Volume Title: Education, Income, and Human Behavior

Volume Author/Editor: F. Thomas Juster, ed.

Volume Publisher: NBER

Volume ISBN: 0-07-010068-3

Volume URL: http://www.nber.org/books/just75-1

Publication Date: 1975

Chapter Title: Education and Consumption

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Chapter URL: http://www.nber.org/chapters/c3699

Chapter pages in book: (p. 233 - 252)

Part Two:
The Impact of Education on Behavior

9. *Education and Consumption*

by Robert T. Michael

INTRODUCTION

It has long been recognized that the influence of education on behavior is pervasive. Even through casual observation, many aspects of the behavior of the individual or of the household are seen to be closely associated with level of schooling. Income, choice of occupation, residential location, geographical mobility, consumption expenditures, leisure-time activities, avocations, characteristics of friends and associates, "lifestyle," and attitudes toward a myriad of personal and social issues all would appear to be relatively strong correlates of education. Governments frequently impose laws regulating the minimum permissible amount of education. This is done in the belief that individuals are better citizens if they are literate and possess basic information about a number of subjects. Moreover, as a result of its influence on behavior, level of schooling is one of the common characteristics by which social scientists categorize people.

Yet, for all the examples of strong correlates of education that one might suggest, very little is known about the causes or the nature of these effects. We may know that more highly educated people earn different incomes or hold different opinions, but we cannot say whether these differences result from specific knowledge acquired as part of education, from a change in the manner in which decisions are reached, or from changes in basic beliefs and values. Although psychologists tell us something of the way

NOTE: This chapter is a nontechnical summary of some of the research reported in my monograph (Michael, 1972). Since this chapter is intended for a wider readership, many technical points are ignored, and the standard economic jargon is modified. I have avoided the use of mathematics entirely. For a more thorough discussion of procedures and of theoretical as well as statistical issues, see the NBER monograph. This chapter was submitted for inclusion in this volume in July 1970, and only very minor subsequent revisions have been made.

one learns, little is known of the process by which learning or newly acquired knowledge affects subsequent behavior.

Leaving aside questions about the causes of the influence of education, even the nature or extent of the effects is not well documented. One of the few factors which have been studied in detail is the relationship between schooling and earning capacity in the labor market. Numerous studies in the past decade have shown that earnings are raised systematically by education and that the purchase of some level of higher education is a wise investment for most people when the return on the investment is measured in enhanced earnings alone. The chapters in Part One of this volume attempt to extend and refine these findings. Other effects of education are less well documented. In part, the purpose of the work on which this chapter reports is to identify and describe the effect of education on another aspect of behavior: consumer expenditure patterns.

In addition to determining the extent to which education affects spending patterns, the chapter also offers an explanation of why consumer behavior might be affected in a specific manner. The explanation is partial at best in that it relates the effect of education on consumer behavior in the home or "nonmarket sector" to the effect of education on earnings in the labor market. Yet, if the same type of influence exists both in the home and in the labor market, then the observed influence of education may operate through its effects on how one uses his or her own time, rather than through its effects on any bargaining power associated with the attainment of a level of education.[1]

WHY EDUCATION MIGHT AFFECT CONSUMER BEHAVIOR

In order to analyze why the level of formal schooling might influence consumer behavior, some interpretation of the consumption process itself is needed. The general approach adopted in this study

[1] One explanation sometimes offered for the observed positive relationship between education and earnings is that schooling is used as a criterion for jobs solely as a means of reducing the competition for those jobs. Schooling helps "zone" people, to use the term suggested by social critic David Hapgood, who says: "The effect of diplomaism is to zone out the person who wants to make his own way to a productive place in society. . . . The degreeless creative oddball who could perform better than his credentialed competitors is not allowed to compete" (1971). Obviously, however, such an explanation cannot be applied to any directly observed effects of education on productivity in the home, since in home production the household is both the supplier and demander of labor services.

follows Becker's formulation of household activities (Becker, 1965; Michael & Becker, 1973). The household is viewed as an organizational unit (comprised of members of the family) which engages in the production of many different things. Within the household the family seeks to achieve as great a level of satisfaction or utility as possible, subject to its resource limitations. The household, then, is a small multiproduct firm which produces many desiderata from which family members derive satisfaction. These desiderata are called *commodities* (for example, good health, physical exercise, nutrition, intercity visits, and children), each of which is produced within the household organization by a production activity (for example, convalescing, bicycling, eating, traveling, and child care).

