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The usual approach to the theory of the consumption function is to assume a one-sided relation: family's income is supposed to determine its consumption. To be sure the relevant concept of income was, and still is, subject to a considerable disagreement among economists (see Mayer) but it seems that the one-sided relation is widely and may be even generally accepted. This approach ignores the importance of family members' time as a scarce productive factor.

Becker (1965) and Mincer (1960, 1963) were apparently the first to recognize the importance of this factor and have incorporated it into economic theory. This ingenous idea opened new avenues for investigations into the subject of the consumption function. A consistent approach to the problem along the ideas of Becker and Mincer suggests a simultaneous determination of consumption and earnings of family members. In view of the fact that earnings comprise the major portion of family's income, it may be argued that family's income and consumption are determined simultaneously. This is in line with an assessment made long ago by Mincer in which he expressed the desirability of a "set of simultaneous relations which undoubtedly exist between income, consumption, labor supply, and population" (Mincer, 1963, p. 26).

An attempt was made in this paper to show how the simultaneous determination of family's consumption and earnings is systematically affected by the presence of children of various ages. The outline of the paper is as follows: In section (a) a static version of the model was presented. Then in section (b) it was shown how the children effect was derived from the equilibrium conditions. This effect reflects a systematic relation between children's age and family's consumption and market activity. The propositions emanating from the analysis imply a negative effect on consumption by young children, and this effect declines systematically (in absolute terms) and ultimately in the case of older children it becomes positive. A similar effect was obtained with respect to the female's market activity.

This paper was written while I was a research associate at the National Bureau of Economic Research. I owe a debt of gratitude to many of my colleagues at the NBER for their useful comments on various drafts of this paper. In particular I have to mention Jacob Mincer who initiated me into the subject and was very patient listening to my reservations. Discussions with John Hause, Thomas Juster, and Robert Willis were also very useful and I wish to thank them. I solely remain responsible for any remaining errors. Empirical analysis of the theoretical propositions were presented in section (c). The findings do show an unequivocal support of the theoretical propositions.

(a) The Model

Following Becker's seminal paper (1965) it can be assumed that the family acts like a small factory where family members' combine their time and goods bought on the market in order to produce what Becker calls "commodities" These commodities enter directly into the utility function that the family tries to maximize. To make things easier all the goods and commodities were aggregated. Thus, the aggre-gate commodity is produced by the aggregate good bought on the market (which is what is usually referred to as consumption) combined with husband's and wife's time as inputs (a similar approach was taken up by Ghez, 1970. Gronau 1970 too followed the approach of regarding the household as a unit which combines goods and family members' time to produce various activities. But Gronau dealt with a very different subject than that discussed in this paper).

$$X = f(Y_1, Y_2, Y_3)$$
 (1)

 Y_1 = the aggregate good

- Y₂⁻ = husband's time devoted to nonmarket activities
- Y₃ = wife's time devoted to nonmarket activities
- X = the aggregate commodity.

Maximizing U(X) is equivalent to maximizing X and therefore it may be assumed that the family tries to maximize

$$X = f(Y_1, Y_2, Y_3)$$
(2a)
S.T. $P_1Y_1 = V + (\bar{Y} - Y_2)P_2 + (\bar{Y} - Y_2)P_3$

$$\sum_{i=1}^{Z} P_iY_i = V + (P_2 + P_3)\bar{Y}$$
(2b)

- P_i = price of the i-th productive factor, i=1,2,3
- P_2, P_3 = the market wage rates of the husband and wife \bar{Y} = total time available for market
 - = total time available for market and nonmarket activities, like twenty-four hours a day, seven days a week, etc.

V = nonearning income.
P, = price of the aggre

or

The left-hand side of (2a) is the cost of buying the aggregate good Y_1 on the market, and the right-hand side represents the resources available for that purpose. In (2b) the left-hand side is the cost to the family of the productive factors used in the process of producing the aggregate commodity X. The family buys its members' (husband and wife) time at the market wage rates. The right-hand side of (2b) is the maximum income available had family members' spent their total available time in market activity.¹

The model as presented in (1) and (2) has no reference to savings nor to any planning for the future. This is of course a simplification but it was felt that at this stage it was justified in view of the high payoff of the model in its present form in terms of theoretical propositions which can be easily subjected to an empirical test. It can be shown that the conclusions reached here remain intact under a dynamic setup where savings are included (see Landsberger 1972). Maximizing (1) subject to (2b) results in the necessary conditions for an extremum.²

$$\frac{\partial f}{\partial Y_{i}} - \lambda P_{i} = 0 \quad i=1,2,3 \quad (3)$$

$$\sum_{i=1}^{3} Y_{i}P_{i} - V - (P_{2} + P_{3})\overline{Y} = 0$$

$$i=1$$

where λ is the Lagrange multiplier.

