Expenditures of single parents: how does gender figure in?

Regression analysis indicates that, for the most part, expenditure patterns are the same for both families headed by a single father and families headed by a single mother; among the few differences found were effects due to income, marital status, and age

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Over the last few decades, the proportion of traditional two-parent families has been declining. In 1980, married couples headed 81 percent of all family households with their own children under 18. By 1999, the figure had fallen to 72 percent.[1] The change was due mostly to the growth in the number of single-parent households. For example, in 1980, the married-couple households just described numbered slightly under 25 million. In 1999, the figure was slightly *over* 25 million, a small change.[2] By contrast, households headed by a single parent grew from just under 6.1 million in 1980 to nearly 7.8 million in 1999.[3] In total, single-parent families with their own children under 18 accounted for 20 percent of family households in 1980 and 28 percent in 1999.[4]

One explanation for the increase in single-parent families is the high divorce rate in the Nation today. Between 1980 and 1999, the number of divorced persons doubled, from 9.9 million to 19.7 million.[5] Divorce undoubtedly has contributed to the increasing number of single fathers in the United States. In 1980, approximately 616,000 family households with their own children under the age of 18 included a father, but no mother. By 1999, the figure had risen to 1,706,000, an increase of 177 percent.[6] Similarly, over the same period, single-mother households grew from 5.4 million to 6.6 million, an increase of 21 percent.[7] Put another way, single fathers accounted for 2 percent of family households with their own children under 18 in 1980 and 5 percent in 1999. Single mothers accounted for 18 percent of these households in 1980 and 23 percent in 1999.[8]

Child rearing is difficult even when two parents are present. Yet, single mothers and single fathers face the same tasks that married parents do (for example, making sure that children are clean, clothed, and fed; helping with homework; preparing children for school; earning enough money to pay bills; disciplining children; and comforting them when they are upset), but with fewer resources: not only is there no other adult to share in the time spent with children, but in 1998 single parents received less than half the income ($24,530) that husband-and-wife families reported ($59,653).[9] According to Douglas B. Downey, ample literature supports the claim that children from single-parent families are outperformed in the classroom by their counterparts from two-parent families.[10] Downey reports that a leading explanation for this phenomenon is the lower economic status of families headed by a single mother, compared with the economic status of two-parent families.[11] However, he finds that, despite higher levels of education and income for single fathers compared with single mothers,[12] children in single-father families do no better in school thanthose from single-mother families.[13]

Because an increasing proportion of children in the United States reside with one parent only, and because the economic status of single-parent families remains relatively low, research on the economic status of these families is important, regardless of the gender of the parent. For example, profiling the basic economic situation of families in which parents are raising children

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without a spouse can provide useful information for public policymakers. Furthermore, understanding the income sources, expenditure levels, budget shares, and characteristics of single-parent families is useful for those who provide financial, economic, or other counseling to families headed by single parents. Moreover, given that the proliferation of single-father households in the past decade was even more dramatic than that of single-mother households, and in view of the fact that single-father families grew more rapidly than either two-parent or single-mother families in the 1980s, it is important for family researchers to appreciate the heterogeneity among single-parent families.[14] That is, it is useful to ascertain whether there are important differences between consumption levels and budget shares by single mothers and single fathers for various categories of consumption.

Literature review

Expenditure patterns of single-parent families. There is a vast literature examining single-parent families from different perspectives. Using the 1984–85 Consumer Expenditure Survey, Mark Lino examined the allocation of expenditures of single-parent households.[15] His findings show that these households spent 35 percent (the largest share) of their total expenditures on housing, 20 percent on transportation, and 13 percent on food at home. He also found that single-parent households spent 5 percent of their total expenditures on entertainment, 3 percent on health care, and 2 percent on education. In another work, Lino analyzed the expenditures of single-parent families by marital status and found that the total expenditures of single-parent families maintained by a widowed parent reached $22,071, those headed by a divorced or separated parent summed to $16,426, and those maintained by a never-married parent amounted to $7,741.[16] In addition, he found that the shares of total expenditures for all categories compared in the study were similar for the divorced or separated families and the widowed families, but were substantially different for the categories of housing, transportation, and food for never-married parents.[17]

In yet another article, Lino reported on factors influencing the housing, transportation, food, and clothing expenditures of single-parent households, also using data from the 1984–85 Consumer Expenditure Survey.[18] He found that household size, automobile ownership (for transportation), and the gender, age, race, education, and employment status of the single parent were significant factors affecting expenditures. Not surprisingly, he also found that the larger the family size, the greater were the expenditures on transportation and food. The following other significant socioeconomic characteristics of single-parent households were revealed in Lino's study: (1) households headed by women spent 148 percent more on clothing than did households headed by men, all else held constant; (2) the higher the educational level of the single parent, the greater were the expenditures on housing, all else held constant; and (3) whether a single-parent household resided in an urban or a rural area had no significant effect on expenditures for housing, transportation, food, or clothing. Although Lino found that homeownership had no significant effect on housing expenditures for single-parent households, he also found that those who owned an automobile had transportation expenditures higher than did those who did not own an automobile, all else held constant.

A year later, using the 1987 Consumer Expenditure Survey, Lino examined child-rearing expenses in single-parent families.[19] In the database, 91 percent of single-parent households are headed by a woman. The findings indicate that child-rearing expenses increase with the age of the child and with family income. Lino also found that single-parent households spent slightly more per child than did married-couple households in the same income group. Estimated total expenditures for the younger child in a two-child, single-parent household ranged from $3,800 to $5,650 per year for households in the lower income group and from $7,830 to $10,030 per year for households in the higher income group.[20] For both income groups, the largest proportion of child-related expenditures was allocated to housing, while the second-largest proportion was allocated to transportation. This was also the case within each income group, regardless of the age of the child. The smallest share was allocated to health care in each group. The other categories Lino considered were food; clothing; and education, child care, and other expenditures, but no clear patterns emerged for these expenditures.[21]

Comparisons of single- and two-parent families. Sally E. Horton and Jeanne L. Hafstrom compared differences in consumption expenditures between families headed by a single mother (that is, families maintained by a woman without a husband present) and two-parent families, using the 1972–73 Consumer Expenditure Survey.[22] The authors modeled total expenditures and expenditures on six consumption categories (total food, food at home, shelter, household expenses, clothing and cleaning, and recreation and reading) as functions of current and permanent income.[23] The major focus of the study was to examine whether families headed by a single mother would change their expenditures on selected items by the same percentage as two-parent families, given the same percentage increase in income for each type of family. The major finding was that only the two families' expenditures for shelter differed significantly. That is, the authors estimated that married couples would increase their expenditures for shelter by a larger percentage (0.60 percent), given a 1-percent increase in (current) income, than would single mothers (0.26 percent). However, the authors also found that, for each of the two types of family, a 1-percent increase in current income was associated with a 1-percent increase in expenditures for recre-

ation and reading.[24] Lino's study, which included single-parent families maintained by fathers and used data from the more recent 1984–85 Consumer Expenditure Survey,[25] found that families maintained by single fathers did not have different expenditure patterns for housing, transportation, or food, all else held equal, than did families maintained by single mothers. However, Lino did find a significant gender difference in expenditures for clothing. (Families headed by single mothers spent more.)

Using the 1984–86 Consumer Expenditure Survey, Maureen Boyle compared the spending patterns and income of single parents and married parents.[26] Married parents, on average, had more than twice as many vehicles as single parents had, and they also had a higher rate of homeownership. Single parents spent less than married parents for major expenditure categories (food, housing, transportation, and apparel), even when "per capita" expenditures were compared. However, on a per capita basis, single parents spent more than married parents on some items, such as utilities, fuels, and public services ($545, compared with $519); babysitting and day care ($142, compared with $106), and clothing for boys aged 2 to 15 years ($43, compared with $33). Single parents also spent less on food away from home, entertainment, personal care, reading, personal insurance, and pensions than did married parents. However, single parents spent more on miscellaneous expenditures, which included legal fees, than did married parents. The expenditures for education, tobacco and smoking supplies, and cash contributions were not significantly different between single and married parents. Similarly, single parents appeared to spend more per capita ($68) than did married parents ($6) on public transportation, but the difference was not statistically significant.

Mohamed Abdel-Ghany and F. N. Schwenk also examined differences in consumption patterns of single-parent and two-parent families for six major expenditure categories.[27] The major hypothesis of their study was similar to that of Horton and Hafstrom: the consumption patterns of single- and two-parent families differ as regards major expenditure categories. However, Abdel-Ghany and Schwenk analyzed more recent data, obtained from the 1989 Consumer Expenditure Survey. They compared the influence of permanent income, family size, geographical region, race, gender, age, and education of the head of the family on the major expenditure categories. Using the Chow test for equality of the entire set of single-parent and two-parent regression coefficients, they found that the five expenditure categories of total food, food at home, household expenses, apparel, and recreation and reading had a significant *F*-statistic. This means that the consumption patterns of the two groups with regard to those five categories were significantly different. (Only expenditures for shelter were found to be essentially the same.) This finding contrasts with Horton and Hafstrom's that only expenditures for shelter *differed* significantly between the two groups. The discrepancy may lie in the fact that Horton and Hafstrom compared one specific determinant of expenditures (income), whereas Abdel-Ghany and Schwenk compared models as a whole, through the Chow test.

In sum, several studies have analyzed the expenditures of single-parent families, and a number of studies have compared differences in consumption expenditures between families headed by single mothers and two-parent families. Yet, despite the fact that single parenting has become commonplace, only limited scholarly attention has been paid to the expenditure patterns of single fathers compared with those of single mothers. Nevertheless, the gender of single parents may play a critical role in a family's expenditure patterns. Understanding the differential expenditures between the two sexes is important, especially given the increasing number of single-father households. Indeed, one study suggests that using the characteristics of female-headed single-parent families to represent all single-parent families is no longer possible, considering the rapid increase in the number of single-father families during the past two decades.[28]

The analysis in this article

By comparing levels of expenditures and budget shares of single-mother and single-father households, this article examines whether there are differences in household consumption patterns based on the gender of the parent. If there are, such differences may translate into differences in economic well-being in single-mother and single-father households, particularly for children in those households.

One reason for the aforementioned lack of attention to gender-related differences is the absence of separate data on single-mother and single-father households. This article uses data from a nationwide survey to compare major expenditures for the two kinds of household. The data for the survey are collected from national probability samples of households in the U.S. population.[29] Selected for study are 221 single-father and 1,660 single-mother families.

The data. The data used in this article are from the Interview component of the Consumer Expenditure Survey. The Interview component is a panel survey designed to collect expenditure information from families over five consecutive quarters. During each interview, the respondent is asked to recall the family's last 3 months' expenditures for most items listed in the survey. The first interview is used for bounding purposes—that is, to make sure that the expenditures subsequently reported actually took place during the reference period. (For example, a family that purchased a refrigerator during the 3 months prior to the first interview should report the purchase during the first interview. If the respondent for that same family then reports purchasing a refrigerator in the second inter-

view, the interviewer can make sure that the respondent is not referring to the same refrigerator reported in the first interview.) The Interview component of the Consumer Expenditure Survey is designed primarily to collect accurate information on recurring (for example, rent or insurance) and "big ticket" (for instance, automobiles or major appliances) expenditures, because outlays for such items tend to be remembered for long periods. As it turns out, the Interview component actually covers up to 95 percent of *all* expenditures.[30] (The Interview component is also the source of Consumer Expenditure Survey data used in the works described in the previous section.)

The sample that is examined in this article consists of single parents, interviewed in 1998 or 1999, who live with their own children only. That is, no other relatives or unrelated persons live with these individuals, so that no one (other than, perhaps, their children) shares in or otherwise directly affects their expenditure decisions. The parents are also between the ages of 25 and 49, and their oldest child is under 18 years. The parents' age range of 25 to 49 years is used for both a theoretical and an empirical reason. The theoretical reason is to narrow the focus to parents who are old enough to have established themselves economically. That is, they are not financially dependent on someone else strictly because of their age, and they are legally old enough to obtain substantial employment, to own or rent a home, to purchase, rent, or lease a vehicle, and to have been "of age" for at least a few years. In addition, although they may have children preparing for college or other events, the parents themselves are probably not expecting major events in their own careers, such as imminent retirement, nor are they experiencing age-related health problems that may have a great impact on their spending patterns. The empirical reason is that the sample for men is extremely small below age 25: during the 2 years covered in the survey, only 11 single fathers under age 25 participated. By comparison, during the same period, there were 13 single fathers between the ages of 25 and 27 alone. The children's age was selected to ensure that the children would be financially dependent on their parents.

