# HARD AT PLAY!  THE GROWTH OF RECREATION IN CONSUMER BUDGETS, 1959-1998

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## INTRODUCTION

Several recent studies of consumer expenditure patterns suggest that the average American consumer is enjoying a sustained increase in living standards.  In support of this proposition, Cox and Alm [1993; 1997; 1999] cite trends toward greater use of timesaving products and services (microwave ovens, fast foods); improvements in the quality and variety of products (autos, air conditioners, running shoes, cable TV); and increased expenditures on recreation and entertainment (sporting goods, electronics, spectator sports, video rentals).  At a more technical level, Nakamura [1997] examines changes in the shares of budget spent on necessities and luxury goods, including recreation, for the years 1959, 1974, and 1994.  Using Engel's Law, he demonstrates that the shift in budgets away from necessities and toward luxuries both correspond to rising real income.  Nakamura finds the people have increased spending on luxury goods, and concludes that living standards have risen much faster over the last 20 years than is reflected in either real hourly wages or real GDP per capita.  In related work, Costa [1999] estimates Engel curves for food and recreation for different income classes using data from the Consumer Expenditure Survey (CES) for five selected years from 1888 to 1991.  She argues that changes in the mean share of expenditures devoted to recreation serve 'as an indirect indicator of living standards because recreation is both a luxury good and a complement to leisure time.  Costa finds that the expenditure elasticity for recreation has declined over time for all income groups, which implies that recreation is less concentrated by income class.  Thus, these studies provide evidence of increases in average living standards, despite official data that indicate rising inequality of money incomes [Burtless, 1996].

However, several other studies provide a different interpretation of the data.  Frank [1985; 1999] argues that spending on luxury goods reflects conspicuous consumption and concerns about relative position.  In support of the existence of consumption externalities, he cites well-known work by Easterlin [1974; 1995], that shows that economic growth may not increase happiness if preferences are interdependent. Schor [1998] uses the relative income hypothesis to argue that economic growth has vertically stretched the relevant peer groups and substantially increased consumption aspirations among lower-income classes.  Hence, emulation increases the number and variety of items that are considered necessities.  She argues that this has resulted in mass overspending by the middle class, which is reflected in other trends

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such as increased consumer debt and bankruptcies [Schor, 1998, 20]. Lastly, Brown [1994] uses cross-sectional CES data for five years from 1918 to 1988 to measure "economic distance" among income and social classes. She argues that recent changes in expenditure patterns including purchases of homes, furnishings, autos, clothing, and recreation goods and services, are motivated by both product innovation and a desire for status. Brown [1994, 464-66] concludes that from 1950 to 1973 consumption was motivated largely by status, while from 1973 to 1988 many expenditures were driven by innovation. Since product innovations disrupt previous consumption norms, we can infer that emulation was an important force during the 1990s.[1]

Given these conflicting views, the purpose of this study is to analyze empirically the growth and pattern of consumer expenditures on recreation, including: (1) the growth of recreation expenditures relative to total personal consumption expenditures; and (2) the "conditional" growth of six components of recreation. I use time-series data for 1959-97 from the National Income and Product Accounts (NIPA). These data cover 10 commodity groups, including the underlying recreation data that are organized into six sub-groups. First, several indexes for consumption patterns are analyzed, including budget shares, Divisia real quantity and price indexes, and second-order Divisia moments for quantities, prices, and budget shares. The negative relationship between prices and quantities is documented. A summary measure also is constructed for changes in the structure of consumption, which is an alternative to Brown's [1994] distance measure. Second, regression estimates are obtained for income and price elasticities for 10 NIPA commodity groups. This extends the empirical work of Costa [1999] to cover income and price elasticities for additional commodities. The analysis also includes demographic variables describing the changing age distribution of the population. Third, using a measure of the income distribution, I provide empirical tests of relative income as an influence on expenditure patterns. These results apply to the hypothesis that relative consumption imperatives have influenced expenditure patterns and norms. Fourth, the analysis is repeated for six recreation sub-groups from 1969 to 1998, including electronic products, printed products, sporting goods, gambling, live entertainment events, and all other recreation products and services. The within-group allocation of recreation expenditures has not been recently analyzed. Hence, the study extends the analysis of expenditure patterns and trends to various recreation sub-groups. Fifth, I use the results to construct an index of the quality of consumption that summarizes the extent to which luxury goods, including recreation, have displaced necessities in consumer budgets. This index provides evidence of a rising average standard of living. The overall quality index rises for the sample period and all sub-periods examined, with an important portion due to increased recreation expenditures.

Building on Engel's famous observation, the share of one's budget spent on food often has been used as an indirect welfare indicator. A declining share spent on necessities signifies increasing welfare because a greater portion of income is available for other goods and services. This study analyzes the consumption of luxury goods, which take up a larger share of the budgets of better-off households. A rising share for luxury goods also is an indicator of increased living standards, provided externalities are absent and consumption varies systematically with income [Deaton and Muellbauer, 1980, 193]. I show below that recreation is the fastest growing seg-

ment of consumption. The portion of a budget dedicated to recreation is especially attractive as an indicator of welfare, since many of the goods and services in this category are regarded as luxuries that formerly were accessible only to the wealthy or are closely associated with the use of leisure time [Costa, 1999]. Previous empirical studies, such as Costa [1999] and Brown [1994], have used cross-section CES data on food, recreation, and other expenditures to analyze these trends. However, CES data do not include prices and there is less product detail on recreation.

The remainder of the paper is organized as follows: the next section presents the NIPA data and conducts a preliminary investigation using the Divisia index analysis developed in Theil [1975; 1976; 1980]. This is followed by a description of the demand model and the empirical estimates of the income and price elasticities for the 10 NIPA commodity groups, including recreation. I also test the relative income hypothesis as an explanation for changes in expenditure patterns. The third section describes the recreation data and presents the Divisia analysis for six recreation sub-groups, which is followed by the conditional elasticities for the sub-groups. The last section uses the results to construct an index of the quality of consumption that measures the extent to which the average market basket has shifted toward luxury goods due to, in part, to increased real incomes or falling relative prices.

## NIPA COMMODITIES, BUDGET SHARES, AND DIVISIA INDEXES

The increased important of recreation expenditures is documented first. The data used in this section are from the National Income and Product Accounts [U.S. Department of Commerce, 1999] for nominal and real personal consumption by type of expenditure. These data are organized into ten product groups: (1) food; (2) alcohol and tobacco; (3) clothing and personal care; (4) housing; (5) household operation; (6) medical care; (7) transportation; (8) recreation and entertainment; (9) education and research; and (10) all other goods and services. Appendix Table A.1 describes the groups in greater detail. Per capita estimates are obtained by dividing expenditures by the census population for residents (www.census.gov/population). Price indexes with base year 1992 are obtained by dividing nominal by real expenditures stated in 1992 dollars.

