated the parent. Thus, less educated parents have more to learn and, in fact, benefit more from children's human capital.

Finally, approximately 20 percent of the families were female-headed with no husband currently present. An additional test of the RIT hypothesis would be to ascertain whether or not the same results

[8]See Maccoby and Jacklin (1974) for literature review on sex differences in psychological development.

TABLE 3
Correlation of Elasticities
Female-Headed Households (No Husband Present)

	Head's Education	Child's Human Capital
A. One-Child Families		
Family Income	.21***	.04
Head's Education		.09
B. Two-Child Families		
Family Income	.22***	.35**
Head's Education		.23***
C. Three-Child Families		
Family Income	.25***	.51*
Head's Education		.15
D. Four-Child Families		
Family Income	.13	.28***
Head's Education		.60*

*Statistically significant at $\alpha \leq .01$.
**Statistically significant at $.01 \leq \alpha \leq .05$.
***Statistically significant at $.05 \leq \alpha \leq .10$.

hold for these families as well. Table 3 contains these results, and, again, all correlations are positive, although slightly lower in magnitude. At minimum this confirms the previous results of the effects of children. However, in addition, if parental-child interaction is smaller in one-parent homes, then smaller correlations would not be unreasonable and probably even predictable.

If greater child human capital implies greater parental consumption efficiencies, one might argue that consumption efficiencies increase with number of children. Unfortunately, this is not necessarily the case, as two opposing forces are at work. On the one hand, as noted, more children imply greater possibilities for each child to transfer skills to parents. On the other hand, greater amounts of parental time must be devoted to child care and less to consumption. Obviously, this leads to consumption inefficiencies, at least for purchased commodities. For this reason, no discernible patterns appear obvious when comparing the elasticity correlations across family size groups. For female-headed households they appear to rise until four-child families. For traditional husband-wife households, the pattern is less clear cut.

CONCLUSIONS AND IMPLICATIONS

This paper has introduced a potentially important concept—reverse intergenerational transfers—and presented an empirically viable method of determining whether children exert any positive influence on behavior of parents by extending the Engel-curve literature through devising additional relevant Engel-type elasticities. Despite the numerous qualifications, the adopted methodology has proven important by illustrating an indirect test of the plausibility of the reverse intergenerational transfer hypothesis. That children as they acquire more human capital induce efficiencies in parental consumption behavior is hypothesized.

Two mechanisms for this reverse intergenerational transfer are possible. One is a change in the intrafamily time allocation, in which children take on greater home responsibilities as they age and become more educated, and the other occurs via direct transfer of verbal, quantitative, and spatial skills learned in school. Evidence is presented that these reverse intergenerational transfers result from the educational process, namely schools. The mere possibility of reverse intergenerational transfers occurring as a result of the educational system is important because it defines a benefit to schooling heretofore ignored in the literature. In fact, not accounting for such benefits could cause underestimates in measured rates of return to education because efficiencies in consumption through the reverse intergenerational transfer mechanism are omitted from traditional studies. However, even if reverse intergenerational transfer comes about through mechanisms other than schooling, the concept is still important in understanding consumer behavior. Whereas the results are not meant to prove unambiguously the existence of reverse intergenerational transfers, they are consistent with such notions. More direct tests are needed, and this study serves to justify such a direction for future research.