Demographic analysis. Table 1 shows the demographic composition of single parents in the sample selected for study. The vast majority is female; in fact, women outnumber men in the sample by more than 7 to 1. Obviously, women are represented in the single-parent category at a much higher rate than they are in the general population, and males are underrepresented. But this is only one of many differences across gender.

Despite the deliberate selection of men and women in the same age range (25 to 49 years old), men are still 4 years older than women, on average. They also have fewer children (1.4) than women have (1.8), and about twice as many vehicles (2.1, compared with 0.9). It is interesting to note that although both men and women own about one automobile, on average, men have many more "other" vehicles—primarily recreational vehicles (such as boats, campers, and motorcycles), but also trucks and vans. In addition, men are more likely than women to own at least one vehicle (91 percent, compared with 72 percent).

The circumstances of single parenthood also differ dramatically by gender. Three-fourths of all single fathers have become single due to divorce, compared with a bit more than half (54 percent) of single mothers. The death of a spouse is equally likely for both groups (6 percent) and could be a function of age, given that both groups presumably have similar mortality rates under age 50. Single mothers are twice as likely as single fathers never to have been married, but still, a substantial proportion of the fathers—nearly 1 in 5—has never been married.

Race and ethnicity play an interesting role in this analysis. Of all interviews conducted in 1998–99, 11.2 percent involve families whose reference person is black, and 8.5 percent report Hispanic ethnicity.[31] However, in the distribution by gender among single parents, blacks are overrepresented (30.7 percent of women and 13.1 percent—only a slight overrepresentation—of men). In contrast, Hispanic men are underrepresented (5.4 percent), although Hispanic women also are overrepresented (13.7 percent).

Single fathers are much more likely than single mothers to own their homes. In fact, the numbers are almost exactly opposite with regard to owning and renting: nearly two-thirds of single fathers (64 percent) own their homes, while nearly two-thirds of single mothers (63 percent) rent their homes. Like income, homeownership is an important measure of economic well-being. For example, because owners can build equity in their property, they have greater access to loans in case of emergency or even planned-for events, such as their children's education.

Income. Income is an important measure of the ability of parents to provide basic goods and services for their children. Table 2 shows that there are large differences in income between single fathers and single mothers, at least for complete reporters.[32]

The income distribution by gender is quite different for single mothers and single fathers. Men are underrepresented in the two lowest quintiles, with slightly more than one-fourth of single fathers reporting incomes placing them there. By contrast, five-eighths of single mothers are found in that part of the distribution. Single fathers also are about 3 times as likely (47 percent) to appear in the highest two quintiles than are single mothers (15 percent).

Similarly, single fathers report almost twice as much income ($44,634) as do single mothers ($23,188). Also, while single fathers report more income from employment (wages

Table 1. Demographic characteristics of single parents, Consumer Expenditure Interview Survey, 1998–99

Variable	Single parents		*t*-statistic (absolute value)
	Men	Women	
Number of consumer units (sample size)	221	1,660	...
Characteristics of consumer units:			
Age of reference person	39.7	35.3	10.60
Average number per consumer unit:			
Persons	2.4	2.8	9.77
Children under age 18	1.4	1.8	9.77
Earners	1.2	1.0	5.80
Vehicles	2.1	.9	10.78
Automobiles	.9	.8	2.59
Other vehicles[1]	1.2	.2	9.59
Rooms other than bedrooms	3.2	2.8	4.33
Bedrooms	2.7	2.6	1.61
Bathrooms and half baths	1.6	1.5	2.68
Percent distribution:			
Marital status of reference person:			
Divorced	75.1	54.3	...
Widowed	6.3	6.4	...
Never married	18.6	39.3	...
Age of oldest child:			
Under 6 years	7.7	16.2	...
6 to 11 years	33.9	34.9	...
12 to 17 years	58.4	48.9	...
Housing relation:			
Homeowner	63.8	37.2	...
With mortgage	52.5	28.6	...
Without mortgage	11.3	8.6	...
Renter	36.2	62.9	...
Race of reference person:			
Black	13.1	30.7	...
Ethnic origin of reference person:			
Hispanic	5.4	13.7	...
Education of reference person:			
Less than high school graduate	10.0	16.5	...
High school graduate	29.0	34.8	...
Attended college (did not graduate)[2]	32.6	33.4	...
College graduate	28.5	15.2	...
Number of earners:			
No earners	1.8	14.9	...
One earner	82.4	74.6	...
Two or more earners	15.8	10.5	...
Earner composition:			
Reference person only	81.9	73.6	...
Reference person and at least one child	15.8	10.4	...
Child(ren) only	.5	1.0	...
No earners	1.8	14.9	...
Occupation of reference person:			
Wage and salary earners	85.5	80.6	...
Manager or professional	32.1	21.1	...
Technical/sales	17.2	33.3	...
Service	7.2	16.7	...
Laborer/operator	29.0	9.5	...
Self-employed	12.2	3.4	...
Not working	2.3	16.0	...
Taking care of home or family	.5	10.9	...
Retired, unemployed, and other not working	1.8	5.1	...
Region of residence:			
Northeast	20.8	14.5	...
Midwest	24.0	25.7	...
South	24.9	34.5	...
West	30.3	25.4	...
Degree of urbanization:			
Rural	8.6	6.4	...
At least one vehicle owned	91.4	72.1	...

[1] Includes truck or van; motorized, trailer-type, or attachable camper; motorcycle, motor scooter, or moped; boat, with or without motor; trailer (other than camper type); private plane; and other vehicles.

[2] Includes those who earned an associate-of-arts (AA) degree.

and salaries or self-employment) and savings and investment (interest, dividend, rental, and other property income), single mothers report much more income from assistance sources (for example, unemployment, workers' compensation, public assistance, alimony, and child support). Whereas, on average, about 1 percent of single fathers' total income comes from assistance sources, nearly 18 percent of single mothers' total income comes from these sources.

There are several factors that may explain these differences. First, as shown in table 1, although the average number of earners is similar for single fathers (1.2) and single mothers (1.0), the likelihood of having at least one earner is quite different: less than 2 percent of consumer units headed by single fathers have no earner, compared with 15 percent of consumer units headed by single mothers.[33] Also, families headed by single fathers are more likely to have multiple earners (16 percent) than are families headed by single mothers (11 percent).

Second, single fathers have a higher level of educational attainment than single mothers. About 61 percent of single fathers have at least attended college, compared with about 49 percent of single mothers. Similarly, 1 in 6 single mothers has not graduated high school, compared with 1 in 10 single fathers. Lower levels of education may also explain lower incomes for single mothers.

Expenditure patterns. Given differences in income, it is not surprising that single fathers spend more each quarter on many items, such as shelter and utilities, than do single mothers. Even so, the two genders spend about the same on a large number of items.

According to table 3, single mothers spend a little bit less, on average, each quarter for food at home ($847) than do single fathers ($883).[34] However, this difference is not statistically significant. Similarly, for most apparel and services, both types of family spend about the same, on average. The lone exception is that single mothers spend significantly more ($44) for children's apparel than do single fathers. Expenditures for babysitting and day care are also similar by gender, and so are expenditures for public transportation, despite the fact that single mothers are less likely to have a vehicle than are single fathers, as noted earlier.

Levels of expenditure are not the only important measure of spending patterns: expenditure shares—the portion of the

Table 2. Income sources of single parents, Consumer Expenditure Interview Survey, 1998–99

Variable	Single parents		*t*-statistic (absolute value)
	Men	Women	
Number of consumer units (complete income reporters only)	177	1,347	...
Income distribution (percent in each quintile):			
Quintile 1	7.3	31.3	...
Quintile 2	18.1	31.6	...
Quintile 3	27.1	21.7	...
Quintile 4	29.9	12.1	...
Quintile 5	17.5	3.3	...
Income before taxes	$44,634	$23,188	7.36
Wages and salaries	37,796	17,835	7.98
Self-employment	6,135	965	2.38
Interest, dividend, rental, and other property income	203	115	.80
Unemployment, workers' compensation, and veterans' benefits	104	164	1.06
Public assistance, supplemental security income, and food stamps	87	1,499	14.86
Regular contributions for support (such as alimony and child support)	55	1,702	15.93
Other income	254	908	4.67
Share of total income before taxes (complete reporters only, percent)	100.0	100.0	...
Wages and salaries	84.7	76.9	...
Self-employment	13.7	4.2	...
Interest, dividend, rental, and other property income	.5	.5	...
Unemployment, workers' compensation, and veterans' benefits	.2	.7	...
Public assistance, supplemental security income, and food stamps	.2	6.5	...
Regular contributions for support (such as alimony and child support)	.1	7.3	...
Other income	.6	3.9	...
Percent reporting:[1]			
Wages and salaries	91.0	82.4	...
Self-employment	13.6	5.2	...
Interest, dividend, rental, and other property income	28.2	7.9	...
Unemployment, workers' compensation, and veterans' benefits	6.8	3.9	...
Public assistance, supplemental security income, and food stamps	4.5	29.5	...
Regular contributions for support (such as alimony and child support)	5.1	33.7	...
Other income	6.2	11.3	...

[1] Numbers add to more than 100 percent, because some families report more than one source of income.

Table 3. Average quarterly expenditures of single parents, Consumer Expenditure Interview Survey, 1998–99

Variable	Single parents		*t*-statistic (absolute value)
	Men	Women	
Average quarterly outlay	$9,435	$6,074	7.18
Food at home (less trips)	883	847	1.11
Shelter and utilities (less trips)	2,725	2,059	3.88
Apparel and services	295	315	.74
Adults' apparel (for members 16 years and older)	109	103	.39
Children's apparel (for members 15 years and younger)	85	129	3.93
Footwear	40	38	.44
Other apparel and services	61	45	1.34
Transportation (less trips)	1,558	766	3.39
New-car or -truck purchases	206	104	2.94
Used-car or -truck purchases	668	219	1.95
Other vehicle purchases	50	([1])	...
Gasoline and motor oil	221	155	5.23
Other vehicle expenses (licenses, insurance, rentals, etc.)	400	272	3.47
Public transportation (local, less trips)	13	17	1.02
Health care	350	227	2.90
Health insurance	238	108	3.58
Medical services	85	86	.06
Prescription drugs	19	22	.62
Medical supplies	8	11	1.19
Entertainment and recreation	1,096	599	4.72
Local entertainment	858	474	4.85
Food away from home (less trips)	361	185	6.50
Fees and admissions (less trips)	96	51	3.80
Pets, toys, and playground equipment	55	57	.15
Other entertainment equipment and services (less trips)	322	161	2.35
Reading	24	21	1.18
Trips and travel	238	125	1.87
Miscellaneous child-related expenditures	191	226	1.12
Personal-care products and services	53	65	2.16
Babysitting and day care	138	161	.73
Personal insurance and pensions	920	415	8.35
Life and other insurance	70	39	3.47
Pensions and Social Security	850	377	7.96
All other outlays	1,417	620	3.44
Alcohol (less trips)	90	23	6.10
Housing upkeep	283	248	.64
Domestic services	11	27	3.64
Other household expenses	22	17	1.45
Household furnishings and equipment	249	204	.85
Education	98	77	.63
Tobacco and smoking supplies	97	53	3.72
Cash contributions (including alimony and child support)	568	52	2.53
Miscellaneous outlays	281	167	1.51

[1] No data reported.

average dollar allocated to a particular expenditure category—also are important. One of the most famous applications in economics is known today as *Engel's law*. In 1857, Prussian economist Ernst Engel found that as income increases, the share of income allocated to food decreases. The implication of this finding is straightforward: essentially, there are some goods and services that all persons must consume to survive, but the quantity needed is limited; therefore, as income increases, less and less of it needs to be allocated to these items, and more of it is available for spending on other items. Thus, families that allocate larger portions of their income to basic items like food have less to spend on "electives" such as entertainment. With Engel's law in mind, shares analysis may give a more meaningful description of family expenditure patterns than can levels alone.

