Volume Title: The Economics of Aging

Volume Author/Editor: David A. Wise, editor

Volume Publisher: University of Chicago Press

Volume ISBN: 0-226-90295-1

Volume URL: http://www.nber.org/books/wise89-1

Conference Date: March 19-22, 1987

Publication Date: 1989

Chapter Title: Household Dissolution and the Choice of Alternative Living Arrangements among Elderly Americans

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Chapter URL: http://www.nber.org/chapters/c11580

Chapter pages in book: (p. 119 - 150)

4 Household Dissolution and the Choice of Alternative Living Arrangements Among Elderly Americans

Axel Börsch-Supan

4.1 Introduction

A significant segment of the housing market is governed by choices and decisions made by the elderly. The importance of this segment will be even greater in the future because the share of elderly Americans in the total population will be steadily increasing. For the elderly, housing choices are more complex than the choice of housing expenditure, dwelling size, tenure, etc., of their own dwelling. In particular for the older elderly, a potential alternative to living independently is to live in one household with their adult children or to share accommodations with other elderly. The decision to dissolve the household, and the consequent choice of living arrangements, is the focus of this paper.

The choice of living arrangements is an important aspect of the well-being of the elderly and the economics of aging because of its side-effects in the provision of care and the physical environment that this choice implies. Sharing accommodations, in particular with adult children, will not only provide housing but also some degree of medical care and social support for the elderly. If elderly persons perceive sharing accommodations as an inferior housing alternative and remain living independently as long as their physical and economic means allow, this social support and a larger amount of medical care have to be picked up by society at large rather than the family or close friends.

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Mike Tamada and Winston Lin provided valuable research assistance. Helpful comments by John Quigley and Angus Deaton were appreciated. Financial support was received from the National Institutes of Health, Institute on Aging, grant no. 1-PO1-AGO5842-01.

Household dissolution decisions also have obvious consequences for the intergenerational distribution of housing. In particular, in times of tight housing market conditions with very high housing prices for newly developed units, the elderly's willingness to move out of the family home is an important parameter in the supply of more affordable existing homes. There is also the subtle question of intergenerational equity when the elderly are perceived as being "overhoused," that is, living in houses that are relatively more spacious than those of younger families with children.

This paper studies the economic and demographic determinants of the elderly's decision to continue living independently or to choose some kind of shared accommodations. The main questions being asked are:

- How many elderly live independently? Does this percentage exhibit a similar development as in the nonelderly population?
- Who are the elderly living independently? Are they younger, are they wealthier?
- How many elderly live with their children? If so, do they head the household, or are they "received" by their children?
- How many distantly related and unrelated elderly share accommodations?
- Are economic conditions (income, housing prices) important determinants for the choice between living independently or sharing accommodations? Or is the decision to give up an independent household simply determined by age and health?
- Do only the less wealthy and older elderly "seek refuge" in their childrens' homes?
- Who are the "hosts" for subfamilies? Do they tend to be richer (because they can afford supplying extra shelter) or do they tend to be poorer (because they cannot afford privacy)?

The paper is organized in three parts. We first contrast living arrangements of elderly Americans with the population under the age of 65 years, describe the changes from 1974 to 1983, and compare housing choices in SMSAs with those in nonmetropolitan areas and study regional variations. Our main result in this descriptive analysis is the discrepancy of the trends of household formation/dissolution between the elderly and the younger population; after a steady decline in the 1970s, who observe a rapid increase in the rate of "doubled-up" young families in the beginning of the 1980s. No such development can be found among elderly Americans. The proportion of the elderly living independently steadily increases in our sample period from 1974 to 1983.

In the second part, we estimate a formal choice model among living independently and six categories of alternative living arrangements. The main finding is the predominance of demographic determinants as opposed to economic explanations. This is not too surprising, but somewhat frustrating for an economist. To our relief, the data indicate a growing importance of income in this choice. We also discover a striking difference in the importance of income between the poor elderly and the well-to-do.

Finally, we employ these estimation results to explain the discrepancy in the development of household formation/dissolution between the young and the elderly.

4.2 Data and Household Decomposition

Our analysis is based on the Linked National Sample, 1974 to 1983, of the Annual Housing Survey, now called American Housing Survey (AHS). Our primary reason for employing the AHS is its very large sample size that allows us to make inferences about infrequent choices and to conduct subgroup analyses. The careful recording of household composition makes it possible to detect elderly living as subfamilies or as "secondary individuals" in households headed by their children or other younger persons. Another important advantage of the AHS for the study of housing decisions is its inclusion of structural housing characteristics that allow a precise definition of housing prices. Data sets such as the Panel Study of Income Dynamics (PSID) and the Retirement History Survey (RHS) allow only the construction of simple expenditure measures uncorrected for quality differences.

However, it should be pointed out that the AHS has also several severe shortcomings. Though the dwelling units are linked over time, the households or individuals living in these units are not. This prevents any dynamic analysis without stringent assumptions on the transition probabilities. The analysis in this paper is strictly cross-sectional and static; a limited dynamic version of the model in the second part of this paper is the subject of a sequel to this paper. The AHS does not contain a systematic record of the functional health status of the elderly.[1] We will depend on age as an indicator for health also, relying on the fact that age-specific medical cost and hospitalization patterns have been relatively stable for the last two decades (see Poterba and Summers 1985). Finally, the AHS includes all elderly that live in regular housing units but not the institutionalized population. Hence, the choice among alternative living arrangements excludes the choice of the continuum between congregate housing and nursing homes, alternatives that are becoming increasingly popular.[2]

Therefore, most housing data are collected on a household level, with much information about individual household members subsumed in a household total. This is the case in the Census, to some degree in the PSID, and in the AHS. However, once one realizes that many elderly do not live independently, and that the choice between living independently and sharing accommodations is an important decision, one must veiw households as an outcome of such decisions rather than an exogenously given sampling unit. If the alternative living arrangements are endogenous, the primary decision unit in housing choice analysis must be smaller than the household, and a fairly narrow definition of a family is more appropriate. A suitable decision unit is the (family-) nucleus, defined as follows:

> A nucleus consists of a married couple or a single individual with all their own children below age 18.

Households are formed as an outcome of living arrangement decisions made by individual nuclei. In many cases, the household is formed by only one nucleus. Typical examples of multi-nuclei households are elderly parents in the household of their children, adult children still living in the household of their parents, or roommates. We can distinguish four types of households:

(1) Households consisting of only one nucleus.
(2) Households composed of nuclei with family relations (in this household type, child-parent relationships are of particular interest).
(3) Households composed of nuclei without family relations.
(4) Complex households, that is, a combination of the latter two types.