Under the usual assumptions of convexity the equations in (3) are sufficient for determining the optimal values of the unknowns Y_1 , Y_2 , Y_3 , λ , in terms of the parameters of the system P_1 , P_2 , P_3 , V, \bar{Y} .

$$Y_{i}^{*} = g^{(i)} (P_{1}, P_{2}, P_{3}, V, \bar{Y})$$
(4)
for i=1,2,3 and

$$\lambda^* = g(P_1, P_2, P_3, V, \overline{Y})$$
 the asterisks de-
note optimal values
of the variables.

Remembering that Y_1 can be referred to as consumption, g(1) in (4) is the consumption function and g(2), g(3) are the demand functions for the male's and female's home services. Thus, consumption and earnings of the family are determined simultaneously as part of the optimal time allocation of family members.

What has been done heretofore is merely a convenient way of formalizing the ideas of Becker and Mincer, although the presentation of the problem is more in spirit with the approach taken up by Becker. As noted before Ghez, 1970 has followed a very similar approach. Relying on the first order conditions for an extremum an attempt was made in the next section to derive a set of propositions which relate in a systematic fashion children's age with the level of consumption and market activity of the male and female.

(b) The Children Effect

The effect of children on consumption has been largely ignored in the various theories of the consumption function. In empirical studies the number of children has been sometimes indirectly inserted as a variable in regression analysis. Most frequently a variable indicating the number of persons in the family (family size) was inserted and no distinction was made between adults and children. not to speak about a distinction between children of different ages. As far as I recall this has always been done with no particular theoretical reference, with the exception of Ghez, 1970, Ch. IV. However, Ghez did not make any distinction between children of different ages which is the main issue in this paper.

Children's age as a factor affecting the level of market activity of the male has been also ignored in the literature. But as opposed to consumption this subject as a whole was not discussed in a systematic way.

Market activity of the female was intensively covered in the literature (Mincer 1962, Cain 1966, Bowen and Finegan 1969). It appears that Mincer and Cain were mostly interested in wage rate effects. Mincer made a remark about the interaction between young children and wage rate effect (Mincer 1962, p. 92). Bowen and Finegan have discussed the effect of children's age on the female's market activity. It appears that the findings presented in this paper with respect to the relation between children's age and the female's market activity are very much in accord with the conclusions reached by Bowen and Finegan whose study had a predominant empirical orientation. Rewriting (3), the conditions for an extremum can be presented as

$$\frac{P_1}{P_2} = \frac{MP_1}{MP_2}, \quad \frac{P_1}{P_3} = \frac{MP_1}{MP_3}, \quad \frac{P_2}{P_3} = \frac{MP_2}{MP_3}$$
(5)

where MP_istands for the marginal product of the i-th factor.

It can be assumed that an increase in the number of young children in the family causes an increase in the productivity of home activity of the female. Her home activities are regarded now as being more important and the demand curve for her home services shifts to the right. As a result of it, at the former equilibrium level of $Y_3 = Y_3^*$ the marginal productivity - MP₃ is higher than the wage rate, MP₃ > P₃. It can also be argued that as a result of having young children not only is there an increase in MP_3 but also a decrease in MP_1 , namely, a decrease in the marginal productivity of the aggregate good (consumption). Although there is an increase in the demand for goods which are related to the "needs" of the child, but this can be more than offset by a decrease in the demand for goods by the parents. This is because having young children implies usually a decrease in demand for such commodities as trips abroad,

meals in restaurants and other kinds of entertainments which are very good intensive. Thus the demand curve for the aggregate good shifts to the left, and at the former equilibrium point $Y_1 = Y_1^*$ MP₁ < P₁. In addition it may be assumed that in view of the new composition of activities within the household there is a decrease in the demand for home activities of the husband which means a decrease in the MP₂ at $Y_2 = Y_2^*$. The rationale for this assumption is explained later on, however, it should be remarked that this assumption can be dropped without detracting from the significance of the main propositions of this study.