Each household produces the commodities it desires by combining time and goods (labor and capital) in a productive activity. It is therefore limited in its ability to produce commodities by its available resources of time and goods. This limitation involves essentially a limited amount of available time—24 hours per day per family member—and the particular wage rates at which the household members convert their time into money in the labor market. (Of course, any nonwage income adds to its resources as well.) In this framework, the household uses some of its time directly in producing commodities and some of its time indirectly by first selling the time (or the labor services) in the marketplace and then using the income to purchase goods and market services. These are subsequently combined with the household's nonmarket time in commodity production.

Now, these commodities, in this framework, need not be physical. It is not difficult to name some satisfaction from every activity in which a household member engages. (Thus time and goods used in sleeping produce good health or perhaps a pleasant disposition, whereas time and goods spent in grooming produce a desirable personal appearance, and so forth.) It is possible to translate any activity or expenditure of money or of time into this framework, which is, at this level, simply a language—a way of talking about how households behave. Its usefulness lies in facilitating our analysis of the factors which influence observed behavior.

The study of the effects of education is a good illustration. Given this framework, in which households are viewed as combining purchased market goods with their own time to produce commodities, we can predict that education will affect the household's capacity to convert these goods and time into commodities. That is, edu-

cation may affect the efficiency with which the commodities are produced. There are, in fact, at least two reasons for predicting that education will raise efficiency.

First, there is the fact—confirmed by both casual empiricism and rigorous statistical analysis—that wage rates rise with education levels (see Part One of this volume). This is consistent with education raising the productivity of labor services in the market. If increases in education raise the productivity of time used in one activity, it seems reasonable to expect education to have an analogous effect on the productivity of time in other activities. Since the household production function framework views consumption as a production activity, it is logical—in light of the observed correlation of education with wages—to expect education to enhance efficiency in consumption.

This expectation depends critically upon the inference that the positive correlation between education and earnings results from an *influence* of education on the value of the marginal product of time in the labor market. There are at least three distinct explanations for this observed correlation: (1) Education may alter the productivity of one's time and thereby affect wage rates;[2] (2) education may screen individuals on the basis of native capacity and thereby operate, in job markets characterized by positive information costs, as certification of some given level of capability;[3] and (3) education may simply operate as a bargaining device which "opens doors" or which "zones" people, thereby establishing noncompeting groups.[4]

A positive effect of education on efficiency in nonmarket produc-

[2] Intuitively, it is clear that this mechanism is at least in part responsible for higher wages. For example, knowledge of anatomy and physiology acquired from schooling enhances the surgeon's skills. Similarly, knowledge of languages, mathematics, literature, history, and so forth, is essential in specific occupations. Although training enhances productivity in specific skills, formal schooling need not be the only way to acquire these skills.

[3] Taubman and Wales (Chap. 4 in this volume) attempt to distinguish directly between these two explanations.

[4] A very different set of distinctions has been suggested by Gintis. He, too, is concerned with the mechanisms by which education affects earnings, but he distinguishes an effect of education on various dimensions of personal characteristics. In particular he emphasizes the effects of schooling on the "cognitive" (mental) characteristics and the "affective" (psychological) characteristics. Both of these may be viewed as ways in which education alters an individual's productivity, and thus they belong under explanation 1 of the rubric suggested in the text (Gintis, 1971).