### Budget Shares and Growth Rates

Let $p_{it}$ be the price and $q_{it}$ the per capita real quantity consumed of commodity $i$ during year $t$. The consumer's market basket has $n$ commodities. Total expenditure ("income") on all n commodities is given by $M_t = \Sigma(p_{it}q_{it})$. The budget shares, presented in Table A.2, are $w_{it} = (p_{it}q_{it})/M_t$, $i = 1, ..., n$. The shares for food, alcohol and tobacco, clothing, and household operation declined from 1959 to 1997. Shares for housing, medical care, recreation, education, and all other goods rose. The budget share for transportation rose until 1977, and declined thereafter. Mean budget shares by decade are shown in Table 1. The mean share of food declined from 20 percent in the 1960s to 13.5 percent in the 1990s, while the share for medical care increased substantially from 7.6 to 17.2 percent. The combined share of food, clothing, and household operation was 45 percent in the 1960s and 33 percent in the 1990s. The

## TABLE 1
### Mean Budget Shares, Quantity Log-changes, and Real Price Log-changes (percent)

| Means | Food | Alcohol & Tobacco | Clothing | Housing | House Operate | Medical Care | Transpor- tation | Recre- ation | Educa- tion | All Other |
|---|---|---|---|---|---|---|---|---|---|---|
| **Shares-all** | 17.21 | 3.90 | 9.64 | 14.78 | 12.86 | 11.76 | 12.79 | 6.80 | 1.89 | 8.37 |
| 1960s | 20.01 | 4.83 | 11.33 | 14.69 | 13.94 | 7.63 | 12.89 | 6.08 | 1.55 | 7.07 |
| 1970s | 18.37 | 4.21 | 10.05 | 14.32 | 13.14 | 10.29 | 13.38 | 6.73 | 1.93 | 7.58 |
| 1980s | 15.69 | 3.39 | 8.60 | 15.04 | 12.61 | 13.51 | 13.15 | 6.93 | 1.98 | 9.11 |
| 1990s | 13.54 | 2.80 | 8.09 | 15.21 | 11.30 | 17.24 | 11.49 | 7.80 | 2.23 | 10.31 |
| **Quantity-all** | 0.52 | −0.03 | 2.36 | 2.35 | 2.07 | 3.40 | 2.03 | 4.49 | 2.73 | 2.30 |
| 1960s | 1.21 | 0.55 | 2.40 | 3.53 | 2.80 | 4.72 | 3.13 | 3.79 | 5.62 | 2.84 |
| 1970s | 0.03 | 1.61 | 2.18 | 2.99 | 1.84 | 4.26 | 2.01 | 4.41 | 1.51 | 2.01 |
| 1980s | 0.70 | −1.03 | 2.80 | 1.67 | 1.66 | 2.78 | 2.04 | 4.63 | 2.07 | 3.19 |
| 1990s | 0.03 | −1.55 | 2.00 | 0.92 | 1.95 | 1.46 | 0.64 | 5.29 | 1.47 | 0.88 |
| **Real Prices-all** | 0.11 | 0.16 | −1.31 | −0.08 | −0.57 | 1.30 | −0.19 | −1.30 | 1.02 | 1.14 |
| 1960s | 0.03 | 0.13 | −0.17 | −0.65 | −0.63 | 1.05 | −0.10 | 0.64 | 0.88 | 1.12 |
| 1970s | 1.45 | −0.97 | −1.83 | −0.94 | 0.21 | 0.41 | 0.53 | −1.99 | 0.74 | 0.94 |
| 1980s | −0.72 | 0.78 | −1.62 | 1.06 | −0.80 | 2.21 | −0.95 | −1.77 | 1.19 | 0.99 |
| 1990s | −0.42 | 0.83 | −1.68 | 0.31 | −1.16 | 1.59 | −0.25 | −2.28 | 1.31 | 1.60 |
| **Nom. Prices-all** | 4.44 | 4.48 | 3.02 | 4.25 | 3.76 | 5.62 | 4.13 | 3.02 | 5.34 | 5.46 |

All entries have been multiplied by 100 to obtain shares and annual growth rates for quantities and prices. Budget shares are based on nominal expenditures and quantity log-changes are based on real expenditures per capita. Log-changes in real prices obtained by subtracting the differential Divisia price index from the nominal (nom.) change. Sample period is 1960-97.

combined share of housing, medical care, and transportation rose from 38 to 44 percent. The mean share for recreation, 6.1 percent during the 1960s, increased to 7.8 percent in the 1990s.

For analytical purposes, the data on quantities and prices are expressed as annual growth rates. Using natural logarithms, the log-change in per capita consumption is defined by the expression $Dq_{it} = \log(q_{it}/q_{i,t-1}) = \log q_{it} - \log q_{i,t-1}$, where $D$ is the log-difference operator. When multiplied by $100, Dq_{it}$ is the annual growth rate of per capita real consumption of the $i^{th}$ commodity. The log-change in nominal prices is given by $Dp_{it} = \log p_{it} - \log p_{i,t-1}$. The log-change in real prices is obtained by subtracting a price index, $Dp_{it}^* = Dp_{it} - DP_t$, where $P$ is the Divisia price index (see below). Table 1 summarizes the quantity and price growth rates by decade. During the 1980s and 1990s, real consumption of alcohol and tobacco fell. The real consumption of medical care grew the most quickly compared to other goods during the 1960s, but for the remainder of the study period and overall, real consumption of recreation grew the fastest. One reason real expenditures on recreation grew so quickly is because the real prices of recreation were falling. During the 1990s, nominal prices of recreation grew at an annual rate of 0.7 percent, while the prices of all goods rose at an average annual rate of 3.0 percent. Hence, the real price of recreation fell by −2.3 percent per year. In contrast, both the real and nominal price of medical care grew

the most quickly. During the 1990s, real prices of food, clothing, household operation, transportation, and recreation fell.

### Divisia Indexes

For overall comparisons, Divisia quantity and price indexes are computed. First, write the differential of the budget constraint as

$$(1) \qquad dM_t = \sum_{i=1}^{n} p_{it} dq_{it} + \sum_{i=1}^{n} q_{it} dp_{it}.$$

Dividing both sides by $M$, and rewriting using the budget shares $w_{it}$, yields a Divisia decomposition of the consumer's total expenditure

$$(2) \qquad d(\log M_t) = \sum_{i=1}^{n} w_{it} d(\log q_{it}) + \sum_{i=1}^{n} w_{it} d(\log p_{it}) = d(\log Q_t) + d(\log P_t),$$

which partitions the income log-change into differential Divisia quantity and price indexes. The finite-change versions of the indexes are given by budget-share weighted-averages of the log-changes in quantities and prices, respectively

$$(3) \qquad DQ_t = \sum_{i=1}^{n} \overline{w}_{it} Dq_{it}, \quad DP_t = \sum_{i=1}^{n} \overline{w}_{it} Dp_{it},$$

where $\overline{w}_{it} = (w_{it} + w_{i,t-1})/2$ is the moving-average budget share in years $t$ and $t-1$. These indexes measure the overall growth in per capita real consumption and prices, respectively.

Mean values of the Divisia quantity and price indexes are displayed in the upper half of Table A.3. Average per capita real consumption grew by 2.1 percent per year during 1960-97, but the overall annual growth rate declined from 2.7 percent in the 1960s to 1.3 percent in the 1990s. This decline is contrary to the picture presented by some observers [Schor, 1998]. On average, all prices grew by 4.3 percent per year, but rates of increase were faster during the 1970s and 1980s.

### Second-Order Divisia Moments

Using second-order moments, changes in the dispersion of quantities and prices can be examined. I also construct a measure of changes in the structure of the budget shares. The Divisia variances of the quantity and price log-changes are

$$(4) \qquad K_t = \sum_{i=1}^{n} \overline{w}_{it} (Dq_{it} - DQ_t)^2, \quad \Pi_t = \sum_{i=1}^{n} \overline{w}_{it} (Dp_{it} - DP_t)^2,$$

where the first term in parentheses is the relative quantity log-change, $D(q_{it}/Q_t)$, and the second term in parentheses is the real price log-change, $D(p_{it}/P_t) = Dp_{it}^*$. These variances measure the degree to which quantities and prices of the individual commodities change disproportionately. That is, if all quantities or real prices change proportionately, the respective variance would vanish. The mean values in Table A.3 indicate that the quantity variances have systematically exceeded the price variances,

which agrees with past studies [Clements and Selvanathan, 1994, 75]. The real price variances were higher in the 1970s and 1980s, which were the time periods with higher rates of price increase. The relative quantity variances were also higher during these periods, suggesting that increases in the dispersion of real prices tend to be associated with increased dispersion of growth rates for quantities.