For example, as noted, families headed by single mothers spend less for food at home than do those headed by single fathers, although the difference is not statistically significant. However, the *share* of total outlays is greater for the single-mother families by nearly 5 percentage points.[35] (See table 4.)

Similarly, spending for children's apparel by families headed by single mothers exceeds spending by families headed by single fathers by about 52 percent; however, the share of total expenditures allocated to children's apparel in single-mother families is double (2 percent) the share spent in single-father families (1 percent). And again, despite similar levels allocated to babysitting and day care, families headed by single mothers allocate nearly double the share (2.7 percent) that families headed by single fathers allocate (1.5 percent). Finally, total spending for shelter and utilities by single fathers accounts for less than 3 of every 10 dollars spent, whereas shelter and utilities accounts for 3 of every 9 dollars spent (that is, one-third of total expenditures) by single mothers.

For goods and services that are more "discretionary" in nature, such as recreation, the reverse obtains: shares are closer, but expenditures by women are much smaller. For example, single fathers allocate 9 percent of their total expenditures to food away from home, compared with 8 percent by single mothers. However, single mothers actually spend about one-half ($185) of the amount that single fathers spend on this item ($361) each quarter. And the same holds true for fees and admissions: both groups allocate about 1 percent of their total expenditures to these items, but the households headed by women again spend about half ($51) of what those headed by men spend ($96).

Methodology: regression analysis

So far, several differences in expenditure patterns have been observed for single-father and single-mother families. But at the same time, several demographic differences have been observed. Perhaps more important, large differences in income and total spending are evident. Therefore, it is impossible to say how much of the difference in expenditure patterns is due to the difference in gender of the single parent and how much is due to other socioeconomic phenomena.

To help understand these relationships, regression analysis is often used. In regression analysis, comparisons can be made under "*ceteris paribus*" assumptions—that is, all characteristics are held equal except the one under study. In this article, then, regression analysis may help to uncover how single fathers and single mothers might allocate their expenditures, given the same total income, age, family size, and other factors.

In what follows, several items are selected for regression analysis. Some (for example, food at home; shelter and utilities; and apparel and services) are chosen because they represent basic goods and services that any family or individual needs to meet the essentials of existence. Others (for instance, transportation; and babysitting and day care), while not necessary for the preservation of life, are still goods and services that most families with children would find difficult to forego.[36]

Table 4. Expenditure shares of single parents, Consumer Expenditure Interview Survey, 1998–99

[In percent]

Variable	Single parents	
	Men	Women
Average quarterly outlay	100.0	100.0
Food at home (less trips)	9.4	13.9
Shelter and utilities (less trips)	28.9	33.9
Apparel and services	3.1	5.2
Adults' apparel (for members 16 years and older)	1.2	1.7
Children's apparel (for members 15 years and younger)	.9	2.1
Footwear	.4	.6
Other apparel and services	.6	.7
Transportation (less trips)	16.5	12.6
New-car or -truck purchases	2.2	1.7
Used-car or -truck purchases	7.1	3.6
Other vehicle purchases	.5	[1]
Gasoline and motor oil	2.3	2.6
Other vehicle expenses (licenses, insurance, rentals, etc.)	4.2	4.5
Public transportation (local, less trips)	.1	.3
Health care	3.7	3.7
Health insurance	2.5	1.8
Medical services	.9	1.4
Prescription drugs	.2	.4
Medical supplies	.1	.2
Entertainment and recreation	11.6	9.9
Local entertainment	9.1	7.8
Food away from home (less trips)	3.8	3.0
Fees and admissions (less trips)	1.0	.8
Pets, toys, and playground equipment	.6	.9
Other entertainment equipment and services (less trips)	3.4	2.7
Reading	.3	.3
Trips and travel	2.5	2.1
Miscellaneous child-related expenditures	2.0	3.7
Personal-care products and services	.6	1.1
Babysitting and day care	1.5	2.7
Personal insurance and pensions	9.8	6.8
Life and other insurance	.7	.6
Pensions and Social Security	9.0	6.2
All other outlays	15.0	10.2
Alcohol (less trips)	1.0	.4
Housing upkeep	3.0	4.1
Domestic services	.1	.4
Other household expenses	.2	.3
Household furnishings and equipment	2.6	3.4
Education	1.0	1.3
Tobacco and smoking supplies	1.0	.9
Cash contributions (including alimony and child support)	6.0	.9
Miscellaneous outlays	3.0	2.7

[1] No data reported.

The remaining items (food away from home; fees and admissions; pets, toys, and playground equipment; and trips and travel) may not be necessary to sustain life or the basic daily functioning of the family, but they represent activities that are important for other reasons. For example, families may occasionally consume food away from home for reasons of conven-

ience. This category includes all food purchased at restaurants or carryouts, regardless of where it is consumed. A single parent who works long hours might find it more convenient, then, to purchase a pizza from a local establishment, rather than coming home and cooking (and thus delaying the children's meal even longer). Moreover, the availability of food away from home may allow the parent time to earn extra income to help purchase other goods and services for the family. Similarly, the other items tested are, arguably, important for a child's physical or mental and emotional development. For instance, a child may learn responsibility by caring for a pet, may obtain social skills by sharing games and toys with others, and may get exercise from using playground equipment. Finally, taking trips and traveling may be a means of relaxation for adults, but can be opportunities for children to learn about the world outside their neighborhoods.

In this analysis, one expenditure category that could easily be defined as "basic" has been purposely omitted: health care. The reason for this omission is that the results of such an analysis are not easily interpreted. In the Consumer Expenditure Survey, it is information on total out-of-pocket expenditures that is collected for health care items, rather than information on the actual amount of health care that is consumed. That is, if a child in an "insured" family receives the same inoculations and other treatments as a child in an "uninsured" family, the actual amount of health care consumed is the same. However, the insured family might report no expenditures for health care—other than, possibly, an insurance premium—while the uninsured family would report the amount paid to the health care professional administering the services. Furthermore, differences in other kinds of health care expenditures may not be clearly ascribable. For example, two families may have identical health insurance policies, but one policy may be employer sponsored and the other may not. Therefore, the health care expenditure for the employer-assisted family will be lower than that for the unassisted family. In addition, some facts about the policy are not clear. For instance, information on the *number* of persons covered by the policy is collected in the survey, but information on the *identity* of each person covered is not. Thus, if one person in a single-parent family is covered by health insurance, it is not clear whether it is the parent or a child who is covered. Even if two or more persons are covered by different policies, it is possible that the policies all cover the same person. Because of these issues, a thorough examination of health care expenditures is beyond the scope of this article.

In what follows, two types of regression analysis are performed. The *method of ordinary least squares* is used to analyze all of the selected expenditure categories. That way, the basic relationships mentioned earlier (such as the relationship of expenditure to income) can be examined. The method of ordinary least squares works well enough for expenditures that are universally purchased, such as food at home or shelter and utilities. However, for other items, far less than 100 percent of families report the expenditure. (See table 5.) This can be for several reasons. For example, some items, such as clothing, are reasonably durable, and it may be that the family did not need to purchase those items during the previous 3

Table 5. Percent of single parents reporting selected expenditure categories, Consumer Expenditure Interview Survey, 1998–99

Variable	Single parents		
	Men	Women	Chi-square
Average quarterly outlay	100.0	100.0	[1]
Food at home (less trips)	100.0	99.6	[1]
Shelter and utilities (less trips)			
Homeowners	100.0	100.0	[1]
Renters	100.0	99.4	[1]
Apparel and services:			
Adults' apparel (for members 16 years and older)	54.3	58.0	1.07
Children's apparel (for members 15 years and younger)	50.2	67.9	[2]27.05
Transportation (less trips)	96.4	89.9	[2]9.72
Entertainment and recreation:			
Local entertainment:			
Food away from home (less trips)	91.4	81.7	[2]12.95
Fees and admissions (less trips)	66.5	47.8	[2]27.41
Pets, toys, and playground equipment	43.4	44.0	.02
Trips and travel	36.7	25.2	[2]13.01
Miscellaneous child-related expenditures			
Babysitting and day care	20.4	29.9	[2]8.72

[1] The chi-square test is invalid when 100 percent of at least one group reports the expenditure in question.

[2] The chi-square statistic is statistically significant at the 99-percent confidence level. Note that chi-square values between 3.84 and 6.63 are significant at the 95-percent confidence level. By coincidence, for this set of data, all chi-square statistics are significant either at the 99-percent level or not at all.

months. Other items, such as fees and admissions or food away from home, may be infrequently purchased due to the tastes and preferences of the family itself or because the family's income may be too low (temporarily or permanently) to afford those items on any but the rarest occasions. Whatever the reason, for several items, logistic regression, or "logit" is used to predict the probability of their purchase. The logit results are then used to weight the ordinary-least-squares results so that a more accurate picture of the family's spending patterns develops. If the aim is truly to measure the expected outcome for the average family, one needs to take into account the fact that the average family has a less-than-100-percent chance of purchasing several items, as well as the possibility that probability is influenced by demographics, just as the level of expenditure (once a decision is made to purchase something) may be so influenced. The resulting process is essentially a modified version of the Cragg model. (See Appendix A for more information on the methodology.) The expenditure category of shelter and utilities offers a special case. Homeowners are expected, a priori, to have different expenditures than renters have for shelter and utilities, even if the dwelling is the same size and at the same location. However, each group is expected to have *some* expenditure for this item. In this case, logit analysis is also used to predict the probability of renting the home. Then the method of ordinary least squares is employed in separate models for owners and renters, and the results are analyzed, comparing single mothers who own with single fathers who own and, similarly, single mothers who rent with single fathers who rent.

In addition, ordinary-least-squares regressions can be affected by problems such as heteroscedasticity, a condition in which the error produced in the regression is not random for the dependent variable, so that the observed values will not vary consistently around the regression line. One case in which heteroscedasticity appears is when the dependent variable is not normally distributed. However, if the underlying distribution is known, it is possible to convert the variable to something that is—or at least that approaches being—normally distributed. For example, if the data are lognormally distributed, then regressing the logarithm of the dependent variable on various characteristics should result in unbiased ordinary-least-squares estimators.[37] In the analysis to be presented here, a program was run to find the appropriate Box-Cox transformation of the data. The results showed that in all cases, the fourth root was an appropriate transformation of the data. (That is, before any regression was carried out, the square root of the square root of each dependent data point was obtained; then, that fourth root was subsequently used in the regression.)

The Box-Cox transformation is also used for total quarterly outlays, which are employed as a proxy for permanent income in this study. "Permanent" income is used in the regressions instead of current (that is, annual pretax) income because, according to the "permanent-income hypothesis," expenditures are usually made with expectations of future earnings in mind.[38] In the present situation, the distinction is particularly interesting, because, as shown in table 2, the sources of income acquired by the two groups under study are quite different and may lead to very different expectations of future income. Other factors, such as homeownership, might also influence expectations in different ways, even if current incomes (and sources) are identical. (See the earlier section, "Demographic analysis," for some examples.) According to the permanent-income hypothesis, total outlays reflect rational decisions based on levels of wealth (rather than income alone) that are available to the consumer unit; therefore, such outlays serve as a better indicator of the consumer unit's tastes and preferences for particular goods and services than does income.