APPENDIX A

Estimation of Equation (1) by Family Size for Selected Commodities

Commodity 6: Household Operations

		One-Child Family		Two-Child Family		Three-Child Family	
		coefficient	t-value	coefficient	t-value	coefficient	t-value
INTERCEPT		-3,395.2	-0.33	9,565.3	0.78	-17,752.8	-1.05
REGION	1	2,206.3	0.71	460.3	0.13	-639.8	-0.14
	2	-1,988.3	-0.66	-4,567.8	-1.41	-2,637.2	-0.62
	3	5,375.9	1.85	8,062.5	2.45	8,645.2	2.01
	4	—	—	—	—	—	—
SIZE	1	2,433.9	0.63	9,594.4	2.14	3,907.1	0.69
	2	2,927.3	0.89	4,513.4	1.27	8,540.1	1.85
	3	8,145.3	1.58	1,552.8	0.25	19,113.7	2.15
	4	9,095.9	1.95	3,246.4	0.65	-2,185.6	-0.34
	5	-953.0	-0.22	-4,294.9	-0.84	6,144.4	0.91
	6	1,502.1	0.35	1,880.4	0.42	5,211.1	0.93
	7	2,717.5	0.70	1,422.7	0.34	12,399.9	2.30
	8	—	—	—	—	—	—
AGEFM1		225.6	1.76	375.6	2.06	298.7	1.19
RACE	1	-679.2	-0.16	-16,344.2	-3.32	3,169.0	0.48
	2	—	—	—	—	—	—
EDUCFM1		951.1	2.54	1,609.8	3.81	1,797.5	3.35
OCFM1	1	4,213.3	0.81	-14,017.8	-2.17	11,605.7	1.48
	2	-8,108.6	-1.81	-17,423.2	-3.01	2,379.6	0.35
	3	-4,865.0	-1.06	-6,829.6	-1.20	-1,347.1	-0.19
	4	-1,361.5	-0.25	-16,804.7	-2.36	7,979.9	0.90
	5	-4,848.8	-0.76	-9,179.8	-1.22	-2,007.8	-0.22
	6	-7,671.9	-1.90	-19,102.8	-3.53	-8,336.2	-1.33
	7	-8,984.8	-2.10	-12,862.0	-2.31	-5,365.9	-0.80
	8	-3,072.4	-0.55	-11,750.9	-1.63	-7,274.0	0.87
	9	-6,921.4	-1.30	-18,361.1	-2.71	3,165.0	0.40
	10	2,340.2	0.17	-22,563.0	-0.81	11,759.2	0.41
	11	6,562.1	1.15	559.0	0.05	-21,033.4	-0.90
	12	—	—	—	—	—	—
HOUSE	1	-6,048.9	-1.00	6,056.0	0.87	-3,187.9	-0.30
	2	-6,778.7	-1.02	1,568.6	0.20	-3,994.4	-0.32
	3	-5,679.5	-0.78	8,963.2	0.91	-382.0	-0.03
	4	5,506.5	0.72	9,897.5	0.98	17,310.0	0.98
	5	—	—	—	—	—	—
TOTINC		.02	12.36	.02	11.28	.02	7.20
OCFM2	1	16,657.3	1.82	7,256.9	0.82	-4.482.2	-0.30
	2	18,644.9	4.54	3,043.0	0.72	5,994.1	1.07
	3	-5,913.0	-0.90	25,829.7	3.03	3,741.9	0.26
	4	5,000.7	1.82	8,035.5	2.57	-11,031.8	-2.36
	5	-2,476.0	-0.45	17,765.2	3.05	2,760.2	0.35
	6	10,116.3	0.87	-6,937.8	-0.57	-32,010.7	-1.61
	7	1,102.6	0.26	7,395.4	1.54	-702.6	-0.12
	8	4,716.4	0.83	3,475.8	0.46	-4,742.1	-0.53
	9	5,415.1	1.40	13,602.9	2.97	-215.6	-0.04
	12	—	—	—	—	—	—

APPENDIX A (*continued*)

	One-Child Family		Two-Child Family		Three-Child Family	
	coefficient	t-value	coefficient	t-value	coefficient	t-value
AGECH	-718.0	-3.76	-2,109.3	-7.33	-1,117.7	-2.51
NBOY	-699.6	0.35	-2,163.2	-1.36	-422.5	-0.26
DF	1,246		1,213		771	
R^2	.24		.28		.23	

Key: REGION [1 = NE, 2 = NC, 3 = South, and 4 = West (omitted)]; SIZE [SMSA ≥ 1,000,000: 1 = central city, 2 = other than central city, SMSA = 400,000–999,999: 3 = central city, 4 = other than central city, SMSA = 50,000–399,999: 5 = central city, 6 = other than central city, 7 = urban, and 8 = rural (omitted)]; AGEFM1 = age of head; RACE [1 = white]; EDUCFM1 = Head's education; OCFM1 = Head's occupation [1 = self-employed, 2 = professional, 3 = manager, 4 = clerical, 5 = sales, 6 = craft, 7 = operative, 8 = labor, 9 = service, 10 = not working, 11 = retired, 12 = other (omitted)]; HOUSE = type of housing [1 = one family, 2 = two to four family, 3 = 5 to 19 family, 4 = 20 or more family, 5 = mobile home (omitted)]; TOTINC = total family income; OCFM2 = occupation of wife; AGECH = mean age of children; NBOY = number of male children. Dependent Variable: consumption expenditures in cents.