tion (holding factor proportions constant) would not be implied by explanation 3 (that education bestows monopoly rents) but would be consistent with either explanation 1 (that education augments productivity) or explanation 2 (that education screens and thereby certifies). Thus, while an observed positive effect in the nonmarket sector cannot help us distinguish between explanations 1 and 2, it can help us select between explanation 3 and explanations 1 and 2. Furthermore, there would be little economic incentive to invest in education as certification for nonmarket production, since in this market the household is both employer and employee.[5]

A second reason for expecting education to increase the efficiency of nonmarket production is the similarity between education and technology. The introduction of additional education into the household's production process is analogous to the introduction of new technology into the firm's production process. When a firm introduces new "technology," it generally is in the form of a new idea (e.g., a new way to organize production) or a new input which embodies some new technique (e.g., a machine with a new capability or a new employee with a new skill). Education has similar attributes related to home production. Households composed of more educated individuals have relatively more access to knowledge, concepts, facts, and ideas that may enable the household to arrange nonmarket production more efficiently. Furthermore, since education (or, more precisely, the human capital with which it is associated) is embodied in the individual, it may raise not only the proficiency of the time input used in nonmarket production but also the efficiency of market expenditures, since one use of nonmarket time is the selecting or purchasing of market goods and services.

In other words, in most production activities there are several ways of producing the product, and so the choice of a production technique may be an important determinant of the efficiency with which the production takes place (i.e., the cost of production). One of the expressed purposes of some forms of education is to develop a receptiveness to new ideas. Thus not only may a more

[5] One exception might be the use of education as a screening device in the selection of a spouse. See Jensen (1969).

Another exception might be the psychic satisfaction of simply having succeeded in obtaining certification. (In the terminology of the household production function model, successful certification—or the achievement of some specific level of schooling—might be a direct factor of production in producing the desirable commodity "distinction" or "self-respect.")

educated family have greater access to knowledge and greater facility in assimilating and evaluating new information, but its members may also be more receptive to new ideas and thus be more likely to experiment with, and adopt, improved production techniques. If so, the average level of "technology" employed in household production will be positively related to the education level of the household members.[6]

For both of these reasons—the inferred effect of education on the productivity of time spent in the labor market and the similarities between the role of education in household production and of "technology" in market production—education is expected to enhance the efficiency of nonmarket production and thus affect consumer behavior.

HOW EDUCATION MIGHT AFFECT CONSUMER BEHAVIOR

If education improves the household's capability in converting time and money into commodities, this may affect behavior in two ways. First, since education has a bigger impact on efficiency in some activities than in others, this will alter the relative prices of the commodities. For instance, if education is particularly effective in improving reading efficiency but is ineffective in improving physical exercise efficiency, then, with increases in education, the commodity associated with reading becomes cheaper relative to the other commodity. Economic theory suggests that there will be an incentive to shift consumption toward the relatively cheaper activity.

Second, if education improves the average efficiency of nonmarket production, then households with more educated family members are wealthier in the sense that they can produce more with a given amount of time and money. Thus even if their available time and money are held fixed, families with more education will have more real wealth in terms of commodities. Economic theory sug-

[6] This attribute of education has previously been suggested as one of the ways in which education enhances market productivity. After discussing the importance of the "allocative efficiency of traditional agriculture," T. W. Schultz suggests, "In general, where technically superior factors of production are a principal source of agricultural growth, schooling counts" (1964, p. 189). In a somewhat different context, Nelson and Phelps (1966) suggest that "education enhances one's ability to receive, decode, and understand information." An important and clear analysis of the productive value of education has been made, and evidence of the "allocative effect" of education in agricultural production has been adduced by Welch (1970).

gests that this difference in real wealth among households will affect observed behavior systematically.

