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AGE, RETIREMENT AND EXPENDITURE PATTERNS: AN ECONOMETRIC STUDY OF OLDER CANADIAN HOUSEHOLDS

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QSEP Research Report No. 375

October 2002

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This report is cross-listed as No. 82 in the McMaster University SEDAP Research Paper Series.

September 2002

ABSTRACT

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The paper explores the allocation of consumption expenditure by the older population among different categories of goods and services, and how expenditure patterns change with age within that population. Of particular interest is whether observed differences between pre-retirement and post-retirement patterns are a consequence of changes in "tastes" or reductions in income. An adapted form of the Deaton and Muellbauer Almost Ideal Demand System is estimated with data from six Family Expenditure Surveys and used to investigate that question. The findings suggest that observed changes in budget allocations are most closely related to reductions in income.

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AGE, RETIREMENT AND EXPENDITURE PATTERNS : AN ECONOMETRIC STUDY OF OLDER CANADIAN HOUSEHOLDS[1]

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1. INTRODUCTION

The widespread recognition of the importance of population aging for the economy has generated new interest in how people manage their resources in later life. One can think of three broad aspects of household resource management that are of interest: patterns of saving and the use of wealth, reflecting choices between current consumption, on the one hand, and future consumption or bequests, on the other; leisure/work choices, as indicated by labour force participation rates; and the allocation of current consumption expenditure among different categories of goods and services. The allocation of current consumption expenditure is the subject of this paper. In particular, the paper is concerned with how the expenditure patterns of households in the range 50 and older vary as age increases, and how they are affected by the transition from work to retirement. A question of special interest is whether observed differences between pre-retirement and post-retirement expenditure patterns are a consequence of age-related

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[1]We acknowledge with appreciation the help of Christine Feaver, who did the calculations reported in this paper. The work underlying the paper was carried out as part of the SEDAP (Social and Economic Dimensions of an Aging Population) Research Program supported by the Social Sciences and Humanities Research Council of Canada, Statistics Canada and the Canadian Institute for Health Information.

changes in "tastes" or of reductions in income.

The ideal data base for a study of this kind would be a set of longitudinal observations on the expenditures of older households covering a time interval that included a period of years before and after retirement. Such a base does not exist in Canada. The data we have used come rather from a sequence of independent but similar Statistics Canada Family Expenditure (FAMEX) Surveys. The FAMEX data base has the advantage of large sample sizes but the disadvantage (for our purposes) of providing no linkage of individual households from one survey to the next. In any event, it is the only available source of expenditure information combined with age and other household characteristics, and any study of the kind reported here must necessarily be based upon it.

What we have done is to consider the FAMEX surveys that were conducted from 1969 to 1996, for all of which public use micro data are available. There were nine such surveys. However, three were restricted to the largest urban areas, and for our purposes the data from those were therefore not useful. We thus ended up with a data base drawn from six of the nine surveys. Our aim was to explore the consumption expenditure patterns of the elderly and near elderly in an expenditure share framework that included durables as well as nondurables and services. With that in mind, we chose not to work with the micro data from the six surveys. That would have been the most natural and common approach in studies of other kinds. However, in our case it would have made dealing with durables difficult since at the individual household level purchases of particular durable goods are "lumpy" and in any given year would often be zero. We chose therefore to group observations according to age and region of the country, and to work with the resulting group expenditure share observations pooled across surveys. Almost all published econometric studies of expenditure shares omit durables, assuming (explicitly or implicitly) a two (or more) stage household budgeting framework which allows nondurable

goods and services to be dealt with, while ignoring durable goods altogether. We ourselves followed that practice in a study based on Canadian time series (Denton, Mountain and Spencer, 1999; see also the other studies cited in Table 6 of that paper, in all of which the same was done). But omitting durables in the present study was not a reasonable option for us. A comprehensive view of expenditure was required, and while the use of grouped data was a theoretically imperfect solution to the "lumpiness" problem, it allowed us to deal with the full range of household expenditure categories and made it straightforward to apply a standard type of share equation model.

We provide further discussion of the use of grouped data and the issue of durables below. To make more homogeneous the subject of analysis we confine our attention to households with husband and wife both present; we discuss that below, and other aspects of the data we have used. Among the other matters discussed are the treatment of price indexes in a share equation model when spatial (regional) price level differences have to be taken into account, as well as changes through time, and of course the details of the model used in the study.

The model is a standard linear form of the Deaton and Muellbauer (1980) Almost Ideal Demand System, adapted to suit the requirements of our analysis. It is estimated using the grouped share observations from the six surveys. We present it, subject it to a number of hypothesis tests, and use it to simulate the expenditure patterns of older households in their pre-retirement and post-retirement years under alternative assumptions about income replacement rates at retirement.

2. DATA SOURCES AND RESTRICTIONS

The six FAMEX surveys from which our expenditure information is drawn are for the years 1969, 1978, 1982, 1986, 1992, and 1996. The surveys were not exactly the same in

coverage and definitions but after a careful examination and comparison of their documentation we judged them to be close enough to permit us to extract a reasonably consistent data base. We wished to have a relatively homogeneous sample of older households to work with in terms of composition and type of residential environment. That plus the requirement of consistency of coverage across the surveys suggested restricting the sample to husband-and-wife households living in urban centres of 30,000 or more population (with or without others present in the household), and with husband aged 50 or more. We considered instead using the average age of husband and wife but that would have complicated the analysis greatly by making it difficult to create five-year age groups for matching with other variables. Also, because we were dealing with older households in roughly the last three decades of the 20th century it seemed likely that retirement decisions for those households would have been more closely linked to husband's rather wife's age. Hence the choice of the former.