Therefore, our first step in analyzing the data is to create a data base in which the appropriate decision unit, the nucleus, is the sampling unit. This is achieved by detecting elderly subfamilies in existing households and splitting up households of type (2) through (4) into several nuclei. This household decomposition is based on the demographic and financial information on individual household members available in the AHS. Variables like income, nucleus size, etc., are apportioned accordingly.[3]

Our analysis will be based on 19,154 elderly nuclei. A nucleus is considered elderly if at least one person in the nucleus is above the age of 65 years. For some comparisons, we also use a "control sample" of 19,938 younger nuclei. These samples were drawn as follows. The original AHS data base consists of dwellings that are tracked through nine cross-sections from 1974 through 1983 (with the exception of 1982). First, we systematically sampled every fourth dwelling from the orig-

inal AHS. Of those, every dwelling in which at least one elderly person lived was sampled, and every fourth of the remaining dwellings. We then decomposed each household according to the above rules into nuclei—cross section by cross section.

As was already mentioned, this analysis does not attempt to track individual nuclei over time. Because the AHS cross-sections are linked across time by dwelling only, households will appear and vanish in the sample whenever they move. Hence, only a panel of stayer households could be constructed. Tracking nuclei over time introduces additional difficulties, because nuclei must be identified in each cross section and then be matched over time. This matching is nontrivial because of demographic changes (death or institutionalization) that are confounded by the frequent occurrence of unreliable demographic data. Because we treat observations of the same nucleus in separate years as independent observations, the above 19,154 nuclei should more precisely be termed "nucleus-years." We estimate that the elderly sample contains approximately 5,000 different nuclei.

4.3 Living Arrangements

We will describe the choice of an elderly nucleus among the following seven types of living arrangements:

- Living independently (denoted by INDEP).
- Parents living in one household with their adult children either as head of this joint household (denoted by PARE-H) or as subfamily in the household headed by the adult child (denoted by PARE-S).
- Living with relatives other than adult children either as head of this joint household (denoted by DREL-H) or as subfamily in the household headed by the distant relative (denoted by DREL-S).
- Living with unrelated persons either as head of this joint household (denoted by NREL-H) or as subfamily in the household headed by the nonrelative (denoted by NREL-S)[4]

These seven types of living arrangements for the elderly are depicted in figure 4.1. Note that for elderly who do not live independently we distinguish not only among three different relations to the other household members (PARE, DREL, NREL), but also between two headship categories (HEAD and SUBF). This is important because elderly who dissolve their own household in order to live in their adult childrens' household are living in an entirely different situation than elderly who stay in their family home but provide shelter for some of their adult children. In the first case, an explicit decision to move and to dissolve the elderly's household has to be made, and the elderly person gives up the economically important function as a homeowner (or, more

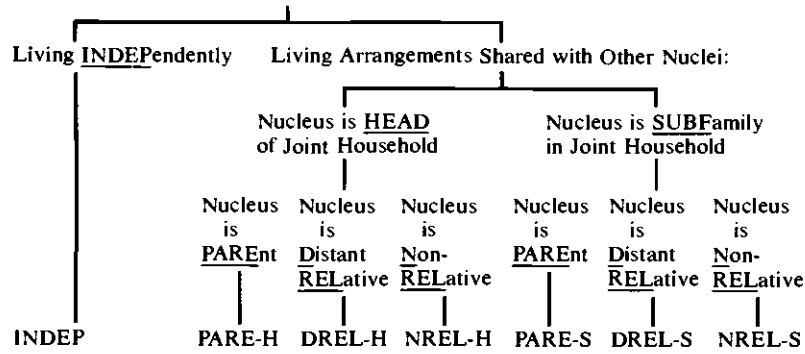

Fig. 4.1 Alternative living arrangements

rarely, as a renter) to become a subletee. In the second case, the elderly person avoids the important psychic and physical moving costs and keeps the status as homeowner.

For the younger nuclei, two additional living arrangements become relevant:

- Adult children living in one household with their parents either as head of this joint household (denoted by CHIL-H) or as subfamily in the household headed by the parent (denoted by CHIL-S).

Table 4.1 presents the proportions in which these living arrangements are chosen by the elderly. The data are stratified by year of cross section (1974 through 1983, except for 1982), by the four census regions (Northeast, Midwest, South, and West), and by whether the dwelling is located in an SMSA or a nonmetropolitan area. For comparison, table 4.2 presents the same proportions for younger nuclei. Based on more than 19,000 observations, the entries have a standard deviation of less than 0.36 percentage points.

More than two-third of all elderly nuclei live independently, that is, either as a married couple or as a single person forming a household. This proportion increases steadily from 1974 to 1983. More detailed tabulations show that about 32.5 percent of all elderly nuclei are elderly living together with their spouses, and about 38.5 percent are elderly living alone. Almost all of the increase in independent elderly nuclei is generated by an increase in the single-person nuclei. A continuation of this trend will have serious consequences in the delivery of health care and social support, because the elderly seem to become increasingly isolated and detached from their traditional source of medical and social support.

The percentage of elderly living independently is highest in the West and Midwest regions of the United States, lowest in the Northeast,

Table 4.1 **Observed Frequencies of Living Arrangements (percentages of elderly nuclei)**

	INDEP	PARE-H	PARE-S	DREL-H	DREL-S	NREL-H	NREL-S	
Year								
1974	69.3	11.4	6.4	5.0	4.8	1.9	1.2	100.0
1975	70.4	11.8	5.9	4.6	4.4	1.8	1.2	100.0
1976	70.5	11.8	6.1	4.8	3.9	1.6	1.2	100.0
1977	70.5	12.4	5.7	4.9	3.9	1.5	1.1	100.0
1978	71.5	11.7	5.4	5.0	3.5	1.4	1.4	100.0
1979	71.5	11.2	5.3	4.9	3.9	1.5	1.6	100.0
1980	71.3	11.8	4.8	5.0	3.9	1.7	1.5	100.0
1981	71.5	12.5	4.1	4.4	4.3	1.9	1.4	100.0
1983	73.0	12.3	4.5	4.4	3.0	1.8	1.1	100.0
	71.1	11.9	5.4	4.8	3.9	1.7	1.3	100.0
Region								
Northeast	64.6	13.8	6.7	6.1	5.2	1.8	1.7	100.0
Midwest	74.5	9.3	5.0	4.3	3.5	2.0	1.4	100.0
South	71.0	13.2	4.9	5.1	4.0	1.0	.7	100.0
West	74.8	10.5	5.0	2.9	2.7	2.4	1.7	100.0
	71.1	11.9	5.4	4.8	3.9	1.7	1.3	100.0
Urban								
SMSA	68.5	12.7	6.3	5.1	3.9	2.0	1.4	100.0
NON-SMSA	75.0	10.5	3.8	4.3	3.9	1.2	1.1	100.0
	71.1	11.9	5.4	4.8	3.9	1.7	1.3	100.0

and is much higher in rural areas as compared to metropolitan areas. The latter result is surprising and in contrast to common beliefs about rural and nonrural living arrangements.

The growing number of independent nuclei is particularly significant because it is not typical for the population at large. Comparing the trend among elderly nuclei with the development among younger nuclei (first column in tables 4.1 and 4.2) yields a striking result: there is a large discrepancy in the development of household formation and dissolution between the elderly and the young. Whereas the percentage of all elderly nuclei living independently rises from 69.3 percent in 1974 to 73.0 percent in 1983, the percentage of nuclei in the younger part of the population that lives independently fluctuates around 55 percent throughout the second half of the 1970s and then markedly declines to 52.4 percent in 1983.