Turning first to relative price effects, consider the price of some particular commodity, say, a "good diet."[7] Its production uses groceries, cooking equipment, and dishes, as well as shopping, cooking, and eating time. The price of one unit—say, one day's worth—of a good diet would be the sum of the expenditures on the day's groceries, some appropriate fraction of the cost of the durable equipment such as the stove and the dishes, and the value of the household members' time spent preparing and eating the meals per day. If education improved the efficiency in this set of activities, it would mean that the same amount of a good diet could be produced each day in somewhat less time and using somewhat fewer money expenditures.[8] Consequently, the price per unit would be lower. If education affected some commodity prices but not others, some prices would rise and others would fall relative to one another. This would hold true even if all commodity prices fell absolutely but by different proportions.

Suppose, instead, that education had the same effect on the prices of all commodities such that, say, each fell by 5 percent. That would mean (under fairly general conditions) that the previous levels of all commodities could be purchased with 5 percent less time and 5 percent less money. This in effect would raise by 5 percent the time and money the household had at its disposal. Although their actual money income and time resources might be the same, the household with more education could produce more commodities; it would be wealthier in terms of final output without being wealthier in terms of resources. Indeed, this is what it means to be more efficient: a smaller amount of input is required to produce a given quantity of output. Consequently, just as a decrease in the cost of living related to *market* prices increases the household's income in real terms, an increase in education which lowers the cost of living related to *commodity* prices increases the household's income in real terms.

[7] The commodity is called a good diet, not a healthy diet, since the desired diet may include more variety and quality than nutritional requirements dictate.

[8] For simplicity, it will be assumed that education affects all the inputs in any activity proportionately, so that if the time used in producing a good diet becomes 5 percent more efficient, the equipment and other purchases used in the production also become 5 percent more efficient.

In this framework, the effect of education is essentially an indirect one. By altering the relative prices of commodities, it induces behavioral shifts toward relatively cheaper items; and by lowering the cost of living in the manner just described, it raises real income and induces behavioral shifts similar to those which accompany any other increase in income. In order to make a prediction about behavior which we can observe and to test the usefulness of our framework, we shall suppose that education has the same proportionate effect on all nonmarket activities in which the household engages. By making this assumption, we eliminate any effect on relative prices of commodities and are left with a very simple prediction: If education *raises* nonmarket efficiency as described, households that have more education but no more money income will shift their expenditures on consumption items in the same manner as households with more money income but no more education. Suppose we compare three households, the first of which has somewhat more income than the other two and the second of which has somewhat more education than the other two (but no more income than the third). We would expect to find the second (more educated) household spending its income on various consumption items in proportions more similar to those of the household with more money income. In short, if education raises real income through nonmarket productivity, it should affect consumer behavior in the same manner as money income affects behavior.[9]

Not only can we infer from observed expenditure patterns the existence and direction of education's effect on nonmarket productivity, but we can also obtain an indication of the magnitude of

[9] It is true that households with more education also tend to have more money income, but this is not the point here. The present argument is that in addition to any effect of education on money income, there is also a nonmarket productivity effect. So in total, education may raise real income both by raising money income and by raising nonmarket productivity. We are interested in determining whether this latter effect is discernible from observed behavior.

Another distinction between the market and nonmarket effects of education relates to the relative commodity prices. It was suggested above that education might affect the relative prices of commodities by a differential effect on the efficiency of their production. Education also may alter relative prices of commodities by its effect on market wage rates and thus on the price of time of family members. The one mechanism (through the nonmarket activities) may be independent of the time intensity of the commodity's production, whereas the other mechanism (through the market wage rate) is closely related to the relative importance of time in the commodity's production. So as available data improve, we should be able to separate these two relative price effects. For now, the latter effect is captured by the observed effect of money income.

the effect. By determining the magnitude of the shift in expenditures resulting from, say, a 1 percent increase in the household's money income and the magnitude of the shift resulting from a 1 percent increase in its education level, we can infer the amount of additional income the household with more education acts as if it has. That additional amount is attributed to the nonmarket productivity effect.[10]

Within the conceptual framework employed here, it has been hypothesized that education raises productivity in the nonmarket sector and thereby affects consumer behavior in a specified way. Of course, now the framework is no longer simply a language; instead, it is used in making a substantive prediction about the way education affects behavior. It may be an incorrect prediction, in which case the hypothesis will be rejected. Moreover, even accurate predictions do not prove that the model's description of the process through which education works is correct. At best, we can find that this interpretation of the way education works is useful, since it correctly predicts behavior; other interpretations which give the same accuracy of predictions would be equally good.