The FAMEX surveys provide considerable detail in terms of expenditure categories. However, our interest is in a broad rather than detailed assessment of the expenditure behaviour of older households. In view of that, and the consideration that minor differences from survey to survey in the definitions of categories were less likely to be a problem at more aggregated levels, we chose ten categories to work with: food at home; food from restaurants; shelter; household furnishing and operation; clothing; transportation; health and personal care; recreation; tobacco; and alcohol. All of the analysis in the paper relates to those ten categories, cross-classified by age and region of the country. Five-year age groups are identified for ages 50 to 74. Beyond that the survey data do not provide any breakdown and it is necessary therefore to treat ages 75 and over as a single group.

Price indexes are required also for our model. The basic source for those is an unpublished set of annual time series of current and constant dollar expenditures, by province,

compiled for purposes of the provincial income and expenditure accounts and furnished to us by Statistics Canada. We combined the Atlantic Provinces and Prairie Provinces to obtain regional aggregates, along with Quebec, Ontario, and British Columbia, making five regions in total. Although the expenditure categories are somewhat different from the FAMEX ones they were available at a sufficiently fine level to permit us to make a close and detailed match, combine the matched categories to form a set of ten corresponding to the ten expenditure categories noted above, and then calculate the implicit price indexes for those categories by dividing current by constant dollar totals. (We were able to do that back to 1971; for 1970 and 1969 we had only national price indexes to work with and we used the changes in those to project the regional indexes back two years.)

A potential alternative to using the indexes calculated from the provincial accounts expenditure series was to use the provincial index components of the Consumer Price Index. However, the provincial accounts indexes were available in full detail for all regions, on a consistent and comprehensive definitional basis for the whole of the period of interest to us, whereas the CPI components were not . Also, the price deflators for the provincial accounts are implicitly derived from the same underlying survey data as the CPI indexes to the extent that the two sets have similar definitions and coverage, but are somewhat broader in scope since they must conform with accepted and comprehensive national accounting definitions. In sum, they were more appropriate and useful for our purposes.

The indexes derived from the provincial accounts series measure only changes through time. Our model requires that interregional as well as time differences in price levels be allowed for. However, as we discuss later, such allowance can be made by an appropriate specification of the model, and the use of a geometric rather than an arithmetic aggregator function in converting the individual expenditure category indexes into an overall index.

3. THE HOUSEHOLD BUDGET AT OLDER AGES: A QUICK LOOK AT THE DATA

To set the stage for the subsequent analysis we begin by taking a quick look at the budget patterns of older households, based simply on the all-Canada percentages spent on the ten expenditure categories averaged over all six of the FAMEX surveys from which our data are drawn. The percentages are shown in Table 1 for the six age groups of concern and there are clear patterns of variation evidenced within the table.

The first clear pattern is the consistent rise with age in the percentage spent on food at home, offset, but only partially, by a corresponding decrease in the percentage spent on food from restaurants; adding the two categories together, the food percentage increases from 20.9 at ages 50-54 to 24.7 at ages 75 and over. The budget share of shelter increases consistently also over the same age range, from 18.2 to 27.8 percent. Thus in total the combined share of food and shelter increases from 39.1 to 52.5 percent of the household budget. In round numbers, the average husband/wife household spends about two-fifths of its budget on food and shelter when the husband is in his early 50s (which in most cases means before retirement) but more than half when he is 75 or older. Other patterns include declines in the expenditure shares of clothing, recreation, tobacco, and alcohol, sharp declines in the transportation share at the oldest ages, and some increase in the health and personal care share at those ages too. (Note though that health costs funded through public insurance plans are by definition not included in household expenditure.) Table 1 and the foregoing discussion are merely descriptive. It remains to be seen whether the patterns reflect changes in “tastes” that come with age or changes in household purchasing power, which also may come with age.

4. A MODEL OF THE EXPENDITURE SYSTEM FOR OLDER HOUSEHOLDS

The instrument for analyzing the expenditure patterns of older households is a variant of

the Deaton/Muellbauer Almost Ideal Demand System model fitted to the observed regional/age group means from six FAMEX surveys, representing a total of 180 group observations. (The total number of underlying sample observations from the six surveys is approximately 10,100.) The model is of the form

$$(1)\quad S_{iart} = \beta_i \ln(x_{art} / P^*_{rt}) + \sum_j \gamma_{ij} \ln P_{jrt} + \sum_r \delta_{ir} R_r + \sum_a \theta_{ia} A_a + \lambda_i Z_{art} + \varepsilon_{iart}$$

where x is total household expenditure, S is the proportion spent on a particular category of expenditure, P is a category-specific price index, P^* is a geometrically weighted composite price index (defined below), R and A are binary dummy variables denoting region and age group, Z is a vector of other explanatory variables, ε is a random error, and the Greek symbols are parameters. Expenditure categories are indexed by i = 1, ..., 10 (or alternatively by j, where necessary), age groups by a = 1, ..., 6, regions by r = 1, ..., 5, and survey years by t = 1969, 1978, 1982, 1986, 1992, 1996. The complete model, consisting of ten equations, is subject to an adding-up restriction (since the shares must sum to 1). In addition, symmetry and homogeneity restrictions are imposed on the β and γ parameters. The model of course has its roots in micro utility maximization theory and can be assumed to apply to aggregate observations only as a convenient approximation. (For a somewhat reassuring evaluation of aggregation error, though, see Denton and Mountain, 2001.) The incorporation of the symmetry and homogeneity restrictions should be viewed as a device for imposing some discipline on the model in estimation (given the relatively small number of group observations), rather than as having a firm grounding in consumer optimization theory when applied to aggregate data. The model is estimated as a restricted seemingly unrelated regression equation (SURE) system. One of the equations is dropped in estimation because of the singularity arising from the adding-up

restriction. In addition, one of the regional dummy variables is dropped in each equation to avoid obvious other singularities.