As it is accepted in economic theory the marginal productivity of one factor depends on the amounts of the other factors employed in the productive process, thus it may be claimed that a movement of one curve causes shifts of the other two. However, it may be assumed that this chain reaction is of secondary importance and the shifts discussed above reflect already these effects. As a result of these shifts in the demand curves the equilibrium conditions (5) are replaced by

$$\frac{P_1}{P_3} > \frac{MP_1}{MP_3}, \quad \frac{P_2}{P_3} > \frac{MP_2}{MP_3}, \quad \frac{P_1}{P_2} \ge \frac{MP_1}{MP_2}.$$
 (6)

If remembered that in the context of the model presented in this study Y_1 , Y_2 , and Y_3 are inputs in a production function, it becomes clear that the change in the marginal productivities of the inputs will cause substitution effects. Y_1 and Y_2 will be substituted by Y_3 which became more productive. The meaning of these movements is an increase in home activity of the female, a decrease in that activity by the male and a decrease in consumption of the family. As the reader can verify it to himself by drawing the appropriate diagrams (see Landsberger 1972) these movements tend to restore equilibrium in (6). Recalling that home and market activities Y_i and \tilde{Y}_i , respectively add up to a constant Y, it comes out that young children tend to reduce the level of market activity of the female, increase the level of this activity in the case of the male and decrease the consumption of the family.

The effect of older children differs mainly because the change in the importance of woman's home activity is much smaller than before and on the other hand the importance of goods increases. Older children have a higher demand for commodities which are good (or money) intensive (like summer camps, clothes, and other expenditures related to education of the children). On the other hand, older children require less mother's care. The presence of older children does not impose on the parents various restrictions which young children (babies) do impose, and thus the parents may renew their stronger demand for good intensive commodities (such as noted before). Thus, the older the children the smaller are the shifts in the demand curves. Eventually, in the case of children of, say, thirteen years old or more the predominant factor is the increased demand for

goods (consumption). The demand curve for the female's home services may not shift at all or even moves to the left with the result of older children having a positive effect on the level of market activity of the female.

It is imperative to the analysis here to realize that the movements of the three demand curves (for Y_1 , Y_2 and Y_3) are interrelated. The position of the demand curve for the aggregate good - Y_1 determines the money expenditures of the family. The position of the demand curves for Y_2 and Y_3 determine the earnings of the family and its income for a given level of nonearning income. Thus, the shifts of the curves have to be simultaneously determined by the family.³

In terms of the equilibrium conditions (5) the effect of children of say 13 years old or more gives rise to the inequality.

$$\frac{P_1}{P_2} < \frac{MP_1}{MP_2} , \quad \frac{P_1}{P_3} < \frac{MP_1}{MP_3} , \quad \frac{P_2}{P_3} < \frac{MP_2}{MP_3}$$
(7)

The way equilibrium is restored can be described as follows: A movement to the right along the new (higher) demand curve for Y_1 results in a lower MP₁. A movement to the left along the new (lower) demand curves for the male's and female's home services results in higher values of MP₂ and MP₃. As the reader can verify to himself, these are movements in the right direction in terms of restoring equilibrium in (7). This equilibrium is being reached at a higher level of family's consumption and market activity of the male and female.

Before concluding this section a short summary of the children effect may be useful. Young children have a negative effect on the consumption of the family while at the same time cause an increase in the level of market activity of the male and a decrease in the market activity of the female. The effect on consumption increases (in absolute terms) with the age of the children and eventually becomes positive. At the same time the older the children the lower the decrease in the market activity of the female and finally this effect may become positive. Children of all ages have a positive effect on the level of market activity of the male, and it is very likely (although not necessary) that this effect is higher the younger the children.

(d) Empirical Test of the Theoretical Propositions Concerning the Children Effect

The empirical analysis presented in this study is based on cross-section data, composed of two surveys: Consumer Anticipation Survey (first visit) conducted by the National Bureau of Economic Research (henceforth, the NBER Survey), and the 1969 Survey of Consumer Finances, conducted by the Institute for Social Research at the University of Michigan (henceforth, the Michigan Survey). A detailed explanation of the data can be found in Landsberger 1972.