THE OBSERVED EFFECT OF EDUCATION

The previous section indicated the way in which education might affect consumer behavior; this section reports on some empirical findings related to those predictions. To determine whether expenditure patterns shift in the same way with changes in education as with changes in money income, we must first estimate the two shifts and then see whether the patterns are similar. As the first step, the two separate effects of money and education are estimated. The data were from a survey of over 13,000 households, or consumer units, conducted by the Bureau of Labor Statistics in 1960–61. The data included information on the household's income and expenditure patterns, the education level and age of the head of the household, and the family size.

For statistical reasons, the data were grouped into 157 cells, which were used as the statistical observations. The cells were

[10] For example, if 1 percent more money resulted in a shift of, say, 4 percent in the relative expenditure on restaurants, and if a 1 percent increase in education resulted in a rise of 2 percent in the expenditure on that item, we could say that the household acted as if the 1 percent more education was equivalent to a ½ percent increase in money income. If no education effect is observed, then we conclude that education was equivalent to no more money income and that the nonmarket productivity effect is therefore zero.

defined by classes of income, education, and geographic region. For instance, one particular observation was the average value of each piece of information for the 211 households living in the South with incomes between $3,000 and $3,999 per year and with 9 to 12 years of education for the head-of-household. For each observation, the average yearly expenditure on 15 categories of consumption—food for home use, food away from home, clothing, medical care, etc.—was used for the analysis. The definitions of these items are given in Table 9-1.

The presumptions on which this analysis rests are (1) that systematic differences in behavioral patterns across households are related to the magnitudes of the variables used and (2) that behavior of households at, say, different levels of income indicates how any household, on the average, would behave if its income were changed in a similar manner. Thus we observe how income *differences* affect behavior across households, and we presume that this is how income *changes* would affect the behavior of a single household. In some form, this presumption is made in all such statistical analyses. A specific assumption here is that there is a one-to-one relationship between the expenditure categories and the commodities produced. With this and an assumption about the production process, the responsiveness of the household's demand for home-produced commodities to changes in income is the same as the responsiveness of its demand for the market goods. That is, the effect of income on the demand for "food for home use" is the same as the effect on the demand for the commodity "good diet."

TABLE 9-1
Expenditure items

1. Food for home use
2. Food away from home
   - Board
   - Meals at work and school
   - Other meals, beverages, and snacks
   - Meals out of home city
3. Tobacco
4. Alcoholic beverages
5. Housing
   - Expenditures on rented dwellings by those who rented plus lodging out of home city (adjusted for the percent of renters)

TABLE 9-1 *(continued)*

6. Utilities
   - Fuel, light, refrigeration, water
7. Household operations
   - Laundry, cleaning, household paper supplies
   - Laundry, cleaning sent out
   - Domestic service
   - Day-nursery care
   - Telephone and other household expenses
8. House furnishings and equipment
   - Household textiles, furniture, floor covering
   - Major and small appliances, housewares
9. Clothing
   - Clothing for family members
   - Clothing materials and upkeep
10. Personal care
    - Haircuts and hair care
    - Personal-care supplies
11. Medical care
    - Prepaid care
    - Direct expenses: hospitalized illness, physician, dental care, eye care, drugs, medical appliances, etc.
12. Leisure
    - Recreation: TV, radio, phonographs, etc.; spectator admissions, hobbies, pets, toys
    - Reading
13. Education
    - Tuition and fees
    - Books, supplies, equipment
    - Music and other lessons
14. Automobiles
    - Purchase and operation
15. Other travel
    - Public transportation in and out of home city
    - Car pool