We report below an evaluation of the complete fitted model and its various estimated parameters, based on standard criteria. From the point of view of the way in which the model is to be used subsequently though, the most important considerations are income effects (strictly speaking, the effects of total expenditure), as represented by the β coefficients and derived income elasticities, and age group effects, as represented by the θ coefficients. Variables other than (real) income and age group are essentially for control purposes.

4. PRICE INDEXES

The treatment of price indexes calls for special attention. The ten individual P variables are time-based indexes rather than indexes based on both time and region, as the correct theory underlying the model obviously requires. However, the use of indexes based only on time is in fact appropriate, in accordance with the following argument. Let $\overline{P}$ be an index based on both time and region. Then P and $\overline{P}$ can be thought of as defined (in log form) by

(2) $\ln P_{jrt} = \ln(p_{jrt} / p_{jro})$

(3) $\ln \overline{P}_{jrt} = \ln(p_{jrt} / p_{j00}) = \ln P_{jrt} + k_{jr}$

where p is the category price per unit in a given region and year, the region index base is $r = 0$, the time (year) base is $t = 0$, and $k_{jr} = \ln(p_{jr0} / p_{j00})$ is a constant with respect to time.

Hence $\gamma_{ij} \ln \overline{P}_{jrt} = \gamma_{ij} \ln P_{jrt} + \gamma_{ij} k_{jr}$ and the term $\gamma_{ij} k_{jr}$ is implicitly absorbed by $\delta_{ir} R_r$, the

regional constant term in equation (1).

A similar argument applies to the composite price index. $P*$ in equation (1) is a geometrically weighted time-based index defined by

(4) $\ln P_{rt}^{*} = \sum_{j} w_{jr0} \ln P_{jrt}$

where w_{jr0} is the expenditure weight for region r in the base year; w is defined in the same way as S but represents the aggregate expenditure proportion over all age groups combined, rather than an age-group-specific proportion. Thus households in a given region are assumed to face the same composite price index, regardless of age, just as they do with the individual category-specific price indexes. An alternative would be to define a separate composite index for each age group in each region by using age-group-specific expenditure weights, and the argument that follows could be adapted easily to accommodate that kind of index. However, there is strong evidence to indicate that using age-group-specific weights would make little difference, based on experimental calculations with the Consumer Price Index (Denton and Spencer, 2000), and we have elected to use combined regional weights instead.

Extending the earlier argument, let $\overline{P}^{*}$ be a composite index based on both time and region. Then

(5) $\ln \overline{P}_{rt}^{\ *} = \sum_{j} w_{jro} \ln \overline{P}_{rt} = \ln P_{rt}^{*} + K_{r}$

where $K_{r} = \sum_{j} w_{jr0} k_{jr}$, a constant over time. If P^{*} is replaced by $\overline{P}^{*}$ in equation (1) the first

term on the right side of that equation can be written as

(6) $\beta_i(x_{art} / \overline{P}^*_{rt}) = \beta_i \ln x_{art} - \beta_i \ln \overline{P}^*_{rt} = \beta_i \ln x_{art} - \beta_i \ln P^*_{rt} - \beta_i K_r$

Thus when P^* is used instead of $\overline{P}^*$ the term $\beta_i K_r$ can be thought of too as incorporated in the regional constant term.

5. OTHER VARIABLES

The variables in equation (1) other than total expenditure, the price indexes, and the age and regional dummies – the elements of the Z vector, that is – include three dummies to allow for the exclusion of particular cities in two of the six surveys, a trend variable to pick up longer-term shifts over the period covered by the surveys (YEAR = survey year), a variable representing the "degree of retirement" (ERNR = ratio of earned income to total income, where earned income is defined as wages and salaries plus income from self-employment), and a variable representing household size (NMEM = number of members of the household). The variables to allow for the exclusion of cities are as follows: R1_92 to allow for the exclusion of Charlottetown and Corner Brook from the Atlantic Region in the 1992 survey; R4_92 to allow for the exclusion of Brandon from the Prairie Region in the same survey; and R1_96 to allow for the exclusion of Charlottetown and St. John's from the Atlantic Region in the 1996 survey.

We experimented with two other variables but did not include them in the final version of the model. The first was a lagged dependent variable, defined as $S_{i,a-5,r,t-5}$. Viewing an expenditure share as associated with a cohort (strictly, a pseudo-cohort), this variable represents the average i^{th} category share of a cohort of age a in region r in year t five years earlier, when it was five years younger. (The five-year lagged cohort shares were obtained by interpolation,

where necessary. The 1969 survey was dropped to allow calculation of the initial lagged S values.) While the inclusion of a cohort lagged variable of this kind seemed reasonable on theoretical grounds it proved to have no acceptable statistical significance and was dropped.

The other variable that we experimented with was intended to deal with the possible effects of age-dependent selection bias. Our sample of 180 grouped observations pertains to older husband/wife households and a concern was that there might be relevant but unobservable age-dependent characteristics. That is to say, the fact that husbands and wives at the oldest ages must have both survived in order to be in our sample might imply unobservable characteristics that were different, on average, from those of the younger households in our sample age range. The proportion of husband/wife households declines with age, reflecting the effects of mortality and widowhood. Since husband's age defines the age of a household for our purposes we calculated from the survey data, by age group and region, the ratio of men currently married to the total of all men who had ever been married and used that to pick up possible selection effects. Again, though, the variable proved to have no acceptable statistical significance and we dropped it.