How does this discrepancy come about? In particular, why is there no increase in alternative living arrangements in the early 1980s? This question will be the focus of the balance of this paper. Before discussing potential explanations, we will analyze the importance of the six dependent living arrangements.

Table 4.2 **Observed Frequencies of Living Arrangements (percentages of young nuclei)**

	INDEP	PARE-H[a]	CHIL-H	CHIL-S	DREL-H	DREL-S	NREL-H	NREL-S	
Year									
1974	55.7	13.5	1.7	20.0	3.3	3.7	1.0	1.7	100.0
1975	55.2	13.3	1.5	19.9	3.9	4.3	.9	1.5	100.0
1976	55.5	12.6	1.9	19.4	4.2	4.5	.9	1.5	100.0
1977	55.3	12.5	1.4	19.5	4.0	5.1	1.2	1.7	100.0
1978	54.5	12.4	.9	20.0	4.0	4.9	1.7	2.6	100.0
1979	55.3	12.1	.8	20.1	4.4	5.0	1.2	1.7	100.0
1980	54.1	12.0	.9	19.2	4.7	5.5	1.7	2.8	100.0
1981	53.4	11.4	1.0	19.9	4.9	5.9	1.8	2.8	100.0
1983	52.4	12.9	1.0	20.8	4.4	5.1	1.8	2.5	100.0
	53.5	12.6	1.2	19.8	4.2	4.9	1.3	2.1	100.0
Region									
Northeast	50.2	14.2	1.9	23.8	3.4	3.8	1.4	1.9	100.0
Midwest	53.5	12.4	1.3	20.8	4.7	5.3	1.0	1.5	100.0
South	57.4	12.3	.9	19.2	3.6	4.4	1.3	1.9	100.0
West	56.5	11.3	1.1	15.2	5.3	6.4	1.8	3.3	100.0
	53.5	12.6	1.2	19.8	4.2	4.9	1.3	2.1	100.0
Urban									
SMSA	52.0	12.8	1.4	20.8	4.5	5.4	1.5	2.4	100.0
NON-SMSA	59.8	12.1	.9	17.9	3.5	3.8	1.1	1.5	100.0
	53.5	12.6	1.2	19.8	4.2	4.9	1.3	2.1	100.0

[a]About 0.4 percent of nuclei in PARE-S are included in PARE-H.

Living together with one's own adult children is the most important alternative living arrangement. Of the 28.9 percent of those elderly nuclei who share accommodations with other nuclei, about 60 percent live in the same household as their adult children do. In most of these cases, the elderly nucleus is household head, not the adult child. Corresponding to the increasing proportion of elderly living independently (especially living alone), parent-child households decline as alternative living arrangements. However, the relative importance of being head or subfamily in an elderly parent–adult child household shifts dramatically (columns PARE-H and PARE-S): in 1974, about 64 percent of all elderly parent–adult child households were headed by the elderly; in 1983, more than 73 percent. The percentage of parent-child nuclei is lower in the Midwest and the West, and markedly lower in nonmetropolitan areas as compared to SMSAs.

The third and fourth columns in table 4.2 (labeled CHIL-H and CHIL-S) represent the mirror image of elderly parent–adult child households, now relative to the living arrangements chosen by younger nuclei. Column three displays again the decline in headship rates of adult children in parent-children households. Note that the proportion of both elderly parent–adult child living arrangements among all living arrangements chosen by younger nuclei households stays approximately constant as opposed to the relative decline of this choice among elderly nuclei—reflecting the changing age distribution in the United States toward a higher proportion of elder Americans and a relatively declining "supply" of younger nuclei for joint households.

About 8.7 percent of all elderly nuclei live doubled-up with relatives other than their own children (categories DREL-H and DREL-S). This percentage exhibits a similar declining trend as parent-child households, from 9.8 percent in 1974 to 7.4 percent in 1983. Again, this trend is in striking contrast to the younger population in which the relative share of this kind of living arrangement increases from 7.0 percent in 1974 to 9.5 percent in 1983.

Only a very small percentage of elderly nuclei (3.0 percent) share a household with nonrelated household members (living arrangements NREL-H and NREL-S in tables 4.1 and 4.2). This percentage is more or less stable in 1974–83 and is slightly lower than the corresponding percentage in younger households (3.4 percent), where we observe a distinct increase from about 2.5 percent in 1974–76 to about 4.5 percent in the early 1980s.

4.4 Determinants of Living Arrangements

Who are the nuclei who live alone, and who are the nuclei who share accommodations? In this section, we will collect descriptive statistics

of the most important financial and demographic characteristics by living arrangement: income, age, marital status, sex, and size of the nucleus. These variables, among others, will influence the demand for housing of each nucleus where housing choices are understood to also include the way in which accommodations are shared with other nuclei. In the case of shared accommodations, these variables will also influence the "supply" of living arrangements by the head nuclei. Short of formulating some kind of demand-supply relationship of household formulation,[5] we will display some of these variables not only by nucleus (as a determinant of demand), but also by each nucleus's respective head nucleus (as a determinant of supply).

We will first concentrate on demand. Tables 4.3 and 4.4 tabulate the income of each nucleus. Average nucleus income for elderly is $11,150 compared to $15,450 for nonelderly nuclei. (These dollar amounts correspond to 1980 figures, and are deflated with the Consumer Price Index.) The respective household incomes are $14,100 for the elderly population and $22,450 for the nonelderly. The income of the elderly is 87 percent transfer income; in turn, 80.1 percent of nonelderly nuclei earn salary or wages as their predominant income source.

Table 4.3 **Income of Nuclei by Living Arrangements (elderly nuclei; hundred 1980 dollars)**

	INDEP	PARE-H	PARE-S	DREL-H	DREL-S	NREL-H	NREL-S	
Year								
1974	113.6	115.4	52.6	95.5	54.7	105.8	1.3	104.7
1975	114.5	111.4	52.3	102.2	44.9	119.7	.0	105.6
1976	116.6	119.7	55.3	82.1	52.6	110.6	1.4	107.6
1977	118.2	115.7	54.0	96.1	59.4	104.2	35.2	109.8
1978	120.2	131.1	46.2	91.5	53.2	96.6	48.7	112.3
1979	116.9	128.7	49.3	71.8	52.6	82.7	65.9	108.6
1980	116.2	141.9	45.8	89.1	50.5	121.9	48.6	111.0
1981	128.1	155.0	48.0	88.4	44.9	89.7	51.5	121.1
1983	128.3	152.7	54.2	102.4	52.8	91.3	78.3	123.4
	119.1	130.2	51.1	90.9	51.7	102.9	38.3	111.5
Region								
Northeast	123.2	148.7	41.8	104.5	59.0	103.6	56.8	115.3
Midwest	111.8	119.3	57.1	91.7	45.6	91.5	25.8	105.0
South	110.6	109.6	50.0	72.9	48.9	99.2	32.6	102.4
West	141.3	161.8	61.7	111.2	52.4	120.1	31.8	133.9
	119.1	130.2	51.1	90.9	51.7	102.9	38.3	111.5
Urban								
SMSA	129.3	148.9	50.7	98.6	50.7	115.0	34.5	120.5
NON-SMSA	104.7	95.0	52.1	76.9	53.2	72.6	46.2	97.4
	119.1	130.2	51.1	90.9	51.7	102.9	38.3	111.5