The Divisia price-quantity covariance and correlation measure the co-movement of prices and quantities. Consumers will tend to substitute away from those commodities whose prices are rising more quickly than average and vice versa. Hence, both the covariance and correlation are expected to be negative. Table A.3 shows that this was true for three of the four sub-periods and overall. However, the covariance can be positive due to its income component [Theil, 1980, 69], and the results for the 1960s are affected by a few exceptional years that exhibited positive covariances and correlations. For the individual years, in 24 out of 38 years prices and quantities were negatively related, which suggests that these data provide a sound economic basis for further analysis of consumer choices.

Lastly, the Divisia variance of the log-change in the budget shares can be expressed as

$$(5) \qquad \psi_t = \sum_{i=1}^{n} \overline{w}_{it}(Dw_{it} - DW_t)^2 = K_t + \Pi_t + 2\Gamma_t$$

where $Dw$ is the budget share log-change, $DW = \Sigma \, \overline{w} \, Dw$ is the budget-share weighted-mean of $Dw$, and $\Gamma$ is the price-quantity covariance [Theil, 1980, 69]. The Divisia share variance is a summary measure of changes in the structure of consumption; that is, it measures the degree to which the growth rates in the ten budget shares differ from each other. The share variance incorporates quantity changes and variance, price changes and variance, and the price-quantity covariance. In general, quantities or prices do not change proportionately, leading to different growth rates for the respective budget shares. In contrast, the distance measure used by Brown [1994] ignores price-quantity correlations as a factor determining expenditure patterns. Table A.3 indicates that the share variance increased from the 1960s to 1980s, but declined some in the 1990s. Hence, both variances and the covariance were larger during the 1970s and 1980s, which implies that the composition of expenditures was changing more during those years. This suggests that the expenditure changes may be due to conventional demand factors, and not necessarily to conspicuous consumption or relative income imperatives.

In summary, rising budget shares were found for housing, medical care, and recreation. It remains to be shown whether these changes reflect changes in income, prices, population composition, relative income, or exogenous trends. After the 1960s, real per capita consumption of recreation grew the most quickly, and its real price grew slowest. The mean growth rate of recreation always exceeded the mean growth of total consumption. During the 1990s, real consumption of recreation grew at an average rate of 5.3 percent per year compared to a weighted-average of only 1.3 percent for total real expenditure. Real recreation prices fell at an average rate of $-2.3$ percent per year in the 1990s, suggesting the importance of changing real prices for changes in expenditure patterns. Despite their aggregate nature, the NIPA data

provide evidence of a negative relationship between real prices and quantities. The Divisia budget-share variance indicates substantial changes over time in the structure of expenditures. Contrary to claims by Brown [1994] and Schor [1998], changes in this structure were more important in the 1970s and 1980s compared to the 1990s.

## NIPA INCOME AND PRICE ELASTICITIES

In order to summarize and compare the unconditional demands, this section estimates individual demand functions for the ten commodities, with demographic variables and relative income as additional regressors. In the interest of space, system-wide estimates are not presented. Hence, except for homogeneity, the elasticities are not constrained by adding-up conditions or other restrictions [Houthakker and Taylor, 1970, 52]. Demand functions containing a single price variable can be justified by the broad commodities employed and additive preferences across the commodity groups. All data series are expressed as log first-differences. The augmented Dickey-Fuller test was used to test for unit roots. Using a test-down approach, all of the dependent variables are stationary at the 5 percent level or better, except for education, which is stationary at the 10 percent level.

Using growth rates, a first-difference logarithmic demand function for the $i^{th}$ commodity can be expressed as

$$(6) \qquad Dq_{it} = \alpha_i + \eta_i DQ_t + \gamma_i Dp_{it}^* + \beta_i DA_t + \varepsilon_{it}$$

where $DQ_t$ is the log-change in per capita real income; $Dp_{it}^*$ is the log-change in real price; $\alpha$ is a constant term representing an autonomous trend; $\eta$ is the income elasticity, $\gamma$ is the own-price elasticity; $\beta$ is a vector of demographic ("age") elasticities; $DA$ is a vector of age proportion variables, expressed as log-changes; and $\varepsilon$ is the disturbance term. The demographic variables are based on the percentage of the total population in five age cohorts: ages 5 to 15; ages 16 to 24; ages 25 to 44; ages 45 to 64; and ages 65 and over.[2] The data source is the *Economic Report of the President* [U.S. Council of Economic Advisers, 1999, Table B-34].

In order to test the relative income hypothesis, I considered several rank measures of changes in the income distribution, including (1) the ratio of the mean family income in the fourth quintile to that in the second quintile, (2) the ratio of the upper limit of family income in the fourth quintile to that in the second quintile, (3) the ratio of mean family income to median family income [Burtless, 1996], and (4) the Gini coefficient for family income. The data sources are U.S. Bureau of the Census, Income Statistics Branch, (www.census.gov/hhes/income/histinc, and www.census.gov/income). However, the four measures are highly correlated (all simple correlations exceed 0.93). Because the results are similar regardless of the measure used, regression estimates are reported for only first of these measures. This ratio was 1.94 in 1960 and rose steadily to 2.61 in 1997 ( = \$57,582/\$22,098). Hence, the rank variable shows rising inequality of money incomes. Similar rank measures have been used in other tests of the relative income hypothesis [Kapteyn et al., 1980].

Least-squares estimates of the income and price elasticities are reported in Table 2. The first set of results excludes the five age variables. The second set of results