Most of the logit regressions contain identical independent variables, most of which are binary. These variables are used to estimate the relationship between the probability of purchasing a given item and various characteristics, including the age of the reference person[39] (35 to 44 years or 45 to 49 years); the reference person's marital status (widowed or never married); the number of children of the reference person (two children or three or more children); the age of the oldest child (under 6 years or 12 to 17 years); homeownership (homeowner with mortgage, homeowner without mortgage, or omitted from the regression for which the probability of renting is estimated); race of the reference person (black); ethnic origin of the reference person (Hispanic); educational attainment of the reference person (less than high school graduate, attended college, or college graduate); number and composition of earners (one child or children only earn, or reference person and at least one child earn); occupational status of the reference person (self-employed, taking care of home or family and so not working, or not working for some other reason); region of residence (Northeast, Midwest, or West); degree of urbanization of residence (family lives in a rural area); and gender of the reference person (male). (For an explanation of omitted categories in the preceding list, see "Control group," later in this section.) There is one continuous variable, as noted earlier: the fourth root of total outlays, used as a proxy for permanent income. Also included is an interaction term created by multiplying the binary variable "male" by the permanent-income proxy. This interaction term allows the probability of purchase of an item to change with income at a different rate for men and women. If the coefficient of the interaction term is statistically significant, then there is a difference in the income effect for single fathers compared with single mothers.

The same variables also are used in the ordinary-least-squares regressions. However, a few other variables are added. Some of these variables are model specific. For example, in the transportation model, a binary variable is added indicating that the con-

sumer unit owns no vehicles. Obviously, this would affect transportation expenditures by cutting costs, for example, for gasoline and driver's licenses, and possibly raising costs for public transportation, automobile rentals, and other, similar expenses. However, it is not clear a priori whether owning no vehicles would directly affect other expenditures. Similarly, in the model for shelter and utilities for homeowners, a binary variable is included indicating that the family owns its home with no mortgage. The shelter and utilities model also has variables that account for the size of the dwelling (total number of rooms and total number of bathrooms or half baths). Both expenditures for mortgages and expenditures for rents are expected to increase with the number and size of the rooms, as are expenditures for utilities, because, presumably, more fuel and electricity are required to manage a larger dwelling. (There is more of a need for temperature control, more space to vacuum, etc.). Some variables are excluded from specific models. For example, the binary variable for "renter" is removed from all shelter and utility ordinary-least-squares regressions, because, by definition, the value of that variable would be 0 for all families in the homeowner model and 1 for all families in the renter model. Similarly, the variable for homeowners with mortgage is excluded from both shelter and utilities regressions, as is the variable for homeowners with no mortgage from the renters-only model. Also, as it turns out, all families who reported trips and travel had a working reference person. Therefore, the binary variable indicating that only children work in the family is excluded from the associated regression. Finally, two sets of interaction terms are added to each of the models: male and marital status (widowers or bachelors); and male and age (men 35 to 44 years old or men 45 to 49 years old).

The selection of these variables was based on a combination of intuition and empiricism. First, variables were selected for general control of variance. For example, a priori, one can assume that characteristics such as the age of the reference person affect the tastes and preferences of the family decisionmaker. (This is because, presumably, the reference person *is* the family decisionmaker as far as expenditures are concerned.) And similarly, the location of the consumer unit (for example, the geographical region of the residence and the degree of urbanization of the surrounding area) may affect prices or the availability of goods and services, in which case they will also affect the probability of purchasing an item, as well as expenditure levels. At first, all binary variables were interacted with "male" to test whether any of them might be differently related to the expenditures of single fathers compared with single mothers (for example, to test whether single fathers in the Northeast spend money differently from single mothers in the Northeast). However, the coefficients for the interaction terms were rarely statistically significant, so, to reduce potential problems from multicollinearity or overspecification, these variables were dropped from the models. In the logit models, only the binary variable "male" and the male-income interaction term were retained (the former to control for "general" differences by gender, the latter, as noted, to test whether single fathers and single mothers respond differently to changes in permanent income). In the ordinary-least-squares model, the interactions for marital status, age, and number of children were retained because these variables had at least one statistically significant coefficient in several models. That is, in one model, only age 35 to 44 might have a statistically significant coefficient, and in another model, only age 45 and older might, but clearly, in either case age was an important factor.

Control group. As noted earlier, in order to make comparisons, it is important for "*ceteris paribus*" to hold; that is, "all other things" must be "held equal." Therefore, a control group is defined for the purposes of analysis. In this article, the control group consists of single mothers who are between 25 and 35 years old; are divorced; rent their homes; are neither black nor Hispanic; are high school graduates; are the sole earner in their consumer unit; work for a wage or salary; live in the urban South; own at least one vehicle; have average permanent income; and have an only child between 6 and 11 years old. These families are compared with single fathers with the same characteristics. In both cases, as regards shelter and utilities, renters are assumed to live in a dwelling containing five rooms (including bedrooms) and one bathroom, while owners are assumed to have a mortgage and live in a home with six rooms and two bathrooms if the household is headed by a woman and seven rooms and two bathrooms if the household is headed by a man.

Note that single fathers have a much larger permanent income, on average ($9,435), than single mothers have ($6,074) and that, for owners, the number of rooms differs by gender. This actually violates the *ceteris paribus* condition, in that it is not clear how much of the differences that are observed are due purely to gender and how much are due to differences in permanent income or the size of the dwelling. Indeed, these differences may be due to some of the underlying characteristics discussed earlier. (For example, on average, single fathers have higher levels of education than single mothers have, but perhaps those with identical education have the same permanent income.) Nonetheless, the results of the analysis are found with the use of these differences so that the "typical" family headed by a single father can be compared with the "typical" family headed by a single mother. Even though there may actually be no family with exactly the characteristics of the "typical" family, many may at least be close. (For the reader who is interested in pure *ceteris paribus* comparisons, such results are presented in tables B–1 and B–2 of Appendix B.)

Analysis of results

Probability of purchase. In examining the probability that a certain item will be purchased, one readily finds that there is

little difference between single fathers, on the one hand, and single mothers, on the other, with respect to the goods studied in this article. Some purchases may *appear* to be substantially different; for example, single fathers are predicted to be fairly likely to purchase fees and admissions (62-percent probability of doing so), while single mothers are predicted to have nearly even odds of purchase (53 percent). (See table 6.) Still, despite the 9-point difference in these probabilities, neither the binary variable "male" nor the interaction with permanent income has a statistically significant coefficient.[40] In other words, there is no "underlying" difference between single fathers and single mothers that causes a change in the probability of their purchasing an item, nor does a change in income affect their likelihoods of purchasing the item in any different way. In fact, in only one case examined is the difference in probability of purchase based on any statistically significant coefficients: for apparel and services for children, the male-permanent income interaction variable is statistically significant at the 95-percent confidence level. The results of the analysis show that single mothers are much more likely (63 percent) to have purchased apparel and services for children in the 3 months prior to the survey than are single fathers (48 percent).

Another set of logit results warrants analysis: probability of homeownership. As mentioned earlier, homeownership has implications for the economic well-being of the consumer unit. The regression results predict the probability of being a renter.

Several factors influence this probability for single parents. For example, the older the reference person is, the less likely the family is to rent.[41] This is probably because older parents have had the time to save for a downpayment on a home, to obtain (and maintain) secure employment, and other factors. They may also earn more income than their younger counterparts, but this condition is controlled for in the regression analysis. By contrast, having a large family substantially increases the probability of renting. For single fathers, the odds rise from about even (51 percent) for those with small families to probable (61 percent) for those with large families; for single mothers, the probability rises from 2 out of 3 (67 percent) for those with small families to 3 out of 4 (75 percent) for those with large families. These results are calculated for families that are identical to the control group, but that have at least three children. This is again probably a "savings" effect, although the data do not include information on how long the existing family structure has prevailed. Still, the presence of two (or more) additional children presumably adds to a family's expenditures, but not to its income.

Table 6. Probabilities of purchase

Variable	Single parents	
	Men	Women
Permanent income (quarterly outlays)	$9,435	$6,074
Probability of purchase (percent):		
Apparel and services (adults)	47.1	55.9
Apparel and services (children)	47.6	[1]63.2
Transportation (less trips)	98.8	99.0
Food away from home (less trips)	98.3	95.2
Fees and admissions (less trips)	62.5	52.8
Pets, toys, and playground equipment	46.5	50.3
Trips and travel	37.1	31.0
Babysitting and day care	28.3	36.2

[1] Male-income interaction coefficient is statistically significant at the 95-percent confidence level.

Marital status also plays an important role. Single-parent widows and widowers are less likely to rent than divorcees, but those who have never been married are more likely to rent. This may be because in the first case, when there was a spouse present, the family decided to purchase a home. In the event of the death of the spouse, the family would presumably still live in the home (or purchase another, rather than permanently renting). However, those who were never married would not have had the potential for receiving extra income, for example, to help improve the chances that their request for a loan would be approved.

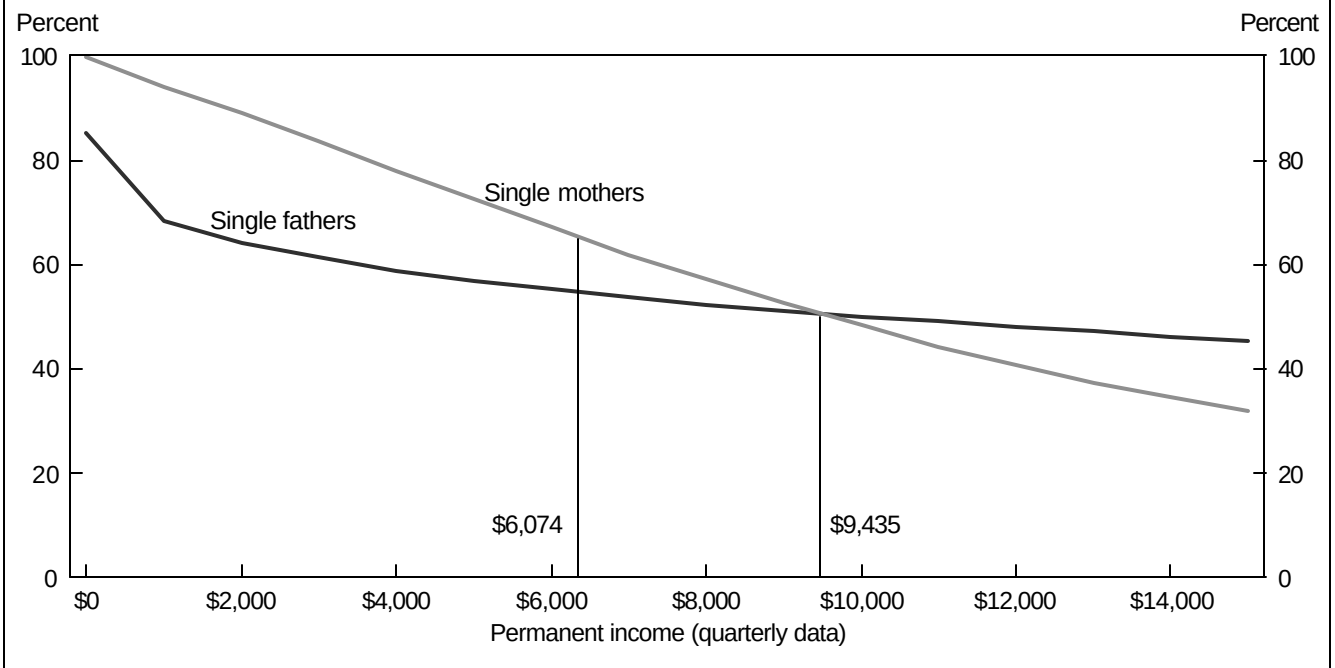
Education is also related to homeownership. For instance, college graduates are much less likely than others to rent their homes, and although the coefficient for those who did not graduate from college is not statistically significant, the coefficient for those who did not graduate from high school is large (about one-half the size of the three-or-more children coefficient, which has already been shown to have a profound effect on the probability of renting), and the coefficient for those who have had some college is fairly small, indicating little difference in the probability of renting (even if it were statistically significant). Assuming that the income of a hypothetical college graduate is the same as that of a nongraduate, it may be that the college graduate is more aware than the nongraduate is of issues such as tax benefits and the accumulation of assets that accrues to homeowners.