Table 4.4 **Income of Nuclei by Living Arrangements (young nuclei; hundred 1980 dollars)**

	INDEP[a]	CHIL-H	CHIL-S	DREL-H	DREL-S	NREL-H	NREL-S	
Year								
1974	191.1	184.6	35.9	136.0	23.4	124.4	11.9	148.3
1975	198.0	214.1	40.0	142.7	25.1	120.9	7.6	153.6
1976	200.2	237.0	38.7	132.9	31.0	104.7	10.2	155.2
1977	198.2	209.1	37.1	158.5	80.5	109.1	53.2	155.9
1978	201.2	238.1	43.4	158.3	76.9	139.7	59.1	157.5
1979	204.7	155.4	45.5	141.6	76.2	141.5	75.0	160.1
1980	202.7	148.0	41.8	140.4	78.9	139.8	59.3	156.5
1981	205.7	186.9	37.5	122.2	67.9	147.4	67.0	155.0
1983	197.1	174.6	31.8	136.1	70.9	123.4	56.3	148.5
	199.7	199.1	39.1	140.9	61.1	130.1	48.1	154.5
Region								
Northeast	192.8	215.4	42.6	158.6	69.6	133.7	53.0	148.2
Midwest	204.7	187.8	41.5	139.6	58.9	132.5	47.9	156.6
South	186.6	182.9	36.9	134.2	56.9	121.4	55.8	147.1
West	221.5	210.9	32.8	137.8	63.5	135.4	38.1	170.5
	199.7	199.1	39.1	140.9	61.1	130.1	48.1	154.5
Urban								
SMSA	209.4	212.2	38.6	149.2	65.3	138.1	47.8	158.5
NON-SMSA	182.3	159.8	40.4	119.1	49.3	108.1	49.0	146.6
	199.7	199.1	39.1	140.9	61.1	130.1	48.1	154.5

[a]INDEP category includes PARE-H category.

The row averages in the last columns of tables 4.3 and 4.4 indicate the income development from 1974 to 1983. Real income of elderly nuclei went up almost steadily from $10,470 to $12,340, essentially due to doubly indexed transfer income. This is in stark contrast to the general real income development. Real income of nonelderly nuclei essentially stayed constant in our sample period—it increased from 1974 to 1979, then decreased rapidly back to the 1974 level. If household formation is income elastic, the diverging income distribution is a formidable explanation for the discrepancy in household formation trends between the young and the elderly. The choice model in section 4.5 will try to estimate this elasticity.

The intergenerational income distribution also exhibits some interesting regional variation: for both elderly and nonelderly, income is highest in the West and higher in urban than in nonmetropolitan areas. In the Northeast, where income of young nuclei is below the national average, elderly nuclei receive an above-average real income.

Not surprisingly, there is a large income gap between nuclei living as head and nuclei living as subfamilies. Head elderly nuclei generally earn more than twice as much as subfamilies. However, this difference

in income between subfamilies and head nuclei is less pronounced among elderly than among younger nuclei (table 4.4). Headship clearly has a strongly positive income elasticity. Among younger nuclei, nuclei living in any kind of shared accommodations have lower incomes than nuclei living independently. Not only headship but also living independently has a positive income elasticity for younger nuclei. This is not necessarily the case with elderly nuclei. Elderly parents who head a joint household with their adult children exhibit larger average incomes than those living independently, and their income rose dramatically from 1974 to 1983. Hence, we observe not only an increasing share of elderly who live as heads of two-generation households (table 4.1), but also that these elderly are very different from the nuclei we would most likely expect to "double-up."

The above observation may be attributable to the demand for or the supply of shared housing opportunities. The stratification by region and urbanization in table 4.3 may yield some clues to help us separate demand from supply: in metropolitan areas, in the Northeast, and in the West—where housing prices rose most during the late 1970s and early 1980s—this income gap is largest; in nonmetropolitan areas and in the South—areas less affected by housing market pressures—it is reversed. Elderly parents with an existing family home owned free and clear seem to provide an increasing amount of housing for the younger generation. Hence, this development may be a supply effect on the part of the elderly and a demand effect on the part of the younger generation.

This finding would also indicate that the supply elasticity for shared accommodations is positive, because those parents who are "host" for the younger generation appear to be wealthier than average. In general, we may distinguish two contradictory hypotheses about the supply elasticity for shared housing. In addition to the hypothesis that only a wealthy nucleus can afford being a "host" for another nucleus (positive income elasticity of supply), it may also be reasoned that only poor nuclei will offer to share accommodations with other nuclei, since in this way they can save on housing costs by splitting them with the "guest" nucleus (negative income elasticity of supply).

Table 4.5 sheds some light on this question. It tabulates the income of the head nucleus by the living arrangement of each nucleus. Hence, columns referring to head nuclei (labeled INDEP or ending in -H) are identical to table 4.3, whereas columns referring to subfamilies (labels ending with -S) now indicate the income of the respective head nucleus.

For distant relatives and nonrelatives living with each other, incomes are roughly comparable (the yearly averages for these living arrangements are based on cells with 25 to 150 observations and carry large standard deviations). Income of both host and guest nuclei are markedly

Table 4.5 **Income of Head by Living Arrangement of Nucleus (head nuclei of elderly nuclei; thousand 1980 dollars)**

	INDEP	PARE-H	PARE-S	DREL-H	DREL-S	NREL-H	NREL-S	
Year								
1974	113.6	115.4	179.7	95.5	102.8	105.8	151.9	116.9
1975	114.5	111.4	210.4	102.2	106.4	119.7	84.2	118.5
1976	116.6	119.7	220.0	82.1	95.8	110.6	64.8	120.1
1977	118.2	115.7	226.5	96.1	106.1	104.2	66.4	121.7
1978	120.2	131.1	217.8	91.5	97.7	96.6	62.4	123.4
1979	116.9	128.7	189.5	71.8	90.1	82.7	80.6	117.7
1980	116.2	141.9	202.9	89.1	100.1	121.9	94.5	121.2
1981	128.1	155.0	198.6	88.4	97.3	89.7	92.3	130.1
1983	128.3	152.7	162.2	102.4	113.0	91.3	85.3	130.1
	119.1	130.2	201.4	90.9	100.9	102.9	86.5	122.1
Region								
Northeast	123.2	148.7	207.4	104.5	85.7	103.6	109.6	128.7
Midwest	111.8	119.3	197.6	91.7	107.4	91.5	63.5	114.7
South	110.6	109.6	188.1	72.9	96.3	99.2	69.5	111.4
West	141.3	161.8	221.5	111.2	142.9	120.1	96.7	145.4
	119.1	130.2	201.4	90.9	100.9	102.9	86.5	122.1
Urban								
SMSA	129.3	148.9	215.2	98.6	108.7	115.0	92.1	134.0
NON-SMSA	104.7	95.0	166.1	76.9	88.7	72.6	74.9	103.5
	119.1	130.2	201.4	90.9	100.9	102.9	86.5	122.1

lower than average. In these cases the distinction between supply and demand for shared living arrangements may be as artificial as the distinction between head nuclei and subfamilies, and we observe the generally declining tendency to double-up when income is increasing.