6. ON THE TREATMENT OF DURABLE GOODS

As noted, the S observations are expenditure shares of an average household for given expenditure categories in a given age group, region and survey year. They thus cover services, nondurable goods and durable goods. The categories in which durable goods are most prominent are household furnishing and operation (which includes furniture and household appliances) and transportation (which includes automobile purchases). However, many goods classified elsewhere also have durability; indeed, virtually all goods are durable in some degree (even food, especially food purchased for freezer storage). Clothing has obvious durability, although it is classified as nondurable, and the same can be said of jewelry and other goods. Owner occupied

dwellings are not treated as durables though, but rather are converted to flows of service purchases by the use of imputed rental prices. In any event, while it is necessary for our purposes to depart from the common practice in consumer demand studies of excluding goods explicitly classified as durable it is worth noting that the distinction between durable and nondurable goods is somewhat arbitrary.

7. EVALUATION OF THE MODEL

Table 2 provides the estimated model, consisting of a system of ten share equations for the ten expenditure categories; Table 3 provides the results of significance tests of zero null hypotheses for different coefficients or groups of coefficients. The individual coefficients are subjected to asymptotic t tests, the groups to Wald tests for the system as a whole or for combinations of coefficients within the individual equations. One, five and ten percent significance levels are reported in Table 3.

The system tests indicate significance at the one percent level in all cases. The coefficients of log total expenditure are significant at the one percent level in six of the ten expenditure equations, and at the ten percent level or better in eight of the ten. The age group coefficients are significant at the one percent level in seven of the equations and at the five percent level in two others. The region coefficients are significant at the one percent level in nine of the equations and at the ten percent level in the remaining one. The coefficients of log prices are significant at the one percent level in every equation. The trend variable coefficients, while highly significant for the system as a whole are significant at the five percent level or better in only four equations. The coefficients of the earned income ratio variable, while also highly significant for the system, show little evidence of that for the individual equations. The coefficients of the household size variable, once again highly significant for the system, are

significant at the five percent level or better in half of the expenditure equations. Overall, our assessment is that the model performs rather well.

8. EXPENDITURE ELASTICITIES AT DIFFERENT AGES

We are particularly interested in how income – more precisely, total expenditure – affects the budget shares for different categories of goods and services at different ages. With that in mind we derived total expenditure elasticities for the six older age groups on which we are focusing in this paper, calculated in each case at mean values of all variables to obtain all-Canada, averages. The elasticities (calculated as $1 + \beta_i / S_{ia}$) are reported in Table 4, together with standard errors calculated by Monte Carlo procedures (since the elasticities are nonlinear functions of the estimated coefficients of the model; see Krinsky and Robb, 1986).

The sixty elasticities in Table 4 are positive, with only one exception (which can be discounted since the standard error is considerably greater than the elasticity estimate). The highest elasticities at every age are those for recreation, transportation, alcohol, clothing, food from restaurants, and health and personal care, all of which are greater than 1. The lowest ones are those for food at home, tobacco, and shelter, which are well below 1. The final category, household furnishing and operation, has an elasticity only slightly higher than 1 at every age. The relative positions of the categories seem generally to be reasonable in light of prior expectations.

There are no gross reversals as age increases – no switches between "greater than" and "less than" unity. However there are some obvious patterns of change. Most notable is that food at home and shelter, which are inelastic, become less so as age increases, while the elastic categories become more so, a pattern made arithmetically possible by the increasing expenditure shares of the food at home and shelter categories (see Table 1; given the expenditure elasticity formula, any change can result only from a change in share). Whether this pattern is a function of

age, as such, or of declines in total expenditure associated with retirement has yet to be determined.

9. PRE-RETIREMENT AND POST-RETIREMENT SIMULATIONS

We have simulated the expenditure patterns of households before and after retirement, as follows. Retirement is assumed to occur at age 65 by setting the earned income ratio variable (EARNR) to zero at that age. The calculations are for a two-person husband/wife household living in Ontario; the dummy variables for all other regions are therefore set to zero, and the household size variable (NMEM) to 2. Also, the trend variable (YEAR) is set to 1992. Alternative assumptions are made about total household expenditure, or income as we shall call it here, for convenience. In particular, various simulations were carried out assuming high, median, and low income levels for a household at ages below 65, where high was taken to be the 3rd quartile level of total expenditure for each of the below-65 age groups in Ontario, as calculated from the 1992 FAMEX survey data, and low was taken to be the first quartile level. Borrowing a term from the pension literature, a "replacement rate" (RR) was then set at alternative levels, depending on the particular simulation, and applied to pre-retirement (real) income to establish the household's post-retirement (real) income for the age groups 65-69, 70-74, and 75 and over. The alternative replacement rates experimented with were 50, 70, and 100 percent. The expenditure patterns were generated by the model for each of the six age groups, from 50-54 to 75 and over, under all nine combinations of income levels and replacement rates. Results for five of the combinations are shown in Table 5. The patterns exhibited by the results in the table are representative of the larger set of simulation results; reporting results for only the five is for the purpose of conserving space. Also, it should be noted that the intention was not to mimic actual pension plans, public or private, but simply to indicate in a more or less realistic

way how changes in income level at retirement might affect a household's budget allocations. Incorporation of actual pension plan and other income source details would have required assumptions about the type of inflation indexing built into private pension plans (and hence rates of inflation), the assessment of income tax, and other matters, and would have made the simulation unnecessarily complicated for our purposes.

10. SIMULATION RESULTS

The results in Table 5 show some clear patterns and suggest some firm conclusions. Age effects on expenditure patterns are seen most clearly in the simulation with median income and a replacement rate of 100 percent – with real income the same after retirement (at 65) as before retirement, and only age allowed to vary. The budget shares of food change only slightly in that simulation, the share of shelter falls a little prior to age 75, and then increases somewhat, the shares of transportation and health and personal care increase a bit, and the share of tobacco declines. Overall though (making allowance for random error in the model parameter estimates, and hence in the simulations), the impression is that if income does not fall the allocation of expenditure does not change appreciably after retirement from what it was before retirement. Indeed, with income constant the simulated combined share of shelter and food (at home or in restaurants) is in fact somewhat lower after retirement, contrary to the actual pattern observed in Table 1.