## TABLE 2
### Regression Estimates of Income and Price Elasticities

| Variable | Food | Alcohol & Tobacco | Clothing | Housing | House Operate | Medical Care | Transpor- tation | Recre- ation | Educa- tion | All other |
|---|---|---|---|---|---|---|---|---|---|---|
| **No Age variables included:** | | | | | | | | | | |
| Constant | | | | | | | | | | |
| | −0.734 | −1.022 | −1.518 | 1.385 | −0.529 | 3.127 | −3.602 | 0.617 | 1.636 | 0.093 |
| | (3.95) | (3.01) | (4.87) | (4.13) | (2.36) | (7.95) | (7.47) | (1.74) | (2.82) | (0.30) |
| Income-elasticity | | | | | | | | | | |
| | 0.611 | 0.523 | 1.407 | 0.437 | 1.098 | 0.484 | 2.668 | 1.298 | 0.730 | 0.983 |
| | (6.42) | (4.98) | (20.6) | (5.74) | (14.5) | (4.62) | (11.6) | (9.15) | (3.09) | (5.62) |
| Own price-elasticity | | | | | | | | | | |
| | −0.285 | −0.656 | −0.713 | −0.575 | −0.517 | −0.570 | −0.143 | −0.883 | −0.428 | 0.125 |
| | (2.86) | (5.44) | (5.82) | (8.25) | (4.53) | (4.20) | (0.62) | (5.48) | (1.18) | (0.92) |
| $R^2$ | 0.552 | 0.521 | 0.810 | 0.552 | 0.803 | 0.316 | 0.802 | 0.695 | 0.315 | 0.419 |
| RESET (p) | 0.425 | 0.038 | 0.495 | 0.979 | 0.366 | 0.679 | 0.115 | 0.099 | 0.120 | 0.249 |
| BG-LM (p) | 0.675 | 0.476 | 0.968 | 0.004 | 0.322 | 0.006 | 0.909 | 0.474 | 0.001 | 0.280 |
| **With Age and Relative Income variables included:** | | | | | | | | | | |
| Constant | | | | | | | | | | |
| | −0.764 | −1.189 | −1.807 | 1.827 | −0.715 | 2.994 | −4.751 | 1.290 | 4.080 | 0.866 |
| | (1.66) | (1.64) | (3.51) | (3.86) | (1.41) | (4.50) | (3.85) | (1.84) | (4.12) | (0.83) |
| Income-elasticity | | | | | | | | | | |
| | 0.483 | 0.397 | 1.448 | 0.382 | 1.085 | 0.384 | 2.917 | 1.201 | 0.606 | 1.072 |
| | (4.73) | (2.92) | (16.7) | (3.89) | (15.6) | (3.05) | (13.1) | (8.85) | (4.11) | (5.85) |
| Own price-elasticity | | | | | | | | | | |
| | −0.371 | −0.486 | −0.697 | −0.476 | −0.508 | −0.339 | −0.114 | −0.936 | −0.348 | 0.183 |
| | (2.74) | (2.50) | (5.34) | (2.96) | (3.12) | (2.19) | (0.49) | (5.15) | (1.46) | (0.80) |
| Relative-income | | | | | | | | | | |
| | −20.61 | −13.62 | −13.62 | −0.047 | −4.991 | 2.916 | 82.63 | −21.92 | 2.705 | 7.370 |
| | (1.02) | (0.43) | (0.77) | (0.01) | (0.32) | (0.12) | (2.09) | (1.21) | (0.15) | (0.25) |
| $R^2$ | 0.643 | 0.621 | 0.847 | 0.726 | 0.819 | 0.527 | 0.844 | 0.778 | 0.743 | 0.530 |
| RESET (p) | 0.529 | 0.054 | 0.440 | 0.020 | 0.643 | 0.393 | 0.706 | 0.836 | 0.652 | 0.108 |
| BG-LM (p) | 0.685 | 0.814 | 0.146 | 0.254 | 0.665 | 0.526 | 0.272 | 0.331 | 0.454 | 0.976 |

T-statistics in parentheses are based on Newey-West standard errors, which are consistent in the presence of auto-correlation of unknown form. RESET is Ramsey's specification error test (two fitted terms) and BG-LM is Breusch-Godfrey's Lagrange multiplier test (two lagged residuals) for serial correlation. F-statistic p-values are reported for these tests. All variables in logged first-differences for the sample period 1959-97.

includes these variables and the measure of relative income. All of the income elasticities are statistically significant.[3] Five commodities have income elasticities that equal or exceed one, which indicates a luxury good (clothing, household operations, transportation, recreation, and all other goods). Transportation has the highest income elasticity, followed by clothing and recreation.[4] Except for all other goods, all of

the price elasticities are negative, seven of which are statistically significant. Transportation, education, and all other goods have insignificant price terms. For the significantly negative results, food and medical care have the most inelastic demands and recreation has the least inelastic demand. For the "No Age" regressions, eight of ten intercepts are significant. Medical care has the largest (positive) exogenous growth rate, followed by education, housing, and recreation. For the "With Age" regressions, only one relative income term is statistically significant. After controlling for changes in prices, income, and age composition, there is little or no support for changes in the distribution of income as a factor affecting average expenditure patterns. Lastly, tests for serial correlation in the residuals are uniformly rejected for the "With Age" regressions. The specification tests for several regressions (e.g., alcohol and tobacco) reflect structural changes during the sample period and occasional outliers, which could be corrected by adding dummy variables.

### Income and Price Elasticities

The remainder of the discussion focuses on the "No Age" regression results in Table 2. The income elasticities range from 0.44 to 2.67. The seven significantly negative price elasticities range from −0.28 to −0.88; demand is the most inelastic for food and least inelastic for recreation. Recreation is characterized by a demand that is income elastic (1.3) and moderately price inelastic (−0.9). The income elasticity values are the same as those reported by Costa [1999] and Clements and Selvanathan [1994, 99]. Recreation also has a positive autonomous trend (0.6 percent per year). In contrast, Food has a modest income elasticity (0.6), a price-inelastic demand (−0.3), and a negative trend (−0.7 percent). Alcohol and Tobacco is characterized by modest income and price elasticities (0.5, −0.7), and a moderately large negative trend (−1.0 percent). Clothing and Personal Care has a large negative trend (−1.5 percent), an income elasticity that exceeds one (1.4), and an own-price elasticity that is second only to recreation (−0.7). Housing has a large positive trend (1.4 percent), but modest income and price elasticities (0.4, −0.6). Household Operation is income elastic (1.1), price inelastic (−0.5), and the trend is negative (−0.5 percent). Medical Care is characterized by a very large autonomous trend (3.1 percent), but small income and price elasticities (0.5, −0.6). Transportation has the largest negative trend term (−3.6 percent), an income elasticity greater than one (2.7), and a zero price elasticity. Education and Research has a large positive trend (1.6 percent) and modest income and price elasticities (0.7, −0.4). Lastly, All Other Goods is income elastic (1.0), perfectly price inelastic, and the trend value is zero. Overall, Recreation is the only commodity with large income and price elasticities and a positive trend. These factors contribute positively to the quality index.

### RECREATION COMMODITIES

Assuming additive preferences, the demand for members of a group can be analyzed in exactly the same way as the group itself, except that total expenditures are replaced by expenditure on the group. The $n$ prices are replaced by prices of the products in the group. Forty-one individual products make up the recreation expen-

**TABLE 3**
**Conditional Budget Shares, Quantity Log-, and Real Price Log-changes**
**(percent)**

| Means | Electronic Products | Print Products | Sporting Goods | Gambling | Live Events | All Other |
|---|---|---|---|---|---|---|
| **Shares—all yrs** | 19.15 | 14.00 | 27.73 | 7.06 | 14.54 | 17.51 |
| 1970s | 18.93 | 14.77 | 30.79 | 4.75 | 12.44 | 18.32 |
| 1980s | 18.12 | 14.66 | 27.47 | 7.25 | 14.85 | 17.66 |
| 1990s | 20.45 | 12.31 | 24.32 | 9.77 | 16.77 | 16.37 |
| **Quantity—all yrs** | 10.90 | 1.09 | 4.23 | 6.39 | 3.79 | 5.57 |
| 1970s | 6.34 | 1.84 | 5.45 | 6.10 | 3.50 | 10.10 |
| 1980s | 11.89 | 0.41 | 2.89 | 6.14 | 5.16 | 7.18 |
| 1990s | 14.87 | 1.01 | 4.37 | 6.98 | 2.58 | −1.25 |
| **Real Prices—all yrs** | −5.30 | 3.38 | 0.37 | 2.75 | 2.65 | −0.59 |
| 1970s | −1.92 | 4.11 | 0.59 | 3.19 | 2.39 | −4.70 |
| 1980s | −5.38 | 3.61 | 0.77 | 3.01 | 2.66 | −2.31 |
| 1990s | −8.96 | 2.31 | −0.32 | 1.98 | 2.95 | 5.91 |
| **Nom. Prices—all yrs** | −2.98 | 5.70 | 2.69 | 5.08 | 4.79 | 1.74 |

All entries have been multiplied by 100 to obtain percentages and annual growth rates. Budget shares are based on nominal expenditures and quantity log-changes are based real expenditures per capita. Log-changes in relative prices obtained by subtracting the Divisia price index from nominal (nom.) changes.

diture portion of the national accounts. Using the detailed NIPA data on nominal and real expenditures, I organized these data into six sub-groups: (1) Electronic Products—TVs, VCRs, records, disk and tape purchases, other video and audio equipment, and personal computers; (2) Printed Products—books, maps, newspapers, and magazines; (3) Durable and Non-Durable Sporting Goods—wheel goods, guns, sporting equipment, cameras, boats, pleasure aircraft, and toys; (4) Gambling—casino gambling, parimutuel net receipts, and lotteries; (5) Live Entertainment Events—motion picture admissions, live events, spectator sports, commercial participant amusements, cable TV, and video cassette rentals; and (6) All Other Recreation Products. More details on the sub-group definitions are given in Table A.1. Because the years 1959 to 1968 yielded negative values for real consumption of the last sub-group, the conditional analysis was limited to the period 1969-98. Table A.4 shows per capita real expenditures on the six recreation sub-groups for the years 1969-98. In nominal dollars, the average consumer in 1998 spent $1871 on recreation products and services, including $448 on sporting goods, $393 dollars on electronics, $312 on live events, $212 on print products, $208 on gambling, and $298 on all other products.