The situation is quite different among elderly parent–adult children households. If elderly parents live in the same household as their children, and the children are head of the household, then the children have a markedly higher income ($20,140, third column of table 4.5, roughly corresponding to the income in the second column of table 4.4, its mirror image) than the average income of young nuclei ($15,450). Conversely, if elderly parents head a two-generation household, they earn more than the average elderly nucleus ($13,020 versus $11,150). This pattern is true in all of the four census regions and in metropolitan and nonmetropolitan areas alike. This finding rejects the hypothesis of a negative income elasticity of supply of living arrangements when two-generation households are concerned.

Stated differently, economic considerations such as saving housing costs may well play a role when distantly related or unrelated nuclei double-up. Not only the demand but also the supply elasticity declines with income. The mechanisms that create two-generation households

seem more complicated. Income clearly indicates which nucleus plays the headship role. The data include elderly parents who provide housing for adult children constrained by the housing affordability crisis in the late 1970s and early 1980s, and we observe adult children with above-average income who provide housing for their elderly parents. To study the economic incentives in these two-generation households more carefully, we would need to know the elderly parents' health status.

Tables 4.6 through 4.9 present the main demographic determinants of the choice among living arrangements: age, nucleus size, and sex of nucleus head, relevant mostly for single elderly nuclei.[6]

The last column of table 4.6 reflects the aging of the American population. Average age increased from 69.2 years to 69.8 years in the decade considered. It is important to realize that this change is more pronounced in the category of elderly who live independently. Once again, this points out the increasing burden of social support and health care that has to be borne by society at large rather than the immediate family. Table 4.7 displays the corresponding age profile: only after age 75 does the proportion of elderly Americans living independently decline with a corresponding increase of living arrangements within the immediate or more distant family.

Table 4.6 **Average Age of Nuclei by Living Arrangements (elderly nuclei; years)**

	INDEP	PARE-H	PARE-S	DREL-H	DREL-S	NREL-H	NREL-S	
Year								
1974	68.7	66.2	77.8	67.9	72.2	68.8	70.7	69.2
1975	68.8	66.2	75.8	68.6	72.2	69.1	71.2	69.1
1976	69.1	66.4	75.8	67.9	72.3	71.0	71.3	69.3
1977	69.3	66.2	76.8	68.6	71.8	70.2	70.6	69.4
1978	69.3	66.8	77.0	68.4	72.1	70.0	71.5	69.5
1979	69.5	66.5	76.8	69.2	72.5	70.7	72.9	69.7
1980	69.6	66.2	77.2	68.6	72.8	68.4	71.2	69.6
1981	69.6	66.8	77.6	68.4	71.9	68.3	71.2	69.6
1983	70.0	65.5	77.4	69.3	72.0	69.8	71.0	69.8
	69.3	66.3	76.8	68.5	72.2	69.5	71.3	69.5
Region								
Northeast	69.6	66.1	75.4	69.2	72.2	67.8	71.1	69.6
Midwest	70.0	67.7	77.6	68.7	74.4	70.5	72.1	70.3
South	68.7	66.2	76.9	68.6	71.2	68.5	71.7	68.9
West	69.1	64.9	78.3	66.0	70.8	71.0	70.3	69.2
	69.3	66.3	76.8	68.5	72.2	69.5	71.3	69.5
Urban								
SMSA	69.2	66.0	77.0	68.0	72.1	70.3	71.1	69.4
NON-SMSA	69.4	66.9	76.5	69.6	72.4	67.5	71.9	69.5
	69.3	66.3	76.8	68.5	72.2	69.5	71.3	69.5

Table 4.7 **Frequency of Living Arrangements by Age (percentage of elderly nuclei)**

Age	INDEP	PARE-H	PARE-S	DREL-H	DREL-S	NREL-H	NREL-S	
< 65	68.3	21.9	1.1	5.1	1.9	1.0	.7	100.0
66–70	72.8	12.2	2.8	5.1	3.7	2.2	1.2	100.0
71–75	77.9	6.5	3.2	5.1	3.6	2.4	1.2	100.0
76–80	74.1	5.5	8.2	4.7	4.1	1.4	1.9	100.0
> 80	58.9	8.8	18.1	3.1	8.0	1.1	2.0	100.0

Table 4.8 **Size of Nucleus by Living Arrangements (elderly nuclei; number of persons)**

Year	INDEP	PARE-H	PARE-S	DREL-H	DREL-S	NREL-H	NREL-S	
1974	1.6	1.7	1.0	1.6	1.1	1.2	1.0	1.5
1975	1.6	1.7	1.1	1.5	1.0	1.3	1.0	1.5
1976	1.5	1.7	1.1	1.4	1.1	1.3	1.0	1.5
1977	1.5	1.7	1.1	1.5	1.1	1.2	1.0	1.5
1978	1.5	1.7	1.0	1.5	1.1	1.3	1.0	1.5
1979	1.5	1.7	1.1	1.5	1.1	1.2	1.0	1.5
1980	1.5	1.7	1.0	1.5	1.0	1.3	1.0	1.5
1981	1.5	1.7	1.0	1.4	1.1	1.2	1.0	1.5
1983	1.5	1.7	1.1	1.4	1.1	1.1	1.0	1.5
	1.5	1.7	1.0	1.5	1.1	1.2	1.0	1.5

The columns in table 4.6 represent the relation between multi-nuclei living arrangements and age. Subfamilies tend to be older than head nuclei, a finding that may be explained by the health status of older and therefore more dependent nuclei. In the case of elderly parents living in the home of their adult children, the age of the parent nucleus is particularly high (76.8 years).[7] This relates back to the discussion of the role of income in forming two-generation households and the importance of the elderly parent's health status in that decision.

Surprising, however, is the fact that elderly parents who head a joint household with their adult children are not only younger than average nuclei, but also became even more so in the time from 1974 to 1983. It is interesting to relate this finding to the ownership rates in table 4.10. These ownership rates represent the percentage of nuclei who live in a dwelling that is owned by the head nucleus rather than rented. The second and third columns in table 4.10 show that the average ownership rates of a two-generation family home are virtually unchanged in our sample period. However, the proportion of family homes owned by the elderly parent increases, whereas the proportion of homes owned by the younger generation declines.