APPENDIX B

Elasticities by Commodity and Family Size (Husband and Wife Present)

Commodity	Income Elasticity	Head's Education Elasticity	Child's Human Capital Elasticity
	(1) One-Child Families		
1	0.34*	0.02	0.04*
2	0.70*	-0.01*	0.08
3	0.26*	-0.23*	0.00
4	0.49*	0.40*	-0.12*
5	0.28*	0.04	-0.01
6	0.85*	0.33*	-0.27*
7	0.64*	0.07	-0.19*
8	0.59*	0.21	-0.09
9	0.80*	0.10	0.06
10	0.30*	-0.11	-0.99*
11	0.89*	0.27*	-0.08
12	0.81*	-0.11	-0.85*
13	-0.04	0.67*	-0.92*
14	0.42*	0.30*	-0.08
15	0.46*	-0.27*	0.11*
16	0.32*	0.36*	-0.06
17	0.71*	0.00	0.05
18	3.77*	1.66*	0.44
19	1.25*	0.26	0.00
20	1.06*	-0.09	-0.08
21	0.66*	0.25*	-0.02

APPENDIX B (*continued*)

Commodity	Income Elasticity	Head's Education Elasticity	Child's Human Capital Elasticity
22	0.77*	0.61*	-0.02
23	0.86*	0.94*	0.31*
24	0.68*	-0.51*	-0.16
25	0.91*	0.02	0.03
26	1.59*	0.67*	-0.24*
	(2) Two-Child Families		
1	0.32*	-0.01	0.17*
2	0.89*	0.10	0.21*
3	0.29*	-0.65*	0.20*
4	0.52*	0.33*	-0.21*
5	0.28*	0.08*	0.05*
6	0.84*	0.51*	-0.58*
7	0.81*	-0.05	-0.17*
8	0.71*	0.28*	0.13
9	0.90*	0.10	0.32*
10	0.36*	0.06	-0.35*
11	1.21*	0.34*	0.48*
12	0.54*	0.15	-0.22*
13	0.08	-0.03	-0.92*
14	0.76*	0.32*	0.03
15	0.57*	-0.21*	0.36*
16	0.15*	0.41*	0.15*
17	0.63*	0.25*	0.28*
18	1.32*	1.48	0.33
19	1.33*	0.63*	0.22*
20	0.93*	-0.49	0.04
21	0.86*	0.33*	0.01
22	0.47*	0.79*	0.07
23	1.16*	1.77*	1.26*
24	0.67*	0.66*	0.22
25	0.63*	0.45*	0.07*
26	1.04*	0.41*	-0.02
	(3) Three-Child Families		
1	0.26*	0.06	0.20*
2	0.69*	0.12	0.54*
3	0.09	-0.47*	0.46*
4	0.55*	0.45*	-0.14*
5	0.21*	0.21*	0.00
6	0.78*	0.61*	-0.37
7	0.78*	-0.05	-0.14
8	0.60*	-0.09	0.15
9	0.84*	0.24*	0.66*
10	0.14*	0.17	-0.62*
11	0.92*	0.44*	0.64*
12	0.61*	-0.29*	0.35*
13	0.82*	0.00	-1.72*
14	0.34*	0.62*	0.01
15	0.57*	0.05	0.34*
16	0.16*	0.30*	0.13*

APPENDIX B (*continued*)

Commodity	Income Elasticity	Head's Education Elasticity	Child's Human Capital Elasticity
17	0.72*	0.15	0.05
18	0.65	-1.12	-0.68
19	1.51*	0.74*	-0.16
20	1.99*	0.65	-0.03
21	0.68*	0.38*	0.16*
22	0.79*	0.67*	0.00
23	1.29*	1.62*	1.70*
24	0.63*	0.39	0.03
25	0.88*	0.21*	-0.03
26	1.11*	0.57*	-0.05

*Statistically significant at $\alpha = .10$.

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