The statistic that indicates the responsiveness of expenditures to changes in income, expressed in percentage terms, is the income elasticity. If the term equals 1.0 for some item, this indicates that expenditures on the item rise proportionately with income. If the term exceeds 1.0, the expenditure on the item rises more than proportionately, and hence as income rises, the percentage of income spent on the item rises. If the income elasticity is less than 1.0, the expenditure on that item rises less than proportionately, or the percentage of income spent on it falls. A similar statistic is used to indicate the responsiveness of expenditures to changes in the level of education. The previous section suggested that if education improves productive efficiency in the home, the effects of income and education will be similar. In particular, if the income elasticity exceeds 1.0, the education elasticity should be positive; if the former is less than 1.0, the education elasticity should be negative.

Notice the asymmetry inherent in the fact that the income elasticity differs from one (1.0), whereas the education elasticity differs from zero. This follows since the latter holds total expenditures fixed, and so the average effect of education on expenditures must be zero—the household cannot spend more on all goods as education rises since it cannot have more income due to the statistical procedure. The most the household can do is to take some money from one item (the theory predicts one of those with income elasticities less than 1.0) and spend that money on other items (those with income elasticities greater than 1.0).

By the statistical procedure of multiple regression, the separate effects of income[11] and education were estimated, and the effects of the age of the head-of-household, the size of the family, and the geographic region were removed. The estimates were made for each of the 15 categories separately and for a broader set of two inclusive categories: *goods* (food for home use, tobacco, alcohol, shelter, utilities, house furnishings and equipment, clothing, reading, and automobiles) and *services* (food away from home, household operations, personal care, medical care, recreation, education, and travel other than automobile). The estimated income and education elasticities for these broad categories are shown in Table 9-2.

[11] For statistical reasons, the income variable was the total consumption expenditure, not the measured disposable income. This procedure is commonly used to avoid short-period random fluctuations in income. The variable will be referred to as the income variable, nevertheless.

TABLE 9-2
Elasticity estimates for goods and services

	Income elasticity	*Education elasticity*
Goods	0.93	−0.07
Services	1.12	+0.19

SOURCE: Author's computations.

The income elasticities indicate that the response to a 1 percent increase in income is an increase of slightly less than 1 percent (0.93) in the expenditure for goods and an increase of slightly more than 1 percent (1.12) in the expenditure for services. That is, as incomes rise, households tend to spend proportionately more on services and proportionately less (although absolutely more) on goods. As for the effect of education, the table indicates that a 1 percent increase in the number of years of schooling completed by the head-of-household (say, from 10 years to 10.1 years) lowers the expenditure for goods by a fraction (−0.07) and raises, by about one-fifth of 1 percent (0.19), the expenditure for services. So for these broad categories of expenditures, education does affect the pattern of spending in the same way as income: both shift expenditures toward services.[12]

The results for the 15 separate categories of expenditures are shown in Table 9-3. For each consumption item, the table gives the estimated income elasticity, the estimated education elasticity, and the average yearly expenditure on the item by the households in the survey.[13] According to these estimates, households with higher incomes spend a larger portion of their income on food away from home, alcohol, household operations, clothing, leisure, education, automobiles, and other travel. As income rises, expenditures for food at home, tobacco, housing, utilities, house furnishings, personal care, and medical care rise less than proportionately.

If education raises nonmarket productivity equally in all nonmarket activities, the education elasticities for the first set of items should be positive. In fact, positive effects are observed for food

[12] Given that the average of these elasticities is a constant, knowing the results for either one of these two categories is sufficient for determining the results for the other; i.e., if expenditures shift away from goods, they must shift toward services.

[13] These elasticities were estimated by double-log regressions for most of the items. For a few, income-education and income-age interaction terms were included, and for food at home, tobacco, and utilities, a linear form was used. In these cases, where the elasticities are not constant, the table shows the elasticities at the point of means.