Table 3 summarizes the data on conditional budget shares, quantity log-changes, and real price log-changes for the six commodities. The conditional budget shares are defined as nominal expenditure on a given recreation commodity divided by total recreation expenditure. During all three decades, sporting goods had the largest share and electronics had the second largest share. Gambling, electronics, and live

events had rising shares, while falling shares were observed for printed products, sporting goods, and all other products. With respect to real growth, electronic expenditures had the largest growth rate, 10.9 percent per year, compared to 6.4 percent for gambling, 4.2 percent for sporting goods, and 3.8 percent for live events. Printed products had a positive rate of growth (1.1 percent), while the rate for all other products was negative (−1.2 percent) during the 1990s. Conditional real prices declined in every decade for electronics. Real prices rose for printed products, gambling, and live events. Sporting goods prices rose overall, but fell during the 1990s.

The conditional Divisia moments are shown in the lower half of Table A.3. The overall growth in real per capita consumption was 5.4 percent, but growth by decade declined slightly over time. This is the same pattern observed for total consumption. The overall growth in prices was 2.3 percent, but the average rate of price growth declined over time. The quantity variance again exceeded the price variance, and these variances were much larger than the unconditional values. The price-quantity covariance and correlations were negative for all three decades. The covariance was negative for 28 of 29 years (only 1970 has a positive value). Clearly, there is evidence that consumers substitute away from goods and services with above-average price increases. This pattern is contrary to claims of conspicuous consumption based solely on status [Schor, 1998]. Lastly, the budget variance again was higher during the 1980s and lower during the 1990s.

## CONDITIONAL INCOME AND PRICE ELASTICITIES

The conditional demand equations play the same role as the demand equations analyzed above, except that the focus is on the within-group allocation of recreation expenditures. Each demand equation shows how the allocation of recreation expenditure per capita depends on (1) an autonomous trend; (2) the conditional Divisia quantity index for recreation; (3) real price of the commodity; and (4) demographic variables. The first-difference logged data were examined for unit roots using the augmented Dickey-Fuller test. All dependent variables are stationary at the 5 percent level, except for electronic products, which is stationary at the 10 percent level. Because some results are affected by new products (cable TV, video rentals), a dummy variable for 1982-98 was included in some live events regressions.

The regression results are displayed in Table 4; the bottom half of the table reports results that include the demographic variables. The relative income variable was never significant, and these results are not reported. The intercepts were not statistically significant when the demographic variables were included. Examining both sets of results, eleven of twelve conditional income elasticities are significantly positive. The estimates range from 0.4 to 1.7. The income elasticities for electronics and sporting goods are greater than one.[5] Live events has the smallest income elasticity (0.4 to 0.5), followed by all other products (0.4 to 0.5) and printed products (0.4 to 0.7). Eight of twelve price elasticity estimates are significantly negative. Except for gambling, the six recreation commodities have price elasticities that fall between −0.7 and −1.5. Electronics, print products, and all other products have price elastic demands. The demand for gambling has a zero price elasticity, live events has an elasticity of −0.7 to −0.9, and sporting goods has an elasticity of −0.5 to −0.8, al-

**TABLE 4**
**Recreation Regression Estimates:**
**Conditional Income and Price Elasticities**

| Variables | Electronic Products | Print Products | Sporting Goods | Gambling | Live Events | All Other |
|---|---|---|---|---|---|---|
| **No Age variables included:** | | | | | | |
| Constant | −3.980 | 3.476 | −3.410 | 2.953 | 3.080 | 2.482 |
| | (2.79) | (1.79) | (4.79) | (1.91) | (2.78) | (4.95) |
| Income-elasticity | 1.601 | 0.401 | 1.461 | 0.750 | 0.470 | 0.454 |
| | (7.54) | (2.23) | (9.08) | (2.29) | (2.07) | (3.73) |
| Own price-elasticity | −1.166 | −1.351 | −0.813 | −0.233 | −0.696 | −1.057 |
| | (6.60) | (6.95) | (1.98) | (0.46) | (2.84) | (13.8) |
| | | | | | | |
| R² | 0.831 | 0.556 | 0.750 | 0.347 | 0.214 | 0.919 |
| RESET (p) | 0.299 | 0.614 | 0.661 | 0.808 | 0.053 | 0.110 |
| BG-LM (p) | 0.981 | 0.255 | 0.756 | 0.529 | 0.851 | 0.445 |
| | | | | | | |
| **With Age variables included:** | | | | | | |
| Dummy for 1982-98 | — | — | — | — | 4.704 | — |
| Income-elasticity | 1.659 | 0.666 | 1.279 | 0.608 | 0.388 | 0.423 |
| | (7.71) | (4.22) | (7.31) | (2.00) | (1.33) | (3.02) |
| Own price-elasticity | −0.911 | −1.491 | −0.522 | 0.104 | −0.868 | −1.077 |
| | (7.61) | (5.90) | (0.94) | (0.24) | (1.74) | (8.70) |
| R² | 0.872 | 0.684 | 0.780 | 0.464 | 0.423 | 0.925 |
| RESET (p) | 0.117 | 0.727 | 0.101 | 0.682 | 0.923 | 0.053 |
| BG-LM (p) | 0.160 | 0.771 | 0.492 | 0.640 | 0.131 | 0.421 |

"With Age" regressions include five variables for age distribution of the population (in log-change form). T-statistics in parentheses are based on Newey-West standard errors. RESET is Ramsey's specification error test (two fitted terms) and BG-LM is Breusch-Godfrey's Lagrange multiplier test (two lagged residuals) for serial correlation. F-statistic p-values are reported for these tests. All variables in logged first-differences for 1969-98.

though the former value is not statistically significant. Excluding the age variables, the autonomous trends are positive for printed products, gambling, live events, and all other products, but negative for electronics and sporting goods. The smaller $R^2$ values for live events and gambling probably reflect the introduction of new products and services. Tests for serial correlation and specification errors are generally satisfactory, except for all other goods.

Combing the results in previous section, some of the differences within the recreation group are significant. Overall, the demand for recreation is income elastic and the price elasticity is close to one. Conditionally, the demands for electronics and sporting goods are income elastic, and the demands for electronics and print products are price elastic. During the sample period, real prices declined for electronics and rose for printed products. Overall, the patterns of consumption for recreation are consistent with conventional economic forces associated with changes in income, real prices, and the age composition of the population. No evidence was found for relative income as a demand factor for the recreation sub-groups. Hence, the results in Tables 2 and 4 suggest that status consumption plays a small role in the expenditure patterns.