As shown in (4) the independent variables in the behavioral equations are P_1 , P_2 , P_3 , V, and \bar{Y} . The first and last independent variables P_1 and \bar{Y} can be eliminated because it is clear that in a cross-section their value are the same for all observations. Data for P3 was available only for about 30-40 per cent of the observations because most women (60-70 per cent) did not have jobs on the market at the survey period. Therefore, it was decided, in this case, to use the female's education ED(W) as a proxy for her potential wage rate. The female's wage rate P3 was inserted into the estimating equation only in the case where the estimation was done for those families where the woman had a job on the market. This calculation was based of course on a much smaller number of observations.

The fact that various families have children of different ages was utilized to evaluate the children effect. Having children of different ages can be interpreted as being on different demand curves for Y_1 , Y_2 , and Y_3 , and therefore having different equilibrium values of the Y's.

It was decided to distinguish between three age groups of children: below six, six to twelve, and thirteen plus. The considerations which affected this division are related to the theoretical arguments as presented in section (b). It seems plausible that children below six cause the most significant increase in the demand for female's home services and decrease in the demand for consumption. On the other hand, children thirteen plus years old can be regarded as being able to provide themselves with various home services and therefore do not restrict, or only very little, the female's market activity. On the other hand, they cause an increase in the demand for consumption, because of their strong demand for good intensive commodities (see section (b)). Children in this age group are expected to have a positive effect on family's consumption.

With respect to children in the intermediate group six to twelve the effect on consumption can be positive or negative. But if positive, it should be lower than for children thirteen plus years old, and if negative, it should be higher (algebraically) than the effect of children below six. The effect on the level of the female's market activity is expected to be negative but smaller (in absolute terms) than that of children below six. To economize space the description of the statistical problems of estimation was omitted, however, this material can be found in Landsberger 1972.

An analysis of the empirical findings presented in Table 1 shows that the results follow strongly the theoretical propositions. In all cases the effect of children under six on consumption expenditure is strongly negative. On the other hand, older children, thirteen plus years old, increase consumption systematically. For children in the middle group the effects are negative in three cases and positive (but very low) in one. These results too are significantly in accord with the theory. The reader may recall that with respect to children in the middle group the theory did not predict the signs of the coefficients. This would be impossible because this is the range where the negative effect declines (in absolute terms) and eventually should become positive. However, the coefficients reflect the average effect of the whole range and therefore it is impossible to predict its value. But as it was pointed out the effects if negative, should be lower (in absolute terms) than the coefficients of NC1, and if positive, should be lower than the coefficients of NC3. And indeed the results in column (2) follow strictly these propositions.

The low t values for the children effects in the Michigan Survey are due to the fact that the calculations here are based on about 500 observations only (as compared to 2,400 in the NBER survey). What is even more important is the fact that information on age distribution of children in that survey was very inefficient for the purpose of this study. The results presented in Table 1 besides their support to the theory concerning the children effect provide useful information from a more general viewpoint. It appears that a child below six years old decreases family's yearly consumption by a few hundred dollars. The figures in column 1 run between \$400-800 which amounts to about 5 to 10 per cent of the yearly consumption of the families involved. The effect of children 6-12 years old is much less but still significantly negative. On the other hand children 13+ years old increase the yearly consumption expenditure of the family by about \$300-500 which is about 4-8 per cent. These results are well related to the effect of children of different ages on earnings.

These results cast a serious doubt on the procedure to lump together children of all ages into a single variable referred to as family size.⁴ Essentially, the coefficients of such a variable are of dubious meaning. Usually, coefficient of such a variable is interpreted as reflecting the marginal contribution to the dependent variable as a result of a change in family size by one unit (see Ghez 1970, p. 113). But the results in Table 1 do suggest that such a change depends significantly on whether the change in family size reflects a change in the number of young or older children. If the increase happened to be in the number of children below six years old the results suggest that family's yearly consumption may decrease by some \$700 whereas in the case of an increase in the number of children 13+ years old it may increase family's yearly consumption by some \$400.