Table 4.9 **Sex of Nucleus-Head by Living Arrangement (elderly nuclei; percent female)**

	INDEP	PARE-H	PARE-S	DREL-H	DREL-S	NREL-H	NREL-S	
Year								
1974	38.6	37.1	79.7	38.9	66.7	47.6	52.0	42.7
1975	38.4	36.3	77.6	42.8	73.1	55.2	38.5	42.5
1976	39.3	37.0	76.5	50.5	64.4	50.0	44.4	43.1
1977	39.8	35.0	79.5	42.6	61.2	54.8	47.8	42.7
1978	39.5	36.2	82.5	37.1	67.6	63.3	48.3	42.8
1979	39.7	35.1	79.7	45.2	66.7	66.7	48.6	43.2
1980	41.5	35.2	84.0	43.6	68.6	63.1	42.4	44.4
1981	43.6	39.9	85.3	52.5	73.1	60.0	38.5	46.7
1983	41.5	34.5	80.6	53.5	66.2	53.7	46.2	44.0
	40.2	36.2	80.2	45.0	67.5	56.8	45.2	43.5
Region								
Northeast	43.0	30.3	85.0	47.0	70.3	50.0	55.0	46.1
Midwest	43.1	43.1	83.7	46.1	77.4	63.6	20.0	46.5
South	39.1	39.8	70.8	46.8	62.3	69.7	45.7	42.5
West	34.1	28.7	83.9	30.1	55.2	44.2	63.0	37.2
	40.2	36.2	80.2	45.0	67.5	56.8	45.2	43.5
Urban								
SMSA	40.1	35.7	82.5	45.6	68.0	62.1	47.9	44.2
NON-SMSA	40.3	37.1	74.3	43.8	66.8	43.5	39.5	42.5
	40.2	36.2	80.2	45.0	67.5	56.8	45.2	43.5

Furthermore, the age profiles in the second and third columns of table 4.10 show the reversal of roles with increasing age, the crucial age being 75 years, after which more elderly become subfamilies rather than heads and at which the rate of independently living elderly nuclei peaks. Except for the small category of NREL-S, the attractiveness

Table 4.10 **Ownership Rates of Head Nuclei by Living Arrangements (elderly nuclei; percent homeowners)**

Year	INDEP	PARE-H	PARE-S	DREL-H	DREL-S	NREL-H	NREL-S	
1974	70.3	79.0	89.1	75.9	67.6	61.9	68.0	72.5
1975	70.2	78.5	83.2	78.6	69.9	65.8	69.2	72.2
1976	70.1	75.9	83.8	78.5	72.4	66.7	55.6	71.9
1977	71.4	75.9	82.9	84.2	80.0	67.7	60.9	73.4
1978	71.0	79.3	83.3	86.7	74.3	70.0	62.1	73.4
1979	70.8	78.3	84.1	83.7	77.4	54.6	54.3	72.7
1980	71.5	79.7	84.9	80.0	72.1	57.9	57.6	73.1
1981	70.7	83.3	86.7	76.2	74.4	62.9	61.5	73.0
1983	73.6	84.7	83.5	74.3	76.5	61.0	65.4	75.2
	71.1	79.4	84.6	79.9	73.5	63.0	61.2	73.0

of all other living arrangements also strongly declines after the age of 75. In passing, note the low ownership rates of living arrangements among nonrelatives. All age patterns exhibit little variation across regions and degree of urbanization (see table 4.6).

Tables 4.8 and 4.9 shed more light on the demographic characteristics of living arrangements, particularly two-generation households. Elderly living in the household headed by their adult children are almost always single and mostly female, whereas elderly parents who are heads in a two-generation household are more often but by no means exclusively couples. Living arrangements with nonrelatives are most frequently chosen by single male elderly persons, particularly in the Midwest.

4.5 A Multinomial Logit Model of the Choice among Living Arrangements

The descriptive analysis in section 4.4 pointed out some important changes in the way elderly Americans live. In addition to the intergenerational shift in ownership patterns among two-generation households, the most striking change is the unexpectedly large increase in the proportion of elderly Americans living independently as opposed to the reversal of headship rates in the younger population.

What factors are generating the difference in household formation/dissolution patterns between the elderly and the young? There are two primary hypotheses. The first could be termed the "inertia hypothesis." Low mobility, caused by relatively higher monetary and nonmonetary moving costs for the elderly, creates a slow adaptation of housing patterns to a changing economic environment among the elderly. Market forces that may induce trends in the general market will only very slowly shift consumption patterns of the elderly. With an increasing share of the population becoming elderly, the proportion of elderly living independently among all households will rise. A relatively decreasing "supply" of younger households because of the change in the age distribution will also increase the proportion of elderly living independently among all elderly nuclei.

The second, the "income distribution hypothesis," rests on the observation that the economic environment has actually changed much less for the elderly than for the younger population. Whereas real income rose in the 1970s and then sharply declined in the beginning of the 1980s for younger families, this was not the case for the elderly. The same holds for housing prices. Housing prices were rising drastically at the beginning of the 1980s, but most elderly were already sitting in houses owned free and clear that appreciated during that period but without a proportional increase in cash costs.

To distinguish between both hypotheses, we need to estimate the price and income elasticities of the proportions in which living arrangements are chosen, as well as to contrast these elasticities with the influence of demographic variables. We will estimate a variant of the multinomial logit model describing the choice among the seven alternative living arrangements introduced in section 4.3 and depicted in figure 4.1.

We consider the most frequent choice of living independently as the base category and measure the attractiveness of the remaining six choices relative to this category. We postulate that the attractiveness or (dis-)utility of each alternative relative to living independently can be decomposed into three additive components. The first component describes the (dis-)utility of sharing accommodations either as head of the joint household (denoted by HEAD) or as subfamily (denoted by SUBF). The second component describes the attractiveness of the partners, that is the (dis-)utility an elderly nucleus receives from living with distant relatives (denoted by DREL) or with unrelated persons (denoted by NREL). Living as elderly parents with adult children (denoted by PARE) serves as the base category for shared living arrangements.

These utility components are a deterministic function v of regional housing prices (denoted by PRI), nucleus income (INC), age of nucleus members (AGE), the size of the nucleus (PER), and the sex of the nucleus head (SEX), comprised in the vector $\mathbf{X}$. In addition, a random utility component μ_i represents all unmeasurable factors that characterize each alternative. Using the symbols in figure 4.1, total (dis-)utility u_i becomes:

$$
\begin{aligned}
(1)\qquad u_{\text{PARE-H}} - u_{\text{INDEP}} &= v_{\text{HEAD}}(\mathbf{X}) + \mu_1,\\
u_{\text{DREL-H}} - u_{\text{INDEP}} &= v_{\text{HEAD}}(\mathbf{X}) + v_{\text{DREL}}(\mathbf{X}) + \mu_2,\\
u_{\text{NREL-H}} - u_{\text{INDEP}} &= v_{\text{HEAD}}(\mathbf{X}) + v_{\text{NREL}}(\mathbf{X}) + \mu_3,\\
u_{\text{PARE-S}} - u_{\text{INDEP}} &= v_{\text{SUBF}}(\mathbf{X}) + \mu_4,\\
u_{\text{DREL-S}} - u_{\text{INDEP}} &= v_{\text{SUBF}}(\mathbf{X}) + v_{\text{DREL}}(\mathbf{X}) + \mu_5,\\
u_{\text{NREL-S}} - u_{\text{INDEP}} &= v_{\text{SUBF}}(\mathbf{X}) + v_{\text{NREL}}(\mathbf{X}) + \mu_6.
\end{aligned}
$$

We assume that the μ_i are mutually independent and logistically distributed and specify functions v linear in the explanatory variables. Hence, the probability of choosing the alternative with the highest attractiveness is of the familiar multinomial logit form (McFadden 1973).