The situation is quite different when the replacement rate is set at 70 or 50 percent – when income is allowed to drop substantially from its pre-retirement level. The food-at-home share then increases – markedly so when RR = 70 percent, and even more when RR = 50 percent. The share of shelter declines with age prior to retirement but then increases. The share of recreation falls at retirement, and quite sharply so in the post-retirement low income simulations.

The share of clothing also declines. The most pronounced differences among the simulation results occur at the oldest ages. Comparing the extremes in the table, for the high income simulation with RR = 70 percent food at home and shelter combined account for 34.7 percent of total expenditure in the 50-54 age group, 38.8 percent in the 75 and older group; for the low income simulation with RR = 50 percent the comparable shares are 45.3 and 57.0.

The overall conclusion would seem to be that age alone does not induce the kinds of changes in expenditure patterns that one sees in the actual data after age 65, and if anything may result in some shifts in the opposite direction. On the whole, changes in "tastes" seem to play a rather minor role; most of the major differences that are observed among the age groups are a consequence of declines in income after retirement.

11. SUMMARY AND CONCLUSION

We have examined the expenditure patterns of older husband/wife households in larger urban areas using a model fitted to data grouped by age and region from six FAMEX surveys carried out in the period 1969-1996. The model, an adapted version of the Deaton/Muellbauer Almost Ideal Demand System, encompasses all categories of consumer expenditure, including expenditures on durable goods, and performs well by conventional criteria. Group expenditure shares averaged over the six surveys show clear patterns of change with advancing age – especially a rise in the food-at-home and shelter shares – and elasticities calculated from the model parameters also show clear age-related patterns. We used the model to investigate whether those patterns are a consequence of age as such, or of lower income levels after retirement, by simulating household budget allocations for a hypothetical household with full retirement from the labour force at age 65 and alternative income levels before retirement and alternative income replacement rates after retirement. The evidence provided by the simulation results indicates that

changes in budget allocations observed in survey data are most closely related to declines in income rather than to changes in "tastes" associated with age.

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TABLE 1: EXPENDITURE SHARES, OLDER HUSBAND/WIFE HOUSEHOLDS IN LARGER URBAN AREAS, BY AGE GROUP: ALL-CANADA, ALL-SURVEY AVERAGES

Expenditure Category		Age Group					
Description	Symbol	50-54	55-59	60-64	65-69	70-74	75+
				%			
Food at home	FOODH	16.0	16.5	17.6	18.0	20.7	21.9
Food from restaurants	FOODR	4.9	4.8	4.4	4.0	3.6	2.8
Shelter	SHLTR	18.2	18.3	19.5	20.5	22.6	27.8
Household furnishing and operation	HSHLD	9.7	9.7	9.7	9.9	10.0	10.4
Clothing	CLOTH	9.5	8.8	8.3	7.4	6.7	6.1
Transportation	TRANS	19.7	19.9	19.2	19.7	17.5	13.9
Health and personal care	CARE	5.8	6.0	6.4	6.2	6.5	7.5
Recreation	RECR	11.8	11.3	10.3	10.3	8.7	7.0
Tobacco	TOB	2.1	2.2	2.0	1.8	1.7	1.2
Alcohol	ALC	2.5	2.6	2.5	2.2	2.1	1.5
Total	EXCON	100.0	100.0	100.0	100.0	100.0	100.0

Note: The averages are all-Canada percentages based on weighted sample data, averaged over the FAMEX surveys carried out in 1969, 1978, 1982, 1986, 1992, and 1996.