In addition, there is strong evidence pointing toward underlying differences between single fathers and single mothers in respect of the decision to own a home. Both the binary variable "male" and the male-permanent income interaction have statistically significant coefficients, albeit of opposite sign. The coefficient on "male" is negative, indicating that something inherent in single fathers makes them less likely to rent than single mothers. However, the male-income interaction effect is positive. When summed with the permanent-income "main effect" (that is, the coefficient on permanent income before any interaction has been performed), the income effect for men is found to be negative, but not statistically significantly different from zero, according to a chi-square test. This means that while there is a strong (negative) income effect for women

regarding the probability of renting, the income effect for men may be negligible. To phrase it more simply, the data suggest that the probability of renting declines for single mothers as their income increases, and while the probability of renting also declines with income for single fathers, it does so at a lesser rate; in fact, for single fathers, the choice to own a home may be independent of their level of income. Put yet another way, because the coefficient of "male" is negative and significant, single fathers with low levels of income will have a lower probability of renting than will single mothers with the same income. However, because single mothers have a stronger (negative) income effect, eventually they will have a lower probability of renting than will single fathers with similar incomes. Given this finding, it is not surprising that if the "typical" single father and single mother are compared (that is, the fathers have higher permanent income ($9,435 versus $6,074, quarterly), but the other characteristics are held to be the same), the mothers have a much greater probability of renting, as noted earlier (67 percent, compared with 51 percent). However, it turns out that the probability functions cross at the level of permanent income associated with "typical" single-father families. That is, for single mothers with the same permanent income as "typical" single fathers ($9,435), the probability of renting is, coincidentally, identical across the two genders. Nevertheless, if the men are compared with the women by reducing the men's family income so that it is equal to the women's family income ($6,074), then the men are still substantially less likely (55 percent) to rent than the women (67 percent). (See Appendix B, table B–3.) The two probability functions are shown in chart 1.

Ordinary-least-squares results. Unlike the logit results, in which only one expenditure examined (apparel and services for children) was found to have a statistically significant difference for single fathers and single mothers, several items exhibit such differences when the predicted expenditures are examined.[42] One-third of the expenditure categories examined with the logit regression (food at home; apparel and services for adults; and pets, toys, and playground equipment) show statistically significant differences across genders in both the intercept and the income effect. For food away from home, the coefficient "male," but not the male-income interaction coefficient, is statistically significant. Further, when the separate housing regressions are examined, it turns out that expenditures for shelter and utilities do not differ by gender for owners, but do differ for renters. In each of these cases, including

Chart 1. Predicted probability of renting, by income, single fathers and single mothers



shelter and utilities for renters, the income effect is smaller for men than for women.

Despite the smaller income effect, single fathers are predicted to spend more than single mothers for all expenditures with a statistically significant difference in the income effect, except for rent. (The resulting expenditure for shelter and utilities is substantially smaller for single fathers, who are predicted to spend more than two-thirds—69 percent—as much as single mothers for that item.)

Marginal propensity to consume (MPC) and elasticity. Two important measures of tastes and preferences are the *marginal propensity to consume (MPC)* and the income elasticity of a particular good or service. The MPC describes how expenditures would change if a consumer unit's permanent income were to increase by 1 *dollar*; elasticity describes how expenditures would change if a consumer unit's permanent income were to increase by 1 *percent*.[43] These quantities can be more enlightening when one examines observed or predicted expenditure patterns, rather than actual levels of expenditures. The actual expenditure for a given item may differ by gender because of differences in income or other factors, as noted. Indeed, even the predicted expenditure for the item may differ by gender because of differences in income, at least in the tables examined here, for reasons described earlier. (However, the predicted expenditures, given true *ceteris paribus* conditions, are shown in Appendix B.) But the MPC and income elasticity measure how important a good is to consumers by showing how much more they would purchase if given the means to do so.

In the case of universally purchased goods (that is, food at home and shelter and utilities in this article), the calculation of the MPC and income elasticity is straightforward. However, for goods and services that are less frequently purchased, the probability of purchase must be taken into account in calculating these quantities. (See Appendix A for details in both cases.) The reason is that it is reasonable to assume that *whether* an expenditure takes place is a function of income, just as how much the purchase is for is a function of income. Therefore, the expected expenditure for a member of the control group is equal to the actual expenditure (if a purchase is made), weighted by the probability of incurring the expenditure. Accordingly, the tables showing MPC and elasticity calculations also show the predicted probability of purchase (which equals 100 percent in the case of universal expenditures).

For most expenditures with statistically significant income differences by gender, the MPC's are fairly small, ranging from 0.4 cent per additional dollar (for apparel and services for children, purchased by single fathers) to 4.5 cents per additional dollar (for apparel and services for adults, purchased by single mothers). (See table 7.) The exception is shelter and utilities for renters, for which, for single fathers, the MPC is 4.6 cents

Table 7. Predicted expenditures, marginal propensities to consume (MPC's), and elasticities of "typical" single parents

Variable	Men	Women
Permanent Income (I)	$9,435	$6,074
Food at home:		
Probability, percent (P)	100.0	100.0
P'	0	0
$E(Y)$	[1,2]$826	[1,2]$649
$E'(Y)$	.0237	.0405
MPC = $P'E(Y) + PE'(Y)$	.024	.041
Elasticity = MPC × ($I/E(Y)$)	.27	.38
Apparel and services (adults):		
P'	2.22E–05	4.09E–05
$E(Y)$	[1,2]$514	[1,2]$413
$E'(Y)$	.0216	.0500
MPC = $P'E(Y) + PE'(Y)$	.022	.045
Elasticity = MPC × ($I/E(Y)$)	.40	.66
Apparel and services (children):		
Probability, percent (P)	[2]47.6	[2]63.2
P'	9.80E–06	3.25E–05
$E(Y)$	$101	$94
$E'Y$)	.0073	.0120
MPC = $P'E(Y) + PE'(Y)$	.004	.011
Elasticity = MPC × ($I/E(Y)$)	.42	.69
Transportation (less trips):		
Probability, percent (P)	98.8	99.0
P'	1.70E–06	1.27E–06
$E(Y)$	$1,602	$788
$E'(Y)$	.1873	.1437
MPC = $P'E(Y) + PE'(Y)$	.188	.143
Elasticity = MPC × ($I/E(Y)$)	1.11	1.10
Food away from home (less trips):		
Probability, percent (P)	98.3	95.2
P'	4.35E–06	1.48E–05
$E(Y)$	[1]$1,217	[1]$572
$E'Y$)	.0523	.0510
MPC = $P'E(Y) + PE'(Y)$	.057	.057
Elasticity = MPC × ($I/E(Y)$)	.44	.61
Fees and admissions (less trips):		
Probability, percent (P)	62.5	52.8
P'	2.05E–05	4.78E–05
$E(Y)$	$389	$216
$E'(Y)$	.0202	.0246
MPC = $P'E(Y) + PE'(Y)$	.021	.023
Elasticity = MPC × ($I/E(Y)$)	.50	.66
Pets, toys, and playground equipment (less trips):		
Probability, percent (P)	46.5	50.3
P'	1.17E–05	2.64E–05
$E(Y)$	[1,2]$524	[1,2]$405
$E'(Y)$	.0033	.0388
MPC = $P'E(Y) + PE'(Y)$	.008	.030
Elasticity = MPC × ($I/E(Y)$)	.14	.45
Trips and travel:		
Probability, percent (P)	37.1	31.0
P'	1.78E–05	3.88E–05

Table 7. Continued—Predicted expenditures, marginal propensities to consume (MPC's), and elasticities of "typical" single parents

Variable	Men	Women
E(Y)	$933	$619
E′(Y)	.0979	.0903
MPC = $P'E(Y) + PE'(Y)$	.053	.052
Elasticity = MPC × $(I/E(Y))$	.54	.51
Babysitting and day care:		
Probability, percent (P)	28.3	36.2
P'	1.16E–05	3.91E–05
$E(Y)$	$273	$365
$E'(Y)$	.0110	.0465
MPC = $P'E(Y) + PE'(Y)$	.006	.031
Elasticity = MPC × $(I/E(Y))$	.22	.52
Shelter and utilities (owners, with mortgage):[3]		
Probability, percent (P)	100.0	100.0
P'	0	0
$E(Y)$	$2,589	$2,258
$E'(Y)$	.1513	.2005
MPC = $P'E(Y) + PE'(Y)$	.151	.201
Elasticity = MPC × $(I/E(Y))$	.55	.54
Shelter and utilities (renters):[3]		
Probability, percent (P)	100.0	100.0
P'	0	0
$E(Y)$	[1,2]$1,248	[1,2]$1,807
$E'(Y)$	.0458	.2394
MPC = $P'E(Y) + PE'(Y)$	.046	.239
Elasticity = MPC × $(I/E(Y))$	.35	.80

[1] Binary variable used to calculate this value for men is statistically significant at the 95-percent confidence level.

[2] Men's income effect used to calculate this value is statistically significantly different from the women's income effect at the 95-percent confidence level.

[3] MPC's and elasticities for homeowners are calculated assuming that single fathers have seven rooms and two bathrooms or half baths and that single mothers have six rooms and two bathrooms or half baths. For renters, both types of parents are assumed to have six rooms and one bathroom or half bath.

NOTE: Values are calculated from detailed regression coefficients, with results rounded for presentation.

per additional dollar. For single mothers, the MPC is 23.9 cents per additional dollar. In this example, the gap between the elasticities of single mothers and single fathers is also large: single fathers have an elasticity of 0.35, compared with 0.80 for single mothers. When single mothers are assumed to have the same level of permanent income as single fathers, the estimated elasticity for those of the mothers who rent actually increases slightly, to 0.82. For homeowners, the parameter estimate of income for single fathers is not significantly different from that for single mothers. For both genders, the estimated income elasticity is in the middle 0.50's. This suggests that both single fathers and single mothers who own homes are more similar to each other with respect to housing decisions than they are to renters of the same gender. (That is, single fathers who are homeowners are different from single fathers who are renters, and single mothers who are homeowners are different from single mothers who are renters.) At the same time, single-parent renters differ substantially by gender in their expenditures.

The expenditure category with the largest income elasticity is transportation. For both single fathers and single mothers, the elasticity is about 1.1. This may at first be surprising, because other categories, such as trips and travel, with which one might associate high elasticities a priori have elasticities less than unity. In the terminology of economists, transportation is a "luxury" good, while trips and travel constitute a "necessity" good.[44] However, one must recall that the elasticity measured in this article is *total* elasticity; that is, it is not just the elasticity for persons who purchase the good, but rather, it is the elasticity for *all* consumers, whether they purchase or not, weighted by their probability of purchase. So as income rises, the increase affects purchases both indirectly (through a consumer unit's probability of purchase) and directly (through affordability for those who do purchase). Note that for both single fathers and single mothers, the MPC for trips and travel for purchasers only is estimated to be about double (10 cents for men and 9 cents for women) what it is for the overall group (about 5 cents each). Thus, for purchasers, the income elasticity for trips and travel would be about double what it is for the overall group, making it larger than unity (that is, a "luxury good") for both single mothers and single fathers.

Finally, one should not confuse the significance of the *difference* of the income effect with the significance of the income effect in general. If there is no significant difference in the income effect, it just means that there is no evidence to support the hypothesis that single fathers and single mothers have different MPC's, given the same level of income. However, it does not mean that the income effect is nonexistent for the good in question. To use a specific example, transportation shows no difference in the income effect across gender when either probabilities or expenditures are predicted. However, the MPC—19 cents for single fathers and 14 cents for single mothers—is significantly different from 0 cents. That is, given extra income, expenditures for transportation will increase for both genders, but not by a very different amount, *ceteris paribus.*

THIS ARTICLE HAS EXAMINED EXPENDITURE PATTERNS for single parents. To aid in the analysis presented, demographics were compared first, followed by expenditure levels and expenditure shares. Although many differences in the expenditures of single fathers and single mothers were found, they could be due to differences in demographic characteristics—especially income. To obtain more precise comparisons, two

forms of regression analysis were performed: logistic (logit) regression, to estimate the probability of reporting certain items, and ordinary-least-squares regression, to estimate the marginal propensity to consume, income elasticity, and similar relationships of expenditure to various characteristics.