Several comments are appropriate concerning the choice of this model. First, all explanatory variables are nucleus-specific, but not alternative-specific. An alternative model commonly used in this situation is the logit model with alternative-specific coefficients, where for each relative utility component

$$(2) \qquad u_i - u_{\text{INDEP}} = \mathbf{X}'\beta_i + \mu_i, \qquad i = 1, \ldots, 6 \text{ or PARE-H}, \ldots, \text{NREL-S}.$$

Our specification simply economizes on the number of parameters by imposing a set of linear restrictions on the β_i:

$$(3) \qquad \beta_1 - \beta_2 = \beta_4 - \beta_5, \text{ and } \beta_1 - \beta_3 = \beta_4 - \beta_6.$$

In addition, these restrictions reflect a nonhierarchical pattern of similarities among the alternatives.

Second, it would be desirable to allow for a more flexible specification of the distribution of the unobserved utility components μ_i. After excluding a general multivariate normal distribution because of its computational intractability, an obvious choice is the generalized extreme value distribution leading to the nested multinomial logit (NMNL) model. However, the NMNL model is not identified in the context of explanatory variables that do not vary across alternatives.[8]

Finally, the data include repeated observations of the same nucleus but treat each observation independently. This assumption requires that all nucleus-specific time-invariant utility components be included in the explanatory variables. We are well aware that if in fact the unobserved characteristics μ_i correlate over time, the logit model will produce inconsistent estimates. It is possible to correct for this potential inconsistency by conditioning on the time-invariant, unobserved nucleus characteristics (Chamberlain 1980). However, with nine cross sections, this approach is prohibitively costly. Little is known about the magnitude of this bias in the coefficients.[9] The longitudinal nature of the data will also deflate the standard errors. Assuming essentially unbiased estimates, the correct standard errors should be approximately twice as large as reported.[10]

Table 4.11 presents parameter estimates of the choice model. The estimates are based on a choice-based subsample of all 19,154 nuclei. The subsample includes all nuclei that live with nonrelatives, a 0.05 percent random sample of independent nuclei, and intermediate-sized random sample of nuclei in other living arrangements. The subsample includes 3,081 nuclei and substantially economizes the estimation, while including a sufficiently large number of observations for each living arrangement to guarantee reliable estimation results. To correct for the case-controlled or choice-based subsampling, the estimation procedure re-weights each observation. The weights (the ratio of the percentage of each alternative in the original sample over the percentage in the subsample) vary by income class and cross section. The estimation approach is a slight generalization of the weighted exogenous sampling maximum likelihood (WESML) estimator proposed by Manski and Lerman (1977).[11]

A striking result in table 4.11 is the predominance of demographic variables relative to economic determinants. The coefficients measuring housing prices are insignificant, the income elasticities are surprisingly small. In contrast, age, nucleus size, and sex of single person nuclei determine most of the observed variation in choices among living arrangements. The overall fit, measured as the ratio of optimal over diffuse likelihood value, is quite satisfactory.

We will first discuss the age variables. Nucleus age refers to the average age of nucleus head and spouse; its sample mean is about 70 years. To be able to capture the important differences in housing choices before and after age 75 discovered in table 4.7, we include age linearly (measured in years) as well as quadratically (measured in squared years divided by 100). The probability of living as a subfamily increases with

Table 4.11 **Multinomial Logit Estimates of Living Arrangement Choices**

Variable	Utility Component	Estimate	Std. Error	*t*-Statistic
Price	Subfamily	−.0185	.0266	−.69
Price	Head	−.0043	.0233	−.18
Price	Distant relative	.0274	.0212	1.29
Price	Non-relative	.0197	.0262	.75
Income	Subfamily	−.1061	.0177	−5.97
Income	Head	−.0013	.0044	−.31
Income	Distant relative	−.0421	.0079	−5.27
Income	Non-relative	−.0208	.0095	−2.17
Age	Subfamily	−.0300	.0125	−2.39
Age sq.	Subfamily	.0521	.0126	4.11
Age	Head	−.0691	.0124	−5.53
Age sq.	Head	.0374	.0138	2.70
Age	Distant relative	.0616	.0121	5.07
Age sq.	Distant relative	−.0671	.0124	−5.40
Age	Non-relative	.1136	.0137	8.24
Age sq.	Non-relative	−.1144	.0145	−7.89
Persons	Subfamily	−1.8548	.2159	−8.58
Persons	Head	.6145	.1433	4.28
Persons	Distant relative	−.7961	.1826	−4.35
Persons	Non-relative	−2.5076	.2248	−11.15
Female	Subfamily	−.0075	.1607	−.04
Female	Head	.4760	.1732	2.74
Female	Distant relative	−.4730	.1543	−3.06
Female	Non-relative	−1.2829	.1497	−8.56
Log likelihood at optimum		−3,159.5		
Log likelihood at zero		−5,995.3		
Number of observations		3,081		

Note: Estimates are obtained by weighted exogenous sampling maximum likelihood (WESML). Standard errors are not corrected for intertemporal correlations.

old age; correspondingly, headship rates decline. However, at ages below 75 years, becoming one year older still decreases the log-odds of being a subfamily rather than living independently. The probabilities of the HEAD alternatives decline uniformly in the relevant age range, whereas the tendency to move as an elderly parent to a home headed by an adult child increases steadily. All these patterns correspond to simple intuition and the tabulations in section 4.4. We will compute these predicted age profiles in more detail below.

The variable PER (persons) represents the number of persons in the nucleus, therefore also the marital status of its head (PER = 1, if the elderly person is widowed, divorced, or never married, in general PER = 2 otherwise).[12] Not surprisingly, elderly couples strongly prefer to live independently. If they share housing, they prefer to head the joint household, other things being equal. They regard doubling-up with nonrelatives as a strongly inferior alternative. The odds of preferring such a living arrangement are about 12 times lower than for single elderly.

The variable FEM (female) indicates that the head of the nucleus is female which is relevant for one-person nuclei. After correcting for differences in income and age between single male and single female elderly, males are much more likely to live together with nonrelated persons in one household; the odds of their choosing this alternative being 3.6 times higher than among female persons.

Of the economic variables, PRI (price) denotes a housing price index of owner-occupied housing computed by Brown and Yinger (1986). The index represents after-tax user cost of a typical single-family home and includes historical appreciation as well as the federal income tax advantages of homeownership for the relevant income range. Because of the very large ownership rates, an owner-oriented price index seems to be the most appropriate index of housing costs for the elderly. The index is computed from AHS tabulations. The index is not SMSA-specific and varies only by the four census regions: Northeast, Midwest, South, and West. However, regional and intertemporal price variation is very large because the second half of the sample period encompasses the rapid rise in housing costs, starting in the West, then picking up in the remainder of the United States. In spite of this dramatic change in housing prices, virtually no price effect can be found in our estimation.