## CHANGES IN THE QUALITY OF CONSUMPTION

This section addresses the question of trends in living standards. I use the "No Age" regression results in Tables 2 and 4 and the quantity and price data documented in the other tables. The analysis applies on average and does not reflect changes that may occur by income or social class. The empirical problem is to measure from the average consumer's point of view the extent to which the "quality" of real consumption has increased. An individual whose real income increases will spend a larger fraction of income on luxuries and a smaller fraction on necessities. That is, the consumer reveals that luxuries (with income elasticities greater than one) are preferred to necessities. If prices are constant, the new market basket is more desirable than the old, so this change can be labeled an increase in the quality (desirability) of consumption [Theil, 1980, 137]. Hence, the solution to the empirical problem is to measure the luxury-necessity composition of the market basket in a way that reflects both income and price changes. Following Theil [1976, 182-85], the log-change in the quality of consumption equals the Divisia covariance of the quantity log-changes and the income elasticities. The covariance is positive (negative) when the composition of the market basket changes so that the quantity of luxuries increase (decrease) relative to those of necessities. Thus, increases in real income will increase the quality index, all other things equal. In a similar fashion, a decrease (increase) in the price of luxuries relative to necessities also will increase (decrease) the quality index. I show below that recreation contributes positively to the quality index due to growth of mean real income, decreases in the real price of recreation, and a positive exogenous trend. Further, recreation is the only NIPA commodity with this particular combination of characteristics.

The Divisia quality covariance can be written in terms of income and substitution effects by inserting the demand functions for quantity changes:

$$\Omega_t = \sum_{i=1}^{n} \overline{w}_{it}(\eta_i - 1)Dq_{it} = \sum_{i=1}^{n} \overline{w}_{it}\eta_i Dq_{it} - DQ_t$$

(7)

$$= DQ_t(\sum_{i=1}^{n} \overline{w}_{it}\eta_i^2 - 1) + \sum_{i=1}^{n} \overline{w}_{it}\eta_i\gamma_i Dp_{it}^* + \sum_{i=1}^{n} \overline{w}_{it}\eta_i\alpha_i + \sum_{i=1}^{n} \overline{w}_{it}\eta_i\varepsilon_{it},$$

where, in the bottom line, the first term is $DQ$ times the income elasticity of demand for quality [Theil, 1976, 184]; the second term is the weighted net substitution effect of real price changes; the third term is the net contribution of the exogenous trends; and last term is the net residual component of the index. Hence, the quality index is a composition of four subindexes. A similar index can be obtained for conditional expenditures on recreation.

Table 5 displays the quality indexes (in growth rate form) and components for the ten NIPA commodities and the six recreation sub-groups. From 1960 to 1997, the quality index increased by 0.21 percent per year, compared to 0.30 percent obtained by Finke and Theil [1985] from 1964 to 1981. The index declines in the 1990s relative

## TABLE 5
### Mean Change in Quality of Consumption (percent per annum)

| All Commodities | All Years | 1960-69 | 1970-79 | 1980-89 | 1990-97 |
|---|---|---|---|---|---|
| Quantity change: | 2.10 | 2.72 | 2.14 | 2.05 | 1.33 |
| Quality change: | 0.21 | 0.29 | 0.15 | 0.29 | 0.13 |
| Necessities | −0.62 | −0.70 | −0.59 | −0.65 | −0.49 |
| Luxuries | 0.83 | 0.99 | 0.74 | 0.94 | 0.62 |
| Real income: | 1.27 | 1.70 | 1.38 | 1.23 | 0.65 |
| Necessities | −0.74 | −0.94 | −0.75 | −0.73 | −0.49 |
| Luxuries | 2.01 | 2.64 | 2.13 | 1.96 | 1.14 |
| Net substitution: | 0.23 | 0.04 | 0.29 | 0.28 | 0.35 |
| Necessities | −0.06 | −0.01 | −0.01 | −0.12 | −0.09 |
| Luxuries | 0.29 | 0.05 | 0.30 | 0.39 | 0.45 |
| Net intercept: | −1.26 | −1.40 | −1.35 | −1.24 | −0.98 |
| Necessities | 0.19 | 0.10 | 0.16 | 0.23 | 0.30 |
| Luxuries | −1.45 | −1.50 | −1.51 | −1.46 | −1.28 |
| Net residual: | −0.03 | −0.05 | −0.17 | 0.02 | 0.11 |
| Necessities | −0.01 | 0.13 | 0.01 | −0.03 | −0.21 |
| Luxuries | −0.02 | −0.18 | −0.18 | 0.05 | 0.32 |
| **Recreation Group:** | | | | | |
| Quantity change | 5.44 | — | 5.74 | 5.41 | 5.14 |
| Quality change | 0.80 | — | 0.16 | 0.45 | 1.89 |
| Real income | 1.15 | — | 1.50 | 0.97 | 0.98 |
| Net substitution | 1.49 | — | 0.57 | 1.37 | 2.65 |
| Net intercept | −1.85 | — | −2.07 | −1.77 | −1.72 |
| Net residual | 0.01 | — | 0.16 | −0.12 | −0.02 |

Sample period for the first 16 row entries is 1960-97 and 1970-98 for the last six rows. "No Age" regression results in Tables 2 and 4 used for empirical results. Necessities are food, alcohol & tobacco, housing, medical care, and education. Luxuries are clothing, household operations, transportation, recreation, and all other goods.

to the earlier time periods. The positive component of the index is mostly due to the effect of increasing real income and its impact on the quantity of luxury goods in the market basket. Recreation's portion of the luxury component for income rises from 5.4 percent in 1960 to 8.7 percent in 1997. The net substitution effect is always positive (although small), which indicates that the prices of luxuries have tended to fall relative to necessities. However, this effect is more important during the 1990s, which illustrates the importance of accounting for price changes. By 1997, the positive contribution of recreation is about half of the net gain due to falling prices. The negative net intercept reflects, in large part, the exogenous trend for transportation. The small values for the residual component indicate that it lacks a trend, which it should have. For the recreation sub-groups, the quality index is positive and rising over time. While

the conditional income effect is important, it is exceeded by the substitution effect after the 1970s.

The mean values provide evidence of a rising quality of consumption over time, although the growth rate slows in the 1990s. The contribution of recreation increases over time, so that by the 1990s, it is the first- or second-largest positive component of the index. Hence, the results in this study demonstrate the importance of recreation as a factor behind the rise in the quality index as a measure of living standards for the average consumer.

## APPENDIX

## TABLE A.1
### National Income and Product Accounts

| Category | Details (partial listing) |
|---|---|
| Food | Food purchased for off-premise consumption; purchased meals and beverages; food furnished to employees; food produced and consumed on farms |
| Alcohol and Tobacco | Alcoholic beverages purchased for off-premise consumption; other alcoholic beverages; tobacco products |
| Clothing and Personal Care | Shoes; clothing and accessories; cleaning, storing, and repair of clothing and shoes; jewelry and watches; personal care, including toilet articles and beauty shop services |
| Housing | Owner-occupied nonfarm dwellings; tenant-occupied nonfarm dwellings; rental value of farm dwellings |
| Household Operations | Furniture; kitchen and other appliances; china, glassware, tableware and utensils; semi-durable household furnishing; cleaning preparations; stationary and writing supplies; household utilities; telephone; domestic services |
| Medical Care | Drug preparations; ophthalmic products; physicians; dentists; other professional services; hospital and nursing homes; health insurance |
| Transportation | User-operated transportation, including new autos, tires, repairs, gasoline, and insurance; purchased local transportation; purchased intercity transportation |
| Recreation and Entertainment | Electronic products; printed products; durable and non-durable sporting goods; gambling; live entertainment events; miscellaneous services |
| Education and Research | Higher education; nursery, elementary, and secondary schools |
| All Other Products and Services | Personal business, including brokerage charges, bank service charges, legal services, funeral services; religious and welfare activities; net foreign travel |
| **Recreation Sub-Groups:** | |
| Electronic Products | TVs, VCRs, videotapes, other video and audio eqpt.; records, tapes, disks, musical instruments; pce computers |
| Printed Products | Books and maps; magazines and newspapers |
| Sporting Goods | Wheel goods; guns, sporting equipment, bicycles, motorcycles, cameras; pce boats and pleasure aircraft; nondurable toys and sports equipment, including ammunition, film, and toys |
| Gambling | Casino gambling, parimutuel net receipts, lotteries |
| Live Events | Motion picture admissions; live entertainment except sports, spectator sports; commercial participant amusements; cable TV, video cassette rental |
| All Other Recreation | Repair of audio and video eqpt.; clubs and fraternal orgs.; pets and pet supplies, veterinarians; film developing, photo studios; high school rec., other recreation |