TABLE 9-3
Elasticity estimates for 15 items

Expenditure item	*Income elasticity*	*Education elasticity*	*Mean expenditure*
Food for home use	0.526	−0.112	$ 989
Food away from home	1.225	0.205	246
Tobacco	0.519	−0.563	91
Alcoholic beverages	1.611	−0.584	78
Housing	0.990	0.372	658
Utilities	0.463	0.052	249
House operations	1.113	0.314	288
House furnishings and equipment	0.981	−0.059	266
Clothing	1.113	0.083	518
Personal care	0.939	−0.125	145
Medical care	0.831	0.030	340
Leisure	1.299	0.147	245
Education	1.594	1.485	53
Automobiles	1.228	−0.347	693
Other travel	1.378	0.097	77
TOTAL			$4,936

SOURCE: Author's computations.

away from home, housing, utilities, household operations, clothing, medical care, leisure, education, and other travel. For alcohol and automobiles, the positive effects are not observed, whereas they are unexpectedly observed for housing, utilities, and medical care. That is, five of the observations are not consistent with the prediction, and the remaining ten are consistent.

Thus, for two-thirds of these 15 items, or about 60 percent of total expenditure, the evidence suggests that education does shift consumption patterns in a direction which is consistent with its raising nonmarket productivity. Notice that this statement takes account only of the sign of the effects and considers a shift associated with education to be either in the same direction or in the opposite direction from the income effect, with no indication of the magnitudes of these effects. If we disregard those items with small relative effects and look only at those with income and education effects different from the averages by, say, 10 percent, then housing, utilities, house furnishings, clothing, medical care, and other travel are eliminated; of the remaining nine items, seven (or 73 percent of the expenditures) are consistent with a positive, uniform

education effect. Thus for those items with a sizable effect, the evidence is somewhat stronger.

Where consumer goods are viewed as inputs in nonmarket production, the rate of use of the item, or the flow of services per period, is of most relevance. The yearly expenditure on an item reflects its rate of use, but it does so more adequately for items purchased continually than for durable items where purchases are lumpy. Hence, the empirical results are likely to be more reliable for nondurable items. If the three durable goods (automobiles, housing, and household appliances) are excluded from the comparison, the evidence of a positive education effect is again somewhat stronger. For the remaining 12 items, 9 (or 80 percent of the expenditures) are consistent with a positive education effect.[14] Finally, if both the three durables and those items with small effects are disregarded, the remaining subset includes food for home use, food away from home, tobacco, alcohol, household operations, personal care, leisure, and education. Of these eight items, seven (or 96 percent of the total expenditure) are consistent with a positive effect of education on nonmarket productivity.

These adjustments for durables and items with small effects are perhaps appropriate when the model is being judged on the quantity of items or the fraction of expenditure consistent with a positive productivity effect. Another use of these 15 estimates is to combine them into a single estimate of the magnitude of education's effect on income through nonmarket productivity. In this estimate the sizes as well as the signs of the elasticities are utilized, and to avoid prejudicing the results by selecting items on any particular basis, these qualitative results include all 15 items. One measure of the relationship over all the items is the correlation coefficient, which indicates the joint relationship between the two elasticities across the items. A positive value implies that on the average, an item with an income elasticity above 1.0 has a positive education elasticity (consistent with education raising nonmarket productivity); a negative value implies the opposite relationship (consistent with education adversely affecting nonmarket productivity); a correlation coefficient of zero implies that no relationship exists between the two elasticities (consistent with education having no effect on nonmarket productivity). For the 15 items the

[14] Distinguishing between durable and nondurable goods is somewhat arbitrary. If clothing, medical care, and education are also excluded as durables, seven of the remaining nine (or 86 percent of the total) are consistent.

(weighted) simple correlation was +.18, suggesting that, overall, the relationship was a positive one, as described in the first example above.