TABLE 2: THE ESTIMATED EXPENDITURE SYSTEM

Variable name	Scaling factor	Expenditure Category 1 FOODH	2 FOODR	3 SHLTR	4 HSHLD	5 CLOTH	6 TRANS	7 CARE	8 RECR	9 TOB	10 ALC
Total Expenditure											
LNEXCON	10^{-1}	-1.3304	0.1286	-0.9243	0.0943	0.2292	1.1551	0.0947	0.6182	-0.1523	0.0869
		(0.1073)	(0.0673)	(0.1835)	(0.0989)	(0.0759)	(0.2289)	(0.0842)	(0.1396)	(0.0390)	(0.0448)
Age groups											
A1	10^{0}	1.7221	2.1630	-0.1765	-2.2081	4.9693	-1.6135	0.8267	-5.8140	1.1215	0.0096
		(1.0620)	(0.9337)	(1.6120)	(1.4120)	(0.9391)	(1.7570)	(1.1250)	(1.5510)	(0.3945)	(0.5921)
A2	10^{0}	1.7234	2.1635	-0.1933	-2.2154	4.9700	-1.5954	0.8266	-5.8147	1.1257	0.0096
		(1.0610)	(0.9335)	(1.6110)	(1.4120)	(0.9388)	(1.7550)	(1.1250)	(1.5500)	(0.3942)	(0.5920)
A3	10^{0}	1.7233	2.1631	-0.2109	-2.2195	4.9750	-1.5800	0.8265	-5.8148	1.1263	0.0110
		(1.0610)	(0.9333)	(1.6100)	(1.4120)	(0.9383)	(1.7530)	(1.1250)	(1.5490)	(0.3938)	(0.5918)
A4	10^{0}	1.7247	2.1611	-0.2027	-2.2236	4.9737	-1.5694	0.8161	-5.8114	1.1257	0.0058
		(1.0600)	(0.9330)	(1.6080)	(1.4110)	(0.9378)	(1.7500)	(1.1240)	(1.5480)	(0.3933)	(0.5915)
A5	10^{0}	1.7335	2.1608	-0.2000	-2.2275	4.9757	-1.5721	0.8160	-5.8162	1.1243	0.0055
		(1.0590)	(0.9327)	(1.6070)	(1.4110)	(0.9374)	(1.7470)	(1.1240)	(1.5480)	(0.3930)	(0.5913)
A6	10^{0}	1.7256	2.1564	-0.1658	-2.2222	4.9774	-1.5902	0.8247	-5.8225	1.1176	-0.0010
		(1.0590)	(0.9326)	(1.6060)	(1.4100)	(0.9371)	(1.7450)	(1.1240)	(1.5470)	(0.3927)	(0.5912)
Regions											
R1	10^{-2}	-0.3661	-0.0205	-1.9654	-0.1770	-0.3093	2.0118	1.5312	-0.3507	0.2564	-0.6105
		(0.5037)	(0.4812)	(0.8218)	(0.6508)	(0.4038)	(0.9935)	(0.5060)	(0.6840)	(0.1831)	(0.2719)
R2	10^{-2}	1.1459	0.4299	-0.3926	-1.1965	1.3168	-1.0702	1.1883	-1.8952	0.6520	-0.1784
		(0.3401)	(0.2710)	(0.5889)	(0.3859)	(0.2672)	(0.7431)	(0.3099)	(0.4738)	(0.1322)	(0.1667)
R4	10^{-2}	-0.5759	0.4706	-3.1846	-0.2656	0.3309	1.4690	1.2719	1.0422	-0.1504	-0.4080
		(0.3274)	(0.2396)	(0.5692)	(0.3542)	(0.2516)	(0.7294)	(0.2831)	(0.4436)	(0.1285)	(0.1528)
R5	10^{-2}	-0.2695	0.3431	-1.5032	0.5659	-0.4425	0.5987	1.3056	0.1336	-0.2141	-0.5176
		(0.3514)	(0.2628)	(0.5952)	(0.4216)	(0.2783)	(0.7932)	(0.3168)	(0.4804)	(0.1345)	(0.1711)
R1_92	10^{-2}	-0.0189	-0.9138	-1.0032	1.9366	0.1646	-1.1850	-0.6230	1.1088	-0.0188	0.5527
		(0.6048)	(0.4781)	(1.0660)	(0.6512)	(0.4684)	(1.3900)	(0.5383)	(0.8382)	(0.2411)	(0.2861)
R1_96	10^{-2}	-0.5139	-0.4267	-0.6668	1.4890	0.7193	-0.4984	0.1253	-0.2427	-0.1174	0.1323
		(0.6656)	(0.5039)	(1.1810)	(0.6911)	(0.5164)	(1.4950)	(0.5852)	(0.9848)	(0.2672)	(0.3126)
R4_92	10^{-2}	-0.8199	-0.1625	-0.0890	0.9311	-0.0949	-0.9472	-0.0909	0.6309	0.3594	0.2830
		(0.5580)	(0.3607)	(1.0090)	(0.5283)	(0.4228)	(1.3290)	(0.4514)	(0.7786)	(0.2331)	(0.2399)

TABLE 2: THE ESTIMATED EXPENDITURE SYSTEM (continued)

Variable name	Scaling factor	Expenditure Category 1 FOODH	2 FOODR	3 SHLTR	4 HSHLD	5 CLOTH	6 TRANS	7 CARE	8 RECR	9 TOB	10 ALC
Prices											
LNP1	10^{-1}	-1.0091	-0.0893	-1.3997	0.3135	0.4699	1.0611	-0.0745	0.8027	-0.3089	0.2343
		(0.2958)	(0.2221)	(0.2838)	(0.3292)	(0.1891)	(0.2831)	(0.2432)	(0.2617)	(0.0585)	(0.1381)
LNP2	10^{-1}	-0.0893	0.6403	-0.2611	-0.1650	-0.6210	-0.2443	0.7708	0.1788	0.0494	-0.2586
		(0.2221)	(0.3049)	(0.2506)	(0.3214)	(0.1846)	(0.2016)	(0.2578)	(0.2381)	(0.0519)	(0.1463)
LNP3	10^{-1}	-1.3997	-0.2611	0.1306	0.6485	0.3865	2.0764	-0.9465	-0.7845	0.0752	-0.7793
		(0.2838)	(0.2506)	(0.5406)	(0.3356)	(0.2286)	(0.4275)	(0.2951)	(0.3861)	(0.0917)	(0.1521)
LNP4	10^{-1}	0.3135	-0.1650	0.6485	0.5905	-0.1501	-0.2389	-1.3826	0.3035	0.0153	0.0652
		(0.3292)	(0.3214)	(0.3356)	(0.6259)	(0.2800)	(0.3001)	(0.3788)	(0.3433)	(0.0737)	(0.2094)
LNP5	10^{-1}	0.4699	-0.6210	0.3865	-0.1501	-0.5712	0.0178	0.8111	-0.3277	0.1236	-0.1389
		(0.1891)	(0.1846)	(0.2286)	(0.2800)	(0.2221)	(0.2096)	(0.2202)	(0.2403)	(0.0505)	(0.1216)
LNP6	10^{-1}	1.0611	-0.2443	2.0764	-0.2389	0.0178	-1.3376	0.5608	-1.8145	0.1472	-0.2279
		(0.2831)	(0.2016)	(0.4275)	(0.3001)	(0.2096)	(0.6542)	(0.2577)	(0.3775)	(0.0931)	(0.1388)
LNP7	10^{-1}	-0.0745	0.7708	-0.9465	-1.3826	0.8111	0.5608	-1.0015	0.7577	-0.0106	0.5152
		(0.2432)	(0.2578)	(0.2951)	(0.3788)	(0.2202)	(0.2577)	(0.4345)	(0.2895)	(0.0641)	(0.1918)
LNP8	10^{-1}	0.8027	0.1788	-0.7845	0.3035	-0.3277	-1.8145	0.7577	1.0186	-0.1787	0.0441
		(0.2617)	(0.2381)	(0.3861)	(0.3433)	(0.2403)	(0.3775)	(0.2895)	(0.5109)	(0.0837)	(0.1549)
LNP9	10^{-1}	-0.3089	0.0494	0.0752	0.0153	0.1236	0.1472	-0.0106	-0.1787	0.1095	-0.0219
		(0.0585)	(0.0519)	(0.0917)	(0.0737)	(0.0505)	(0.0931)	(0.0641)	(0.0837)	(0.0255)	(0.0374)
LNP10	10^{-1}	0.2343	-0.2586	0.0746	0.0652	-0.1389	-0.2279	0.5152	0.0441	-0.0219	-0.2861
		(0.1381)	(0.1463)	(0.1521)	(0.2094)	(0.1216)	(0.1388)	(0.1918)	(0.1549)	(0.0374)	(0.1391)
Year											
YEAR	10^{-3}	-0.1392	-1.1313	0.7229	1.1382	-2.6036	0.2919	-0.4217	2.6663	-0.4885	-0.0350
		(0.5245)	(0.4674)	(0.7995)	(0.7052)	(0.4678)	(0.8473)	(0.5627)	(0.7726)	(0.1935)	(0.2957)
Earned income ratio											
EARNR	10^{-2}	2.1360	0.3815	3.8505	-1.3846	0.8949	-2.8804	-3.0134	0.0922	0.8192	-0.8960
		(1.3640)	(0.8613)	(2.5100)	(1.2650)	(1.0190)	(3.3220)	(1.0760)	(1.9020)	(0.5720)	(0.5712)
Household size											
NMEM	10^{-2}	2.8457	0.0381	-3.5781	-1.6001	1.4411	1.1768	-0.3802	-0.8051	0.9207	-0.0588
		(0.8013)	(0.5109)	(1.4420)	(0.7480)	(0.5979)	(1.8950)	(0.6395)	(1.1040)	(0.3284)	(0.3385)