••••••••••••••••••••••••••••••••••••••			Ch	hildren Effects	
	Source of the Data	Estimating Equation	Under 6 (NC ₁) (1)	6-12 Years 01d (NC ₂) (2)	13+ Years 01d (NC ₃) (3)
	NRED SUMAY	D	-413.2 (-4.3)	-108.9 (-1.8)	389.3 (5.7)
Consumption - Y ₁	NDER SUIVEY	Q	-724.6 (-3.5)	-252.5 (-2.2)	378.1 (3.6)
	Michigan Survey	D	-696.9 (-2.4)	3.0 (.1)	311.7 (.9)
		Q	-783.1 (-2.5)	- 2 54.7 (9)	516.7 (1.5)
	NRED Summer	D	1257 (-11.1)	0560 (-7.5)	.0192 (2.3)
Female's Market Activity – Ŷ ₃	MDER GUIVEY	Q	-7.1620 (-6.8)	-4.2650 (-6.9)	8123 (-1.5)
	Michigan Survey	D	1351 (-4.2)	0044 (2)	.0284 (.7)
		Q	-5.8330 (-3.5)	-4.9112 (-3.4)	-1.2126 (7)

TABLE 1 The Effect of Children on Consumption and Female's Market Activity^a

^aThe numbers in parenthesis are the t values. The dependent variable - Y_1 was measured in terms of dollars per year.

 \tilde{Y}_3 in equation Q was defined in weeks per year. Equation Q was estimated only for those observations where the wife had a job on the market. Equation D was estimated for all observations and here the dependent variable for female's market activity was defined in terms of 0 and 1.

In the last four lines of Table 1 the reader can find the estimates with respect to the female's market activity. Here again the results are in strong accord with the theoretical propositions. Young children (under six) have a negative effect on the female's market activity and this effect declines systematically, and eventually for children 13+ years old it becomes sometimes positive. (Similar results with unimportant deviations were obtained by Bowen and Finegan 1969, although their method of estimation was different from that reported here.) These findings do come out from both equations. The reader should recall that in D the coefficients should be interpreted as probabilities because the dependent variable was dichotomous. On the other hand in Q the dependent variable was defined in terms of weeks per year where a week was defined as 40 working hours. Thus, the coefficients obtained from Q can be interpreted as indicating that as a result of having a young child the female decreases her market activity by some 15 per cent (6-7 out of 40). This effect declines to about 10 per cent (4-5 out of 40) for children 6-12 years old. The female's market activity is decreased by only about 2-3 per cent by having children 13+ years old.

As explained before in order to evaluate the effect of children of different ages on female's market activity one has to combine the results obtained from Q with those obtained from D where the coefficients express the effect of children on the probability of having a job on the market. An addition of a young child in the family decreases by about 12-14 per cent the probability of the female to be engaged in market activity. This effect strongly decreases in the case of children 6-12. Older children tend to increase that probability by about 2-3 per cent only.

In Table 2 the results of the children effect on husband's market activity are presented, suggesting in a very clear fashion that children do have a positive effect on the level of husband's market activity and that this effect declines the older the children are. These findings fit well with the other results as well as with the theory. The fact that the children effect is stronger the younger the children fits well with the fact that the same is true for the female but in the opposite direction. Namely, while the female is decreasing the level of her market activity, the opposite happens with the male. Generally speaking, in the case of young children it appears that the decreases in the female's market activity is stronger than the increase in husband's market activity, which fits well with the decrease in consumption.⁵ The same is true for children in the 6-12 age group. For older children there is too an increase in husband's market activity whereas the effect on the female's market activity is not clear. The probability of those who do not work to have a job on the market increases but on the other hand those already working tend to work a little bit less. This behavior of the parent's market activity (which apparently causes an increase in their earnings) is folowed by an increase in consumption.

TABLE 2

Children Effect on Husband's Market Activity*

	The Effect of Children by Age Groups				
Source of	Under 6	6-12	13+		
the Data	(NC ₁)	(NC ₂)	(NC ₃)		
NBER Survey	.4918	.3093	.1804		
	(3.1)	(3.0)	(1.6)		
Michigan Survey	2.0580	.9757	.4826		
	(2.7)	(1.4)	(.5)		

The figures in parentheses are the t values.

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FOOTNOTES

¹It is assumed here that the nonnegativity restrictions on the Y's are ineffective. Discussion of this subject can be found in Landsberger 1972.

²Second order conditions for a maximum were developed in Landsberger 1972.

³This is the argument to be used to justify the shift to the left of the demand curve for the husband's home services in the analysis of the effect of young children.

⁴Although the variable "family size" includes all members of the family, it can still be regarded as reflecting the number of children because the different between the two is a constant - the parents.

⁵This development is not a necessary one because among other reasons husband's wage rate is much higher, and there is always the possibility of savings.