The logit regressions showed that, although some of the characteristics that were examined definitely account for differences *within* gender groups, there were not many differences *across* gender for single parents. That is, characteristics such as family size affect the probabilities of purchasing various goods and services equally for both families headed by single fathers and families headed by single mothers. However, some differences were found in the ordinary-least-squares analysis. For example, the income effect was frequently significantly different by gender, but the effects of marital status and age were also different in some models. In using ordinary-least-squares results to calculate some factors of interest, such as marginal propensities to consume and income elasticities, it was noted that some of the differences that were found may again be due to differences in income assumed to hold for the "typical" male-headed and female-headed single-parent family. However, table B–2 of Appendix B shows that even if single mothers are assumed to have the same income as single fathers, they would not substantially change the proportion of total income allocated to most goods and services, as evidenced through only minimal changes in their marginal propensity to consume or their income elasticity. (However, a hypothetical increase in income would increase their expected expenditures, and in some cases, they would exceed expected expenditures by single-father-headed households by a large amount.)

It may be surprising that more differences were not found in the analysis, especially in the coefficients for the interaction terms. That is, the results show that there are differences of some sort between families headed by single fathers and those headed by single mothers, but single-father-headed families in the Northeast are not significantly different from single-mother-headed families in the Northeast. The lack of *evidence* of differences, though, should not be interpreted to mean that there is a lack of *differences themselves*. It is important to remember that single fathers are still a small, but noticeable, portion of the single-parent population. Therefore, it may be that differences in certain characteristics of single mothers (such as their region of residence) are not pronounced enough to be readily seen at this time. Still, as noted earlier, single fathers are a rapidly growing group, and they have not yet been studied in great detail. Thus, further research into their expenditure patterns will be useful as their numbers increase both absolutely and relatively to the population of single mothers. □

Notes

[1] *Statistical Abstract of the United States: 2000* (U.S. Bureau of the Census, 2000), p. 58, table 68.

[2] *Ibid*. The precise numbers were 24,961,000 in 1980 and 25,066,000 in 1999, according to table 68.

[3] *Ibid.* The precise numbers were 6,061,000 in 1980 and 7,752,000 in 1999.

[4] *Ibid.*

[5] *Ibid.*, p. 51, table 53.

[6] *Ibid.*, p. 58, table 68.

[7] *Ibid.* The precise numbers were 5,445,000 in 1980 and 6,599,000 in 1999.

[8] *Ibid.*

[9] *Consumer Expenditures in 1998,* Report 940 (Bureau of Labor Statistics, February 2000), table 5.

[10] Douglas B. Downey, "The School Performance of Children From Single-Mother and Single-Father Families: Economic or Interpersonal Deprivation?" *Journal of Family Issues*, March 1994, pp. 129–47.

[11] *Ibid.*, p. 130.

[12] *Ibid.*, table 1, pp. 139–40.

[13] *Ibid.*, p. 144.

[14] *Ibid.*, pp. 129–30.

[15] Mark Lino, "Financial Status of Single-Parent Households," *Family Economics Review*, February 1989, pp. 2–7.

[16] Mark Lino, "Financial Status of Single-Parent Households Headed by a Never-Married, Divorced/Separated or Widowed Parent," in R. Walker (ed.), "Families in Transition: Structural Changes and Effects on Family Life," *Proceedings of the 1989 Pre-Conference Workshop of the Family Economics Home Management Section of the American Home Economics Association*, pp. 151–60.

[17] Divorced or separated parents and widowed parents each allocated 35 percent of their total expenditures to housing, whereas never-married parents allocated 40 percent of their total expenditures to that category. For comparison, the expenditure share for never-married parents for transportation, 11 percent, was about half that of divorced or separated parents (21 percent) and widowed parents (22 percent). Food at home also accounted for a larger share of the never-married parents' total expenditures. One in 5 dollars (20 percent) went to food at home for that group, compared with 1 in 7 dollars (14 percent) for divorced or separated parents and 1 in 8 dollars (12 percent) for widowed parents. Clothing, health care, entertainment, education, child care, and "other" expenditures all accounted for similar shares for each type of single parent. (See Lino, "Financial Status of Single-Parent Households," table 3, p. 160.)

[18] Mark Lino, "Factors Affecting Expenditures of Single-Parent Households," *Home Economics Research Journal,* March 1990, pp. 191–201.

[19] Mark Lino, "Expenditures on a Child by Single-Parent Families," *Family Economics Review*, March 1991, pp. 2–7.

[20] The lower income group included single parents reporting less than $29,900 in income before taxes; the upper group reported at least $29,900. Lino explains that the figures are based on 1987 data for husband-wife families, approximately one-third of which reported income less than $26,000. Although relatively few single parents (15 percent) reported incomes more than $26,000, Lino retained that dol-

lar amount to facilitate comparisons between single parents and husband-wife parents with similar income. The $29,900 was obtained from the Consumer Price Index for All Urban Consumers (CPI-U) in order to adjust the $26,000 from 1987 dollars to 1990 dollars. Apparently, Lino made this adjustment because, at the time he was writing, the 1987 data were the most recent available. (See Lino, "Expenditures on a Child," esp. pp. 2, 3, and 5.)

[21] *Ibid.*, table 1, p. 5.

[22] Sally E. Horton and Jeanne L. Hafstrom, "Income Elasticities for Selected Consumption Categories: Comparison of Single Female-Headed and Two-Parent Families," *Home Economics Research Journal*, March 1985, pp. 292–303.

[23] Current income was defined as income earned within a given designated "recent" period—for example, this week's income or this year's income. Permanent income was defined as current income plus expected future income.

[24] Specifically, they estimated that the increase in expenditures was 1.2 percent for single-parent women and 0.99 percent for married couples. However, they did not find this difference statistically significant.

[25] Lino, "Factors Affecting Expenditures."

[26] Maureen Boyle, "Spending patterns and income of single and married parents," *Monthly Labor Review*, March 1989, pp. 37–41.

[27] Mohamed Abdel-Ghany and F. N. Schwenk, "Differences in Consumption Patterns of Single-Parent and Two-Parent Families in the United States," *Journal of Family and Economic Issues*, winter, 1993, pp. 299–315.

[28] David J. Eggebeen and Anastasia R. Snyder, "Children in *Single*-Father Families in Demographic Perspective," *Journal of Family Issues*, July 1996, pp. 441–65.

[29] *Consumer Expenditure Survey, 1996–97*, Report 935 (Bureau of Labor Statistics, September 1999), p. 257.

[30] *Ibid.*, p. 256. The report indicates that the "Interview [component] collects detailed data on an estimated 60 to 70 percent of total household expenditures. In addition, global estimates, that is, expense patterns for a 3-month period, are obtained for food and other selected items. These global estimates account for an additional 20 to 25 percent of total expenditures."

[31] The categories defined as Hispanic in the survey are Mexican, Mexican-American, Chicano, Puerto Rican, Cuban, Central and South American, and other Spanish.

[32] In general, complete reporters are those consumer units which provide a value for at least one major source of income, such as wages and salaries, self-employment, or Social Security. However, even complete reporters do not necessarily provide a full accounting of income from all sources.

[33] For the purposes of this study, a *consumer unit* is defined as members of the same household related by blood, marriage, adoption, or some other legal arrangement. Also, only single-parent consumer units—that is, those with one person aged 18 or older living with his or her own children and no other persons—are examined. For convenience, the terms "family" and "household" are used interchangeably with the term "consumer unit" throughout.

[34] The table lists this expenditure as "less trips." This is because food at home is included in the expenditure for "trips and travel." The term "food at home on trips" may sound self-contradictory, but in the Consumer Expenditure Survey the "at home" designation refers to the type of business from which the food was purchased; that is, it distinguishes purchases at restaurants and carryouts from purchases at supermarkets or similar establishments. Expenditures for "shelter and utilities on trips" refer to hotel or motel payments or payments for vacation homes. The other "on trips" expenditure categories are straightforward.

[35] In the standard BLS publications of Consumer Expenditure Survey data, certain items, such as mortgage principal payments, are not included as expenditures. This is due to a technical definition whereby principal payments are considered an investment in housing rather than a payment for the consumption of housing services. (According to *Consumer Expenditure Survey, 1996–97* [pp. 250–51], "Mortgage principal repayments are payments of loans and are shown in *Other financial information*.") In contrast, the mortgage *interest* payment is considered an expenditure, because it is the price one pays for the ability to "invest" in the housing. Similarly, when vehicles are purchased, it is the total price of the vehicle, less its trade-in value, that is recorded in the survey results, rather than the amount of monthly payments made. In the standard published tables, this makes sense, because, on average, those who purchase a vehicle during the reference period will have a large expenditure recorded, while those who already own a car, but make payments on it, will have only the interest payments reported. Therefore, on average, recent purchasers' expenditures for new cars will balance out with payments made by those currently financing vehicles. However, in examining individual families, a large expenditure is shown for any family that purchases a new automobile, and a small expenditure is shown for any that make payments each month. In this study, the actual amount that leaves the family's hands, including payments for mortgages and regular payments for vehicles, is analyzed. Only "true" payments for assets or liabilities (such as investments in stocks and bonds) are omitted from the analysis. Technically, this is called a "total outlays" approach; however, for convenience, the terms "outlays" and "expenditures" will be used interchangeably throughout the article.

[36] Even a parent who does not leave home frequently may still occasionally have to hire a babysitter or day-care provider for an emergency or to enable him- or herself to hold a job.

[37] Sometimes, authors use a "double log" specification, in which case the dependent variable and a selected independent variable (frequently income in expenditure studies) are converted to logarithmic form before the regression is carried out. For example, Horton and Hafstrom use such a form. The "double log" specification has a dual advantage: in addition to reducing heteroscedasticity, it allows the coefficient on the transformed independent variable to be interpreted as a measure of elasticity. In other words, if the natural logarithm of expenditure X is regressed on the natural logarithm of income, and the income coefficient is 2.0, then, if the coefficient is statistically significant, the analyst can validly infer that a 1-percent increase in income is associated with a 2-percent increase in X.

[38] See Milton Friedman, *A Theory of the Consumption Function* (Princeton, NJ, Princeton University Press, 1957).

[39] The reference person is the first person identified when the respondent is asked who is responsible for owning or renting the home. In this article, the reference person is assumed to be the parent in all cases.

[40] See additional table, "Expenditure logit results," on the Internet at **http://www.bls.gov/cex/csxart.htm**

[41] See additional table, "Housing tenure logit parameter estimates," on the Internet at **http://www.bls.gov/cex/csxart.htm**

[42] See additional table, "Ordinary-least-squares results," on the Internet at **http://www.bls.gov/cex/csxart.htm**

[43] Horton and Hafstrom's findings in "Income Elasticities for Selected Consumption Categories" are examples of income elasticities. Their finding that a 1-percent increase in income yields a 0.59-percent increase in expenditures for shelter for married couples can be more simply stated by saying that, for married couples, the income elasticity for shelter is 0.59. Similarly, Horton and Hafstrom find that the income elasticity for single mothers is 0.25.

[44] Goods with an income elasticity of exactly unity are known as "unitary elastic." (For example, Horton and Hafstrom found income elasticities for recreation and reading to be unitary elastic.) Goods with elasticities greater than unity are "luxuries," because the increase in spending is disproportionately large compared with the increase in income. Goods with positive elasticities less than unity are "necessities,"

because the increase in expenditure is disproportionately small. All goods with positive elasticities are considered "normal" goods, because their expenditures increase with income. There are some goods for which the income elasticity is negative—the so-called inferior goods, because their expenditure actually decreases as income increases. An example is used goods: because most consumers prefer new products to used products (for example, automobiles, clothing, and furniture), but used goods usually have lower prices than new goods, it can be assumed that used goods will be purchased disproportionately by lower income consumers, compared with new goods. Thus, as income increases, fewer used goods are purchased.