*National Income and Product Accounts.* Individual categories have been combined by the author. Computers were 3.3 percent of total recreation in 1988 and 5.5 percent in 1998. Computers were 16.7 and 26.4 percent of electronics, respectively.

## TABLE A.2
### NIPA Commodity Budget Shares (percent)

| Year | Food | Alcohol | Cloth | Housing | Operate | Medical | Transport | Recreate | Educate | Other |
|------|------|---------|-------|---------|---------|---------|-----------|----------|---------|-------|
| 1959 | 22.04 | 5.38 | 11.69 | 14.15 | 14.18 | 6.48 | 12.79 | 5.56 | 1.26 | 6.48 |
| 1960 | 21.55 | 5.30 | 11.53 | 14.51 | 14.06 | 6.65 | 12.91 | 5.57 | 1.29 | 6.62 |
| 1961 | 21.37 | 5.22 | 11.56 | 14.94 | 14.07 | 6.89 | 12.11 | 5.60 | 1.37 | 6.86 |
| 1962 | 20.53 | 5.15 | 11.47 | 15.05 | 14.03 | 7.21 | 12.74 | 5.72 | 1.40 | 6.69 |
| 1963 | 19.95 | 5.07 | 11.23 | 15.14 | 14.10 | 7.36 | 13.05 | 5.85 | 1.44 | 6.81 |
| 1964 | 19.74 | 4.84 | 11.33 | 14.92 | 14.20 | 7.71 | 12.88 | 5.98 | 1.48 | 6.93 |
| 1965 | 19.76 | 4.73 | 11.14 | 14.72 | 13.98 | 7.67 | 13.30 | 6.03 | 1.55 | 7.11 |
| 1966 | 19.82 | 4.65 | 11.31 | 14.42 | 13.97 | 7.72 | 12.91 | 6.39 | 1.62 | 7.20 |
| 1967 | 19.31 | 4.51 | 11.31 | 14.54 | 13.94 | 7.97 | 12.64 | 6.50 | 1.71 | 7.58 |
| 1968 | 19.10 | 4.43 | 11.27 | 14.24 | 13.63 | 8.34 | 13.13 | 6.56 | 1.77 | 7.54 |
| 1969 | 18.98 | 4.38 | 11.13 | 14.35 | 13.41 | 8.78 | 13.20 | 6.60 | 1.84 | 7.33 |
| 1970 | 19.30 | 4.55 | 10.71 | 14.50 | 13.08 | 9.26 | 12.51 | 6.65 | 1.93 | 7.50 |
| 1971 | 18.41 | 4.51 | 10.52 | 14.62 | 12.81 | 9.54 | 13.49 | 6.55 | 1.95 | 7.60 |
| 1972 | 18.07 | 4.45 | 10.38 | 14.55 | 12.88 | 9.72 | 13.66 | 6.67 | 1.96 | 7.66 |
| 1973 | 18.27 | 4.38 | 10.43 | 14.41 | 13.06 | 9.82 | 13.55 | 6.76 | 1.95 | 7.37 |
| 1974 | 18.86 | 4.33 | 10.17 | 14.40 | 13.24 | 10.06 | 12.78 | 6.81 | 1.97 | 7.39 |
| 1975 | 18.91 | 4.24 | 9.94 | 14.28 | 13.16 | 10.48 | 12.65 | 6.85 | 1.99 | 7.49 |
| 1976 | 18.44 | 4.13 | 9.74 | 14.06 | 13.22 | 10.65 | 13.55 | 6.80 | 1.95 | 7.47 |
| 1977 | 17.95 | 3.92 | 9.67 | 14.06 | 13.36 | 10.95 | 14.06 | 6.69 | 1.88 | 7.46 |
| 1978 | 17.71 | 3.81 | 9.66 | 14.12 | 13.27 | 11.15 | 13.77 | 6.70 | 1.86 | 7.95 |
| 1979 | 17.78 | 3.77 | 9.31 | 14.22 | 13.29 | 11.31 | 13.73 | 6.79 | 1.86 | 7.94 |
| 1980 | 17.61 | 3.76 | 9.03 | 14.50 | 13.21 | 11.72 | 13.54 | 6.61 | 1.89 | 8.13 |
| 1981 | 17.19 | 3.70 | 8.86 | 14.83 | 13.07 | 12.45 | 13.52 | 6.65 | 1.93 | 7.81 |
| 1982 | 16.90 | 3.66 | 8.48 | 15.08 | 13.04 | 13.04 | 12.90 | 6.66 | 1.98 | 8.24 |
| 1983 | 16.13 | 3.60 | 8.51 | 14.85 | 12.95 | 13.30 | 13.11 | 6.74 | 1.97 | 8.85 |
| 1984 | 15.66 | 3.42 | 8.50 | 14.87 | 12.90 | 13.43 | 13.52 | 6.89 | 1.95 | 8.86 |
| 1985 | 15.07 | 3.32 | 8.41 | 15.05 | 12.64 | 13.56 | 13.78 | 6.87 | 1.96 | 9.34 |
| 1986 | 14.82 | 3.26 | 8.52 | 15.29 | 12.40 | 13.69 | 13.13 | 7.01 | 1.97 | 9.92 |
| 1987 | 14.57 | 3.16 | 8.57 | 15.40 | 12.14 | 14.11 | 12.82 | 7.17 | 1.98 | 10.08 |
| 1988 | 14.50 | 3.01 | 8.54 | 15.31 | 11.91 | 14.65 | 12.69 | 7.35 | 2.04 | 10.01 |
| 1989 | 14.46 | 3.00 | 8.54 | 15.23 | 11.80 | 15.18 | 12.48 | 7.37 | 2.10 | 9.84 |
| 1990 | 14.49 | 3.03 | 8.33 | 15.27 | 11.36 | 16.03 | 12.07 | 7.33 | 2.10 | 9.98 |
| 1991 | 14.42 | 3.03 | 8.17 | 15.51 | 11.28 | 16.82 | 10.99 | 7.35 | 2.17 | 10.26 |
| 1992 | 13.84 | 2.98 | 8.21 | 15.33 | 11.15 | 17.38 | 11.17 | 7.37 | 2.21 | 10.37 |
| 1993 | 13.65 | 2.80 | 8.14 | 15.09 | 11.30 | 17.62 | 11.30 | 7.63 | 2.21 | 10.26 |
| 1994 | 13.43 | 2.72 | 8.08 | 15.11 | 11.34 | 17.51 | 11.49 | 7.85 | 2.22 | 10.25 |
| 1995 | 13.10 | 2.65 | 7.95 | 15.15 | 11.29 | 17.66 | 11.59 | 8.16 | 2.26 | 10.19 |
| 1996 | 12.83 | 2.61 | 7.92 | 15.10 | 11.37 | 17.49 | 11.73 | 8.29 | 2.29 | 10.38 |
| 1997 | 12.60 | 2.55 | 7.88 | 15.10 | 11.30 | 17.43 | 11.58 | 8.43 | 2.36 | 10.78 |