Note: Figures in parentheses are standard errors. The coefficients in any row (and the corresponding standard errors) should be multiplied by the scaling factor for that row. LN in a variable symbol indicates logarithm.

TABLE 3: HYPOTHESIS TEST STATISTICS

Category tested	Expenditure system	Individual equations									
		1 FOODH	2 FOODR	3 SHLTR	4 HSHLD	5 CLOTH	6 TRANS	7 CARE	8 RECR	9 TOB	10 ALC
Total expenditure	W = 223.5[a]	t = -12.4[a]	t = 1.9[c]	t = -5.0[a]	t = 1.0	t = 3.0[a]	t = 5.0[a]	t = 1.1	t = 4.4[a]	t = -3.9[a]	t = 1.9[c]
Age groups	W = 246.5[a]	W = 13.9[b]	W = 9.4	W = 59.6[a]	W = 13.5[b]	W = 34.7[a]	W = 20.1[a]	W = 25.4[a]	W = 19.6[a]	W = 47.7[a]	W = 27.3[a]
Regions	W = 366.9[a]	W = 42.4[a]	W = 27.1[a]	W = 46.1[a]	W = 57.6[a]	W = 67.4[a]	W = 19.7[a]	W = 26.6[a]	W = 50.3[a]	W = 49.7[a]	W = 13.7[c]
Prices	W = 412.3[a]	W = 132.0[a]	W = 40.6[a]	W = 57.8[a]	W = 33.8[a]	W = 42.9[a]	W = 72.4[a]	W = 110.0[a]	W = 32.8[a]	W = 83.6[a]	W = 35.0[a]
Year	W = 72.9[a]	t = -0.3	t = -2.4[b]	t = .9	t = 1.6	t = -5.6[a]	t = .3	t = -.7	t = 3.5[a]	t = -2.5[b]	t = -.1
Earned income ratio	W = 22.4[a]	t = 1.6	t = .4	t = 1.5	t = -1.1	t = .9	t = -.9	t = -2.8[a]	t = .0	t = 1.4	t = -1.6
Household size	W = 41.7[a]	t = 3.6[a]	t = .1	t = -2.5[b]	t = -2.1[b]	t = 2.4[b]	t = .6	t = -.6	t = -.7	t = 2.8[a]	t = -.2

Note: W stands for Wald statistic, t for asymptotic normal statistic. Significance levels are indicated by [a] for 1%, [b] for 5%, [c] for 10%, based on Chi-square distributions for W and the standard normal distribution for t.

TABLE 4: EXPENDITURE ELASTICITIES, OLDER HUSBAND/WIFE HOUSEHOLDS IN LARGER URBAN AREAS, BY AGE GROUP: ALL-CANADA, ALL-SURVEY AVERAGES

Age group	Expenditure Category									
	1 FOODH	2 FOODR	3 SHLTR	4 HSHLD	5 CLOTH	6 TRANS	7 CARE	8 RECR	9 TOB	10 ALC
Expenditure elasticities										
50-54	0.117	1.260	0.497	1.093	1.259	1.566	1.169	1.499	0.237	1.384
	(0.071)	(0.149)	(0.122)	(0.103)	(0.102)	(0.167)	(0.161)	(0.144)	(0.309)	(0.212)
55-59	0.135	1.267	0.508	1.094	1.285	1.558	1.161	1.517	0.296	1.386
	(0.070)	(0.153)	(0.119)	(0.104)	(0.113)	(0.164)	(0.154)	(0.149)	(0.284)	(0.216)
60-64	0.195	1.289	0.521	1.093	1.305	1.572	1.149	1.560	0.263	1.361
	(0.064)	(0.166)	(0.116)	(0.102)	(0.121)	(0.168)	(0.143)	(0.162)	(0.296)	(0.200)
65-69	0.219	1.322	0.545	1.092	1.344	1.555	1.153	1.573	0.155	1.416
	(0.064)	(0.184)	(0.111)	(0.101)	(0.136)	(0.162)	(0.145)	(0.165)	(0.346)	(0.230)
70-74	0.322	1.352	0.583	1.093	1.379	1.616	1.143	1.665	0.093	1.425
	(0.055)	(0.201)	(0.101)	(0.102)	(0.149)	(0.180)	(0.137)	(0.190)	(0.371)	(0.234)
75+	0.365	1.438	0.663	1.088	1.411	1.781	1.125	1.824	-0.306	1.670
	(0.052)	(0.250)	(0.082)	(0.096)	(0.161)	(0.228)	(0.119)	(0.235)	(0.560)	(0.370)