APPENDIX A: Methods of analysis

Box-Cox transformations. Expenditure data are not often normally distributed, a situation that can cause bias in regression results.[1] However, expenditure data can be transformed so that they are approximately normally distributed. One method that has been used is the *Box-Cox transformation*.[2] Perhaps the most frequently cited version is

$$Y^* = (Y^{\lambda} - 1)/\lambda,$$

where

Y^* is the transformed version of the variable, Y denotes expenditures for a specific good or service (for example, food at home or apparel),

and

λ is a parameter used to normalize the data.

This version of the equation is most useful in demonstrating two special cases for the value of λ. That is, if λ is unity, then no transformation of the independent variable is necessary. (The net result is that Y^* equals $Y - 1$, and subtracting a constant from each observation of Y will not affect the distribution.) In contrast, if λ approaches zero, then Y^* is approximately equal to the natural logarithm of Y.

Although this specification is useful for deriving the value of Y^* when λ approaches zero, it does not yield an intuitive interpretation when λ takes on any other value.[3] However, in their original article,[4] Box and Cox point out that the equation can be simplified to

$$Y^* = Y^{\lambda}.$$

This leads to a simple interpretation of both λ and the equation as a whole. In the text of the current study, λ is found to be ¼, indicating that the transformed variable is then simply the fourth root of Y.

The obvious question raised is how the value of λ is found. Conventionally, this is done by trial and error. Several values for λ are used, and whichever yields the model with the lowest mean square error is the selected value. However, the method is extremely time consuming and is seen to be nearly impossible when one takes into account the fact that two variables (expenditures and permanent income) are being transformed over several models. In the text, λ is estimated through a maximum-likelihood procedure used by Scott and Rope in their study of Consumer Expenditure Survey data.[5]

Regression techniques. Some expenditures, such as food at home or shelter and utilities, are reported by virtually all participants in the Consumer Expenditure Survey. For these items, the choice of regression technique is straightforward: ordinary least squares. However, many expenditures are not universal and may not be made because of tastes and preferences (for example, tobacco and smoking supplies) or because the item is a durable good (for example, vehicles). In the study set out in the text, four such variables are examined. Three (food away from home, entertainment, and out-of-town trips) are probably examples of the first situation (tastes and preferences dissuade some consumers from purchasing the item), while the fourth (apparel) may be an example of the second situation (perhaps the consumer had sufficient amounts of apparel during the previous quarter or did not need services such as drycleaning or repair). These kinds of expenditures require special treatment.

One set of models designed to handle such situations is called the "double-hurdle" set. The models get their name because the consumer must first decide whether to purchase the item and, if so, then determine how much to purchase. In these models, the hurdles appear in two stages: stage one models the probability of purchase, stage two the level of purchase for those who buy the good. Results of the two stages are used together to predict the expenditure for a given consumer.

One popular form of double-hurdle model is the *Tobit model*, in which the hurdles are estimated with the same independent variables. The stages are estimated in such a way that a set of parameters is produced that can then be utilized to estimate the person's probability of purchasing a given item (using the cumulative density function, as with the probit technique) and marginal propensity to consume (as with ordinary least squares). The predicted expenditure is equivalent to the predicted expenditure for those who purchase the item, weighted by the probability of purchasing it.[6] However, a major drawback of Tobit is the restrictions it places on the results of the analysis. First, because one particular set of independent variables is used, the model is useful only when the exact same set of variables predicts both the probability of purchasing an item and the level of expenditure on the item. This is not always the case. For example, the probability of purchasing health insurance may depend on the size of one's family. However, if a particular policy charges one premium for "family" coverage, regardless of the number of members in the family, the Tobit model has a weakness in predicting expenditures for that policy. Furthermore, the Tobit model assumes that the "direction" of each variable is the same for the probability and for the level of consumption, which may not be true. For instance, an article describing wine consumption by U.S. men found that men who had at least a high school education were more likely to drink wine than men with lower levels of education; however, the article also found that men with at least a high school education drank less wine than those with lower levels of education.[7]

Other models also have been proposed to handle the "double-hurdle" situation. The models used in this article are based on a type described by John G. Cragg.[8] In Cragg's method, the probability of purchase is estimated separately from the level of expenditures. Cragg's approach has many advantages over the Tobit method. The ability to separate the probability-of-purchase and level-of-expenditure equations allows differences in variables and signs across the two stages of the analysis, providing Cragg's approach with a "considerable interpretational advantage" over the Tobit model.[9] In addition, not only does "Tobit...force zero

observations to represent corner solutions," but it also "presumes that the same set of variables and parameter estimates determine both the discrete probability of a nonzero outcome and the level of positive expenditures."[10]

Although Cragg's models use probit to predict probabilities of purchase, he notes that logit can be used instead.[11] Many standard econometrics textbooks point out that logit produces probability estimates that are nearly identical to probit estimates. However, logit results are much easier to use and interpret. The equation for predicting the probability of purchase (P) of an item is

$$P = \exp(\alpha + \beta X)/[1 + \exp(\alpha + \beta X)],$$

where

α is the intercept of the logit equation,

β is a vector of parameter estimates,

and

X is a vector of independent variables.

This formula can be entered into a standard spreadsheet to estimate probabilities of purchase for different consumers. Furthermore, the equation is easily differentiated to find the marginal relationship of probability to a particular variable. (For example, if income rises by $1, by how much does the probability of purchase change?) With probit, an equation must be estimated and the results looked up in a statistical table to find out the overall probability of an event's occurring, as well as the marginal effect on probability due to changing a variable.

In the version of the Cragg model used in the text of this article, the probability of purchasing an item is estimated as suggested with a logistic regression. Separately, the method of ordinary least squares is used to estimate expenditures for those who purchase the item.[12] To get the final results, the predicted probability of purchase obtained from the first stage is multiplied by the predicted expenditure for those who purchase the item. This calculation essentially produces an average predicted expenditure, weighted by the probability of purchase. To illustrate the intuition behind obtaining such a weighted-average predicted expenditure, suppose that a large sample of consumers is selected randomly. Suppose further that 25 percent of the participants purchased a particular item that sold for $100. Then the average expenditure for all consumers is $25, or 25 percent multiplied by $100. If a smaller sample is randomly selected from this large group, the expected value of the average of that smaller sample is also $25. The reason is that if a large number of random samples were pulled from the total sample, and each time the samples were pulled the average expenditure was recorded, then the "grand average" (that is, the average of the averages) is expected to be $25.

In estimating the marginal propensity to consume and the elasticity in Cragg models, the logit results are taken into account, because income is assumed to influence expenditures both directly (through the level of expenditure) and indirectly (by changing the probability of purchase). (The mathematical details behind this statement are provided in the next two subsections of this appendix.)

As a final point, there are some expenditures for which Tobit may be appropriate, in that the technique assumes that, given enough time, all consumers will eventually purchase the given item. For example, less than 100 percent of all consumer units report expenditures for apparel and services every quarter, but it is reasonable to assume that, given enough time, 100 percent of consumer units will eventually purchase those items. However, Tobit still suffers the weaknesses described earlier, and for convenience as well, the Cragg model is used for all variables analyzed in this article.[13]

Marginal propensity to consume (MPC). The marginal propensity to consume (MPC) is defined as the change in expenditure, given a unit change in income. In this case, permanent income is the relevant variable for change.

In the ordinary-least-squares-only regressions described in the text (for food at home, shelter and utilities, and transportation), the equations have the form

$$E(Y^{1/4}) = a + bI^{1/4} + cX,$$

where

$E(Y^{1/4})$ is the predicted (or expected) value of the dependent variable,

a is the intercept,

b is a parameter estimate,

I denotes total outlays (the proxy for permanent income),

and

cX represents all other independent variables, multiplied by their regression coefficients.

In this case, the MPC is calculated by finding the change in the predicted expenditure, given a $1 increase in permanent income, or $\partial E(Y)/\partial I$. Although the model is specified to calculate $E(Y^{1/4})$, the desired result is easily obtained. To simplify the arithmetic, it is easiest to convert $E(Y^{1/4})$ to $E(Y)$:

$$E(Y) = E(Y^{1/4})^4 = (a + bI^{1/4} + cX)^4$$
$$\partial E(Y)/\partial I = 4(a + bI^{1/4} + cX)^3[(1/4)bI^{-3/4}] = [b(a + bI^{1/4} + cX)^3]/I^{3/4}$$
$$= (b/I^{3/4}) \times E(Y^{1/4})^3$$
$$= b[E(Y)/I]^{3/4}.$$

This result has an interesting property in that the MPC is a function of the expected budget share (that is, the specific outlay $E(Y)$, divided by the total outlays I).

The Cragg-based models have a more complicated specification, but they are nevertheless solvable for the MPC. Note that the MPC is still defined and represented mathematically in the same way; however, the initial formulation is more complicated. The desired result is actually

$$E_p(Y) = P \times [E(Y^{1/4})]^4,$$

where P is the probability of observing an expenditure.

To find $\partial E_p(Y)/\partial I$, the product rule of calculus is used. That is,

$$\partial E_p(Y)/\partial I = P'[E(Y)] + P\ [E'(Y)].$$

Now, recall that

$$P = \exp(\alpha + \beta I^{1/4} + \delta X)/[1 + \exp(\alpha + \beta I^{1/4} + \delta X)]),$$

where δX is a vector of all independent variables except income, each multiplied by their parameter estimates.

Therefore, to find P', the quotient rule is used. Thus,

$$P' = (f'g - fg')/g^2,$$

where

$$f = \exp(\alpha + \beta I^{1/4} + \delta X),$$

$$g = 1 + \exp(\alpha + \beta I^{1/4} + \delta X),$$

and

$$f' = g' = [(\frac{1}{4} \times \beta)/I^{3/4}] \times \exp(\alpha + \beta I^{1/4} + \delta X).$$

Because f' and g' are equal in this case, the foregoing equation simplifies algebraically to

$$P' = [f'(g - f)]/g^2;$$

and because g equals $f + 1$, the equation reduces even further to

$$P' = [f'(f + 1 - f)]/g^2 = f'/g^2.$$

Now, with the much simplified result, it can be shown that

$$P' = \{[(\frac{1}{4} \times \beta)/I^{3/4}] \times \exp(\alpha + \beta I^{1/4} + \delta X)\}/[1 + \exp(\alpha + \beta I^{1/4} + \delta X)]^2.$$

Again, by substitution, this reduces to

$$P \times \{[(\frac{1}{4} \times \beta)/I^{3/4}]/[1 + \exp(\alpha + \beta I^{1/4} + \delta X)]\}.$$

Therefore,

$$\text{MPC} = P \times \{[(\frac{1}{4} \times \beta)/I^{3/4}]/[1 + \exp(\alpha + \beta I^{1/4} + \delta X)]\} \times E(Y) + P \times b \times [E(Y)/I]^{3/4}.$$

Because the terms P and $E(Y)$ are common to both pieces of the complicated right-hand side of this equation, the MPC can be simplified mathematically by factoring these terms out and multiplying them by the sum of the remaining pieces. However, the formula is left the way it is for the moment, to illustrate an intuitive point: the MPC is derived from the predicted value of the expenditure for those who actually purchase, weighted by the probability of purchasing. Note that the second term on the right-hand side (P × b[E(Y)/I]3/4, is the same MPC as was found before, except that it is weighted by the probability of purchase. The remaining term on the right-hand side is a result of the fact that the predicted expenditure is affected indirectly because one's probability of purchasing something changes as a result of a change in income.

Elasticities. Income elasticity (or more properly in this case, permanent-income elasticity) is the percent change in expenditure for a specific good (such as food at home), given a 1-percent increase in (permanent) income. For example, for single fathers, the income elasticity for food at home is estimated to be 0.28, meaning that for every 1-percent increase in permanent income, these men are predicted to increase their food-at-home expenditures by more than one-quarter of 1 percent.