Calculated from the *National Income and Product Accounts.*

## TABLE A.3
### Divisia Moments

| Means | Quantity index | Price index | Quantity variance | Price variance | Price-quantity covariance | Price-quantity correlation | Budget-share variance |
|-------|----------------|-------------|-------------------|----------------|---------------------------|----------------------------|-----------------------|
| **Divisia moments: All commodities, 1960-97** | | | | | | | |
| All yrs | 2.10 | 4.32 | 5.30 | 3.32 | −1.44 | −0.19 | 5.74 |
| 1960s | 2.72 | 2.39 | 3.67 | 0.97 | 0.32 | 0.19 | 5.29 |
| 1970s | 2.14 | 6.50 | 6.81 | 4.60 | −2.67 | −0.30 | 6.07 |
| 1980s | 2.05 | 5.17 | 5.74 | 5.06 | −2.27 | −0.33 | 6.27 |
| 1990s | 1.33 | 2.96 | 4.92 | 2.49 | −1.10 | −0.35 | 5.21 |
| **Divisia moments: Recreation commodities, 1970-98** | | | | | | | |
| All years | 5.44 | 2.32 | 30.41 | 20.75 | −20.76 | −0.70 | 9.63 |
| 1970s | 5.74 | 3.18 | 25.17 | 17.15 | −16.19 | −0.56 | 9.94 |
| 1980s | 5.41 | 2.62 | 25.97 | 12.81 | −13.38 | −0.68 | 12.02 |
| 1990s | 5.14 | 1.04 | 41.15 | 33.57 | −34.05 | −0.89 | 6.63 |

All entries in columns 2 and 3 have been multiplied by 100; columns 4 to 6 and 8 by 10,000.

## TABLE A.4
### Real Expenditures on Recreation
### (1992 dollars per capita)

| Year | Electronic Products | Printed Products | Sporting Goods | Gambling | Live Events | All Other | Total |
|------|---------------------|------------------|----------------|----------|-------------|-----------|-------|
| 1969 | 28.95 | 131.82 | 133.14 | 28.26 | 85.80 | 34.06 | 442.03 |
| 1970 | 30.47 | 143.93 | 133.20 | 28.43 | 86.56 | 34.64 | 457.23 |
| 1971 | 31.17 | 140.00 | 135.90 | 29.94 | 87.57 | 39.25 | 463.83 |
| 1972 | 34.62 | 138.78 | 159.27 | 33.24 | 89.80 | 47.19 | 502.90 |
| 1973 | 38.55 | 144.38 | 174.88 | 37.89 | 90.95 | 58.71 | 545.36 |
| 1974 | 40.10 | 146.15 | 177.13 | 39.86 | 97.66 | 63.39 | 564.29 |
| 1975 | 42.80 | 136.11 | 180.26 | 41.28 | 100.79 | 76.62 | 577.86 |
| 1976 | 46.08 | 131.09 | 193.21 | 44.65 | 103.31 | 90.58 | 608.92 |
| 1977 | 48.27 | 134.01 | 201.64 | 46.81 | 111.88 | 93.87 | 636.48 |
| 1978 | 51.01 | 146.68 | 216.25 | 51.08 | 119.01 | 90.08 | 674.11 |
| 1979 | 54.60 | 158.42 | 229.65 | 52.02 | 121.79 | 93.47 | 709.95 |
| 1980 | 55.78 | 157.65 | 213.56 | 54.14 | 124.25 | 97.30 | 702.68 |
| 1981 | 57.87 | 155.64 | 214.26 | 59.96 | 133.60 | 102.31 | 723.64 |
| 1982 | 59.74 | 149.80 | 211.37 | 64.25 | 143.32 | 105.43 | 733.91 |
| 1983 | 76.57 | 149.05 | 217.24 | 69.32 | 157.10 | 122.82 | 792.10 |
| 1984 | 88.76 | 156.32 | 244.03 | 73.34 | 168.98 | 128.60 | 860.03 |
| 1985 | 103.74 | 149.81 | 250.92 | 79.59 | 175.16 | 147.79 | 907.01 |
| 1986 | 128.42 | 149.37 | 266.18 | 83.72 | 184.13 | 158.32 | 970.14 |
| 1987 | 144.40 | 157.23 | 288.03 | 87.50 | 187.66 | 167.11 | 1031.93 |
| 1988 | 166.61 | 164.99 | 296.47 | 94.03 | 200.62 | 181.87 | 1104.59 |
| 1989 | 179.25 | 165.13 | 306.47 | 96.11 | 204.09 | 191.70 | 1142.75 |
| 1990 | 191.90 | 166.16 | 305.60 | 99.91 | 209.86 | 196.22 | 1169.65 |
| 1991 | 212.63 | 159.23 | 297.58 | 98.94 | 202.97 | 198.70 | 1170.05 |
| 1992 | 239.88 | 153.89 | 299.31 | 107.12 | 208.78 | 209.65 | 1218.63 |
| 1993 | 281.72 | 156.83 | 316.64 | 120.74 | 222.01 | 213.94 | 1311.88 |

## TABLE A.4 (Cont.)
### Real Expenditures on Recreation
### (1992 dollars per capita)

| Year | Electronic Products | Printed Products | Sporting Goods | Gambling | Live Events | All Other | Total |
|---|---|---|---|---|---|---|---|
| 1994 | 335.61 | 163.13 | 334.60 | 136.32 | 222.28 | 210.95 | 1402.89 |
| 1995 | 394.40 | 167.80 | 354.96 | 147.70 | 233.33 | 220.50 | 1518.69 |
| 1996 | 467.02 | 172.40 | 378.28 | 155.57 | 239.04 | 208.70 | 1621.01 |
| 1997 | 548.47 | 177.36 | 414.32 | 166.22 | 243.33 | 194.81 | 1744.51 |
| 1998 | 683.22 | 180.78 | 454.11 | 180.10 | 257.48 | 171.25 | 1926.94 |

Calculated from the *National Income and Product Accounts* for recreation.

## NOTES

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1.  Status consumption imperatives are discussed in Congleton [1989], Hirsch [1976], Postlewaite [1998], Rainwater [1974], Sen [1986], and Weiss and Fershtman [1998]. See also Holcombe and Sobel [2000]. Changes in expenditure patterns are discussed in U.S. Bureau of Labor Statistics [1959], Jacobs and Shipp [1990], and Lebergott [1993; 1996].
2.  The age group variables show the importance of demographic changes on demand functions; see Deaton and Muellbauer [1980, Ch. 8]. By decade, the fastest (slowest) growing population cohorts were for the 1960s, ages 16-24 (0-4); 1970s, ages 65+ (5-15); 1980s, ages 25-44 (16-24); and 1990s, ages 45-64 (16-24).
3.  Although the income elasticities are not constrained, the share-weighted sums are very close to unity; see also Houthakker and Taylor [1970, 52].
4.  The demographic variables were most important for food and education, and least important for housing operations. In the recreation demand function, the demographic coefficients were all positive, except for the over-65 age group.
5.  Using CES data for 1991, Costa [1999] reports income elasticities that are greater than one for sporting equipment and home entertainment, including electronics. For the period 1946-64, Houthakker and Taylor [1970] report long-run income elasticities for sporting equipment and electronics of 3.7 and 3.0, respectively.

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