Note: The elasticities are evaluated for each age group at the group's values of ln x, ln P*, etc. Figures in parentheses are standard errors.

TABLE 5: SIMULATED EXPENDITURE PATTERNS,OLDER HUSBAND/WIFE HOUSEHOLDS RETIRING AT 65 WITH ALTERNATIVE INCOME LEVELS AND REPLACEMENT RATES: ONTARIO, 1992

Income characteristics and age group	Total expenditure (1992 $)	Expenditure categories (% shares)									
		1 FOODH	2 FOODR	3 SHLTR	4 HSHLD	5 CLOTH	6 TRANS	7 CARE	8 RECR	9 TOB	10 ALC
High income, RR = 70%											
Ages 50-54	42,051	10.4	5.1	24.3	11.5	6.4	19.5	5.3	14.0	1.2	2.3
Ages 55-59	42,051	10.6	5.1	22.6	10.8	6.5	21.3	5.3	13.9	1.6	2.3
Ages 60-64	42,051	10.6	5.1	20.8	10.4	7.0	22.9	5.3	13.9	1.7	2.5
Ages 65-69	29,436	13.5	4.1	21.5	10.9	5.2	22.4	6.6	12.0	1.4	2.4
Ages 70-74	29,436	14.4	4.0	21.7	10.5	5.4	22.1	6.6	11.5	1.3	2.4
Ages 75+	29,436	13.6	3.6	25.2	11.0	5.6	20.3	7.5	10.9	0.6	1.7
Median income, RR = 100%											
Ages 50-54	34,329	13.1	4.8	26.1	11.3	5.9	17.2	5.1	12.8	1.5	2.1
Ages 55-59	34,329	13.3	4.8	24.5	10.6	6.0	19.0	5.1	12.7	1.9	2.1
Ages 60-64	34,329	13.3	4.8	22.7	10.2	6.5	20.5	5.1	12.7	2.0	2.3
Ages 65-69	34,329	11.5	4.3	20.0	11.0	5.6	24.2	6.7	12.9	1.2	2.6
Ages 70-74	34,329	12.4	4.2	20.3	10.6	5.8	23.9	6.7	12.5	1.1	2.5
Ages 75+	34,329	11.6	3.8	23.7	11.2	5.9	22.1	7.6	11.8	0.4	1.9
Median income, RR = 70%											
Ages 50-54	34,329	13.1	4.8	26.1	11.3	5.9	17.2	5.1	12.8	1.5	2.1
Ages 55-59	34,329	13.3	4.8	24.5	10.6	6.0	19.0	5.1	12.7	1.9	2.1
Ages 60-64	34,329	13.3	4.8	22.7	10.2	6.5	20.5	5.1	12.7	2.0	2.3
Ages 65-69	24,030	16.2	3.8	23.3	10.7	4.7	20.1	6.4	10.7	1.7	2.3
Ages 70-74	24,030	17.1	3.8	23.6	10.3	4.9	19.8	6.4	10.3	1.6	2.2
Ages 75+	24,030	16.3	3.3	27.0	10.8	5.1	18.0	7.3	9.6	0.9	1.6
Median income, RR = 50%											
Ages 50-54	34,329	13.1	4.8	26.1	11.3	5.9	17.2	5.1	12.8	1.5	2.1
Ages 55-59	34,329	13.3	4.8	24.5	10.6	6.0	19.0	5.1	12.7	1.9	2.1
Ages 60-64	34,329	13.3	4.8	22.7	10.2	6.5	20.5	5.1	12.7	2.0	2.3
Ages 65-69	17,164	20.7	3.4	26.4	10.4	4.0	16.2	6.1	8.7	2.3	2.0
Ages 70-74	17,164	21.6	3.3	26.7	10.0	4.2	15.9	6.1	8.2	2.1	1.9
Ages 75+	17,164	20.8	2.9	30.1	10.5	4.3	14.1	6.9	7.5	1.4	1.3
Low income, RR = 50%											
Ages 50-54	26,276	16.7	4.5	28.6	11.1	5.3	14.1	4.8	11.1	1.9	1.9
Ages 55-59	26,276	16.8	4.5	26.9	10.3	5.4	15.9	4.8	11.0	2.3	1.9
Ages 60-64	26,276	16.8	4.5	25.2	9.9	5.9	17.4	4.8	11.0	2.4	2.0
Ages 65-69	13,138	24.3	3.0	28.9	10.1	3.4	13.1	5.8	7.0	2.7	1.7
Ages 70-74	13,138	25.1	3.0	29.2	9.7	3.6	12.8	5.8	6.5	2.5	1.7
Ages 75+	13,138	24.4	2.6	32.6	10.3	3.7	11.0	6.7	5.9	1.9	1.0

Note: RR stands for income replacement rate at retirement. High income is defined as the 3rd quartile in Ontario in 1992, median income as the 2nd quartile, and low income as the 1st quartile.

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