The equation for calculating the elasticity ? is

$$? = \text{MPC} \times I/E(Y).$$

In the case of the ordinary-least-squares-only regressions, the elasticity is constant and equal to the parameter estimate for permanent income. To show this mathematically, recall that the MPC in this case is a function of the predicted expenditure share; that is, $\text{MPC} = b[E(Y)/I]^{3/4}$. Thus, multiplying the MPC by $I/E(Y)$ yields $b[E(Y)/I]^{-1/4}$, or $b[I/E(Y)]^{1/4}$. So while the MPC is a function of the expected budget share, elasticity is a function of the *inverse* of the budget share. Hence, as the budget share increases, so does the MPC, but elasticity declines.

For the Cragg-based models, the full formula is much more complicated, due to the complexity of the MPC equation. However, once the value of the MPC is obtained, multiplying that value by the inverse of the predicted expenditure share still yields the estimate of elasticity.

Notes to Appendix A

[1] Stuart Scott and Daniel J. Rope, "Distributions and Transformations for Family Expenditures," *1993 Proceedings of the Section on Social Statistics* (Washington, DC, American Statistical Association, 1993), pp. 741–46.

[2] G. E. P. Box and D. R. Cox, "An Analysis of Transformations," *Journal of the Royal Statistical Society*, Series B, 1964, pp. 211–43, esp. p. 214.

[3] Even if λ is unity, it is hard to imagine why Y is transformed to $Y - 1$.

[4] Box and Cox, "Analysis," p. 214.

[5] Scott and Rope, "Distributions and Transformations."

[6] See John McDonald and Robert A. Moffitt, "The Uses of Tobit Analysis," *Review of Economics and Statistics*, May 1980, pp. 318–21, esp. p. 318.

[7] J. R. Blaylock and W. N. Blisard, "Wine consumption by US men," *Applied Economics*, May 1993, pp. 645–51, esp. p. 649.

[8] John G. Cragg, "Some Statistical Models for Limited Dependent Variables with Application to the Demand for Durable Goods," *Econometrica*, September 1971, pp. 829–44.

[9] Mohamed Abdel-Ghany and J. Lew Silver, "Economic and Demographic Determinants of Canadian Households' Use of and Spending on Alcohol," *Family and Consumer Sciences Research Journa*l, September 1998, pp. 62–90, esp. p. 65.

[10] Deanna L. Sharpe, Mohamed Abdel-Ghany, Hye-Yeon Kim, and Gong-Soog Hong, "Alcohol Consumption Decisions in Korea," J*ournal of Family and Economic Issues*, Spring 2001, pp. 7–24, esp. p. 14.

[11] See Cragg, "Some Statistical Models," footnotes 5 (p. 830) and 6 (p. 832).

[12] To reduce heteroscedasticity, the ordinary-least-squares models used in this study actually predict the fourth root of the expenditure for those individuals with positive expenditures.

[13] Experiments run with the data presented in the text confirm that Tobit does not yield consistently plausible results for apparel and services. To test how Tobit and Cragg results compare in the present situation, expenditures for both apparel for adults and apparel for children were regressed on various characteristics, using a Tobit model. The first problem in doing so is that, as described earlier, the variables

differ in the first and second stages of the Cragg model. That is, several interaction terms for single fathers are included in the second stage that are not included in the first stage. To make the models consistent, these extra variables were excluded from the Tobit model. (In the second stages of the Cragg models, only two variables were found to be statistically significant: the variable denoting single fathers with two children was significant in both models, and the variable denoting single fathers aged 45 to 49 years was significant only for expenditures for children's apparel.) When the results of the Tobit model are used to predict the probability of purchase, however, they are not consistent with the results produced by the Cragg model, nor do they resemble values expected from the data themselves. For example, the actual percentage of single mothers in the sample who reported expenditures for adult apparel and services is 58 percent, and for children's apparel, the percentage is about 68 percent. (See table 5.) However, for each of these items, the Tobit model predicts virtual certainty of purchase (greater than 99 percent) in each case. This prediction is not consistent with the Cragg model's first-stage results, which are far more similar to the observed data. (Single mothers with average permanent income are predicted to have a 56-percent probability of purchasing apparel for adults and a 63-percent chance of purchasing children's apparel, according to the Cragg model.) When the results of the first and second stages of the Cragg models are compared, it is found that several variables change signs. However, only one sign-changing parameter estimate is statistically significant at the 95-percent confidence level in both stages: the intercept. In the first stage of the Cragg model, it is negative, whereas in the second, it is positive. The effect of the intercept in the first stage, then, is to lower the predicted probability of purchase in these models. However, in the second stage, the intercept acts as a "starting point" for expenditures. (In effect, it can be interpreted as saying, "Even if the control group has no permanent income, it is still predicted to spend at least this much on apparel and services for children or adults.") As mentioned earlier, one of the weaknesses of Tobit is that the parameter cannot change signs across stages. Because the Tobit-derived intercept is "large" and positive, this forces the predicted probability of purchase to be extremely high for both types of apparel. In fact, even if a family's permanent income is zero, the predicted probability of purchasing apparel for children is nearly 96 percent! For single fathers (again, even those with zero permanent income), the predicted probability is slightly higher, at 98 percent. Similar results are observed for apparel for children: single mothers with zero permanent income have a predicted probability of purchase of 83 percent, and single fathers with zero permanent income have a predicted probability greater than 99 percent. In each case, when realistic permanent incomes are assumed, the predicted probability of purchase is greater than 99 percent. Given that the probability of purchase in these cases is strongly "upwardly biased," the probability-weighted estimates of both the marginal propensity to consume and permanent-income elasticity will undoubtedly also be biased. (The direction is impossible to know without any other measure by which to compare the intercepts. For example, if it is assumed that the probability intercept in Tobit is biased upward, it may be that the level-of-expenditure intercept is biased downward, because both events are measured in one parameter. Which effect dominates presumably determines in what direction the two parameters are also biased.) Hence, it is not surprising to find that the results for marginal propensities to consume and income elasticities obtained from the Tobit analyses in this experiment are, for the most part, not consistent with those obtained from the Cragg model. At any rate, this again demonstrates a weakness of Tobit—that is, that both events (probability and level of expenditure) are analyzed with the use of one set of parameter estimates. Thus, this article uses the Cragg model and leaves further examination of the Tobit model for future research.

APPENDIX B: *Ceteris Paribus* results

The tables in this appendix show how single mothers compare with single fathers, assuming the same permanent income and dwelling size. It is interesting to note that adding the extra permanent income to female-headed families—an increase of more than 55 percent—has a noticeable effect on those families' expected probabilities and levels of spending for most goods and services, but does little to change their expected marginal propensities to consume or their income elasticities.

Table B–1. Expenditures of single parents on selected categories

Variable	Men	Women
Permanent income (quarterly outlays, dollars)	$9,435	$9,435
Apparel and services (adults)	47.1	67.0
Apparel and services (children)[1]	47.6	71.8
Transportation (less trips)	98.8	99.3
Food away from home (less trips)	98.3	98.0
Fees and admissions (less trips)	62.5	65.8
Pets, toys, and playground equipment	46.5	57.7
Trips and travel	37.1	42.9
Babysitting and day care	28.3	47.8

[1] Male-income interaction coefficient is statistically significant at the 95-percent confidence level.

Table B–2. Ordinary least squares results, single parents

Variable	Men	Women
Permanent income (I)	$9,435	$9,435
Food at home:		
Probability, percent (P)	100.0	100.0
P'	0	0
$E(Y)$[1,2]	$826	$772
$E'(Y)$	.0237	.0332
MPC = $P'E(Y) + PE'(Y)$	.024	.033
Elasticity = MPC × $I/E(Y)$)	.27	.41
Apparel and services (adults):		
Probability, percent (P)	47.1	67.0
P'	2.22E–05	2.64E–05
$E(Y)$[1,2]	$514	$574
$E'(Y)$	.0216	.0459
MPC = $P'E(Y) + PE'(Y)$	.022	.046
Elasticity = MPC × ($I/E(Y)$)	.40	.75
Apparel and services (children):		
Probability, percent (P)	47.6	71.8
P'	9.80E–06	2.03E–05
$E(Y)$	$101	$133
$E'(Y)$	.0073	.0111
MPC = $P'E(Y) + PE'(Y)$	.004	.011
Elasticity = MPC × ($I/E(Y)$)	.42	.76
Transportation (less trips):		
Probability, percent (P)	98.8	99.3
P'	1.70E–06	6.44E–07
$E(Y)$	$1,602	$1,280
$E'(Y)$	.1873	.1486
MPC = $P'E(Y) + PE'(Y)$	.188	.148
Elasticity = MPC × (I/E(Y))	1.11	1.09
Food away from home (less trips):		
Probability, percent (P)	98.3	98.0
P'	4.35E–06	4.50E–06
$E(Y)$[1]	$1,217	$731
$E'(Y)$	.0523	.0440
MPC = $P'E(Y) + PE'(Y)$	.057	.046
Elasticity = MPC × (I/E(Y))	.44	.60
Fees and admissions (less trips):		
Probability, percent (P)	62.5	65.8
P'	2.05E–05	3.10E–05
$E(Y)$	$389	$295
$E'(Y)$	.0202	.0223
MPC = $P'E(Y) + PE'(Y)$	.021	.024
Elasticity = MPC × ($I/E(Y)$)	.50	.76
Pets, toys, and playground equipment (less trips):		
Probability, percent (P)	46.5	57.7
P'	1.17E–05	1.85E–05
$E(Y)$[1,2]	$524	$526
$E'(Y)$	.0033	.0339
MPC = $P'E(Y) + PE'Y$)	.008	.029
Elasticity = MPC × ($I/E(Y)$)	.14	.53
Trips and travel:		
Probability, percent (P)	37.1	42.9
P'	1.78E–05	3.20E–05
$E(Y)$	$933	$917
$E'(Y)$	.0979	.0872
MPC = $P'E(Y) + PE'(Y)$	.053	.067
Elasticity = MPC × ($I/E(Y)$)	54	.69
Babysitting and day care:		
Probability, percent (P)	28.3	47.8
P'	1.16E–05	3.03E–05
$E(Y)$	$273	$515
$E'(Y)$	.0110	.0434
MPC = $P'E(Y) + PE'(Y)$	.006	.036
Elasticity = MPC × ($I/E(Y)$)	.22	.67
Shelter and utilities (owners, with mortgage):[3]		
Probability, percent (P)	100.0	100.0
P'	0	0
$E(Y)$	$2,589	$2,880
$E'(Y)$	.1513	.1730
MPC = $P'E(Y) + PE'(Y)$	.151	.173
Elasticity = MPC × ($I/E(Y)$)	.55	.57
Shelter and utilities (renters):[3]		
Probability, percent (P)	100.0	100.0
P'	0	0
$E(Y)$[1,2]	$1,248	$2,585
$E'(Y)$	.0458	.2251
MPC = $P'E(Y) + PE'(Y)$	.046	.225
Elasticity = MPC × ($I/E(Y)$)	.35	.82

[1] Binary variable used to calculate this value for men is statistically significant at the 95-percent confidence level.

[2] Men's income effect used to calculate this value is statistically significantly different from the women's income effect at the 95-percent confidence level.

[3] MPC's and elasticities for homeowners are calculated assuming that single fathers have seven rooms and two bathrooms or half baths and that single mothers have six rooms and two bathrooms or half baths. For renters, both types of parents are assumed to have five rooms and one bathroom or half bath. For single mothers who are homeowners, the estimated expenditure $E(Y)$ increases to $2,943 when they are assumed to have seven rooms, and the MPC increases slightly, to 0.176. The elasticity estimate is unaffected by this "total" *ceteris paribus* assumption, falling to 0.56.

NOTE: Values are calculated from detailed regression coefficients, with results rounded.

Table B–3. Housing tenure, single parents

Variable	Men	Women
Probability of renting calculated by raising average permanent income of single mothers to match that of single fathers		
Permanent income (quarterly outlays, dollars)	$9,435	$9,435
Probability of outcome (renter, percent)	50.7	50.7
Probability of renting calculated by lowering average permanent income of single fathers to match that of single mothers		
Permanent income (quarterly outlays, dollars)	6,074	6,074
Probability of outcome (renter, percent)	55.2	66.7