Another qualitative estimate, and one which indicates the magnitude of the nonmarket effect of education on real income, is a regression coefficient obtained by regressing the observed education elasticity on the observed income elasticity across the 15 items in a particular form.[15] The value of the coefficient, using the estimates in Table 9-3 as observations, is +.08. This can be interpreted as indicating that a 10 percent increase in the educational level (e.g., from the mean of 10.0 years to 11.0 years) is *equivalent* to raising the household's level of total expenditure from $5,000 to $5,040. So, in addition to an effect of education on income through the wage rate, the results here are consistent with education's also having a small positive effect on real income by favorably affecting the household's efficiency in nonmarket production.[16]

AN EVALUATION

The empirical results discussed in this chapter indicate that the level of formal schooling directly influences consumer behavior independently of its effect on money income. Second, the results suggest that the effect of education is not a random or erratic one, but is systematically related to the changes in consumption patterns attributable to differences in levels of income. In addition, the chapter suggests an interpretation of these findings based on the notion of households as nonmarket producers, with education affecting the efficiency of the production process.

[15] The form of the equation used in obtaining the estimate discussed here is $\epsilon_i = \alpha(\eta_i - 1)$, forcing the intercept to be zero, where ϵ_i is the education elasticity of item i and η_i is its income elasticity. For a discussion of the reasons for using this form and for additional estimates of α, see Michael (1972).

[16] Although only this one estimate of the nonmarket efficiency effect will be discussed here, the larger monograph (Michael, 1972) includes numerous others. For example, the regression equation was reestimated including only the nine nondurables: food at home, food away from home, tobacco, alcohol, household operations, personal care, medical care, leisure, and education; and using the constant elasticity form, the value of the coefficient was .50. This suggests that the eleventh year of schooling is equivalent to raising the household's level of total expenditure from $5,000 to $5,250. Obviously, these two estimates are considerably different in magnitude and are, at best, rough estimates.

The monograph also considers a more detailed expenditure classification of 50 items and imposes certain constraints on the entire system of demand equations. Overall, the results are qualitatively similar to the result reported here—education appears to have a small but persistent positive effect.

Two reservations must be stressed. First, the magnitude of the overall effect of education was presented as a particular number, but it is simply a rough estimate and should not be treated as more than that. Second, as with any empirical finding, more than one interpretation is consistent with the observation. Although this chapter has focused on an interpretation based on productivity effects, others can be suggested. For example, one interpretation is to attribute the observed effects to changes in tastes or preferences. In this case, the argument would be that tastes change with education in such a way that more educated households desire, and therefore purchase, more of those items with observed positive education effects. This may or may not be true; it can never be rejected as incorrect since the argument is tautological. Other substantive interpretations can be suggested that do predict the same behavior as the interpretation developed here, but they are subject to the same qualification.

To place this work in perspective, one should bear in mind that economists have generally focused their attention on the effects of education related to wage earnings and material well-being in monetary terms. As a result of their success in this direction, an effort is under way to explore other effects of education on well-being. The framework used in this chapter is one way of approaching some of these other effects. It has the attractive characteristic of translating effects into terminology familiar to an economist, thereby enabling him to utilize his analytical tools in studying these other dimensions of behavior. The joys of pure contemplation and the satisfactions of a happy and healthy family are handled in the framework of commodity production, just as is the satisfaction derived from a well-cooked meal. Applied to households' purchases of market goods and services, the approach appears to be a simple, intuitively plausible, and reasonably effective predictor of observed patterns of behavior. Whether it is also useful in dealing with other aspects of human behavior remains to be determined.

Likewise, on the narrower topic of the effect of education on consumption, much work remains to be done. Some of the issues which need exploration are these: Does the effect of education decrease with additional years of training? Do changes in the husband's and wife's education levels have similar effects? Do informal methods of learning—such as on-the-job training, experience, and self-education—have effects similar to those observed

for formal schooling? Do all types of formal schooling affect consumer behavior similarly, or does a liberal arts education have a different effect from that of a technical or vocationally oriented education? There also remains the question raised at the outset: Is the effect of education the result of the learning process itself or of the knowledge acquired? The study of education and its effects is far from complete; it is hoped that the work on which this chapter reports is further evidence that this field of study is productive.

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