The variable INC (income) represents the nucleus's currrent income, measured in $1,000 per year deflated by the Consumer Price Index with base year 1980. Its sample mean is about 10.0. The estimated coefficients indicate a precisely measured, but surprisingly small, income effect in favor of living independently. The log-odds ratio of choosing to live as a subfamily rather than independently decreases by 0.1061

for an income increase of $1,000. At first sight, these results seem to reject the "income distribution hypothesis" in favor of the notion that housing consumption of the elderly is very inert. Even if the income of the elderly had declined as much as in the general population, the lack of responsiveness of household dissolution decisions to income changes would have predicted an essentially unchanged housing consumption pattern.

Because the author of this paper is an economist, not a demographer, the paper would have ended at this point. However, believing in economics after all, we reestimated the model in two different ways. First, the sample was stratified into three income classes and each income class estimated separately. Second, the pooled cross sections were decomposed into an early sample period (1974–76), a middle period (1977–79), and a late period (1980–83).

Table 4.12 presents the results stratified by income class. The lower income class extends to $5,000 per year, and the upper income class begins with a yearly income in excess of $10,000.

Quite clearly, there are very strong differences between the income classes. The statistical hypothesis that the estimated relationships are homogenous with respect to income class can easily be rejected.[13] Whereas the coefficients for housing prices and demographic variables are essentially stable, most of this difference can be found in the income variable. Low-income nuclei are highly income responsive, about 5 times as much as was estimated in the pooled regression in table 4.11. Income responses among the other two income groups are essentially insignificant, while a perverse sign characterizes the middle-income group.[14] Low-income elderly comprise almost half of the sample (1,404 out of 3,081). Hence, the aggregation error in table 4.11 is considerable, and we will use this disaggregate model for the applications in section 4.6.

The result of high income elasticities among the poor elderly corresponds to earlier findings that predicted very elastic household formation rates for single elderly women participating in a general housing allowances program (Börsch-Supan 1986). It also revives the hypothesis that without the double indexation of Social Security income the United States may have experienced a much larger incidence of doubling-up among the elderly than was actually the case. For more affiuent elderly, economic considerations appear to be irrelevant in the decision about living arrangements.

We performed a second sample stratification to investigate whether tastes have changed from 1974 to 1983, reestimating the model separately for the periods 1974–76, 1977–79, and 1980–83. This decomposition also alleviates the econometric problems of pooling cross sections in the presence of unobserved nucleus-specific but time-

Table 4.12 **Multinomial Logit Estimates After Income Stratification**

	Income < $5,000		$5,000 – $10,000		Income > $10,000	
Variable	Estimate	*t*-Stat.	Estimate	*t*-Stat.	Estimate	*t*-Stat.
PRI*SUBF	−.0074	−.18	−.0299	−.60	−.0107	−.23
PRI*HEAD	−.0230	−.55	−.1036	−2.08	.0717	2.02
PRI*DREL	.0286	.92	.0797	1.67	.0037	.10
PRI*NREL	.0409	1.03	.0284	.54	−.0086	−.19
INC*SUBF	−.5191	−7.26	.1701	2.15	−.0162	−1.18
INC*HEAD	−.1186	−1.56	.1765	2.26	−.0115	−1.84
INC*DREL	−.0799	−1.69	−.0755	−1.05	−.0173	−1.93
INC*NREL	−.2780	−4.80	−.1123	−1.42	.0112	1.13
AGE*SUBF	.0168	.86	−.1489	−5.47	−.1068	−3.76
AG^2*SUBF	.0204	1.12	.1534	6.04	.1370	4.45
AGE*HEAD	−.0812	−4.06	−.0911	−2.88	.0005	.02
AG^2*HEAD	.0617	3.06	.0475	1.50	−.0600	−2.09
AGE*DREL	.0550	3.47	.0682	2.33	.0761	2.69
AG^2*DREL	−.0645	−4.12	−.0721	−2.58	−.0669	−2.22
AGE*NREL	.1381	6.70	.0871	2.80	.0537	1.89
AG^2*NREL	−.1380	−6.88	−.0853	−2.87	−.0223	−.73
PER*SUBF	−2.1678	−5.70	−1.2889	−3.39	−1.9998	−5.10
PER*HEAD	.7366	2.61	.5017	1.90	.4561	1.88
PER*DREL	−.4670	−1.71	−.8342	−2.99	−1.6117	−4.58
PER*NREL	−2.4771	−5.49	−1.6769	−4.54	−3.0806	−7.81
FEM*SUBF	−.2018	−.87	.6367	2.01	.1913	.54
FEM*HEAD	.4550	1.64	.7059	2.16	.1121	.32
FEM*DREL	−.3232	−1.61	−.8141	−2.77	−.7886	−2.13
FEM*NREL	−1.2613	−6.45	−1.1145	−3.40	−1.2541	−3.63
Log likelihood at optimum		−1702.4		−729.6		−633.4
Log likelihood at zero		−2732.1		−1562.6		−1700.7
Number of observations		1404		803		874

Note: See table 4.11.

invariant utility components. Estimated coefficients are presented in table 4.13. The results are qualitatively unchanged from table 4.11, and the likelihood ratio test version of the Chow-test is insignificant. If any at all, the income elasticities show a rising tendency both in terms of magnitude and significance. The stability of the results is a fair indication that the potential inconsistency of the logit results may not be a severe problem in this data set.

4.6 Simulations and Applications of the Model

What do the magnitudes of the estimated coefficients imply? How do living arrangement decisions vary by age and income? Are the estimated income effects sufficiently large to explain the discrepancy

Table 4.13 Multinomial Logit Estimates for Three Time Periods

	1974–76		1977–79		1980–83	
Variable	Estimate	*t*-Stat.	Estimate	*t*-Stat.	Estimate	*t*-Stat.
PRI*SUBF	.0193	.31	.0273	.54	−.0134	−.17
PRI*HEAD	.0335	.57	.0094	.22	−.1055	−1.54
PRI*DREL	.0863	1.68	−.0214	−.56	.1085	1.78
PRI*NREL	.0108	.17	−.0532	−1.15	.1306	1.68
INC*SUBF	−.0923	−2.87	−.0988	−3.41	−.1275	−4.43
INC*HEAD	−.0065	−.91	−.0088	−1.05	.0095	1.23
INC*DREL	−.0204	−1.66	−.0440	−2.96	−.0714	−4.37
INC*NREL	−.0415	−1.42	−.0047	−.32	−.0238	−1.69
AGE*SUBF	−.0472	−2.04	−.0143	−.66	−.0365	−1.52
AG^2*SUBF	−.0737	3.22	.0399	1.81	.0464	2.03
AGE*HEAD	−.0865	−3.82	−.0779	−3.46	−.0401	−1.77
AG^2*HEAD	−.0539	2.22	.0509	1.99	.0073	.31
AGE*DREL	.0682	2.61	.0520	2.74	.0585	2.80
AG^2*DREL	−.0771	−3.19	−.0577	−2.72	−.0612	−2.91
AGE*NREL	.1207	5.19	.0868	3.38	.1216	4.81
AG^2*NREL	−.1255	−5.18	−.0858	−3.17	−.1225	−4.78
PER*SUBF	−1.8601	−4.42	−2.3011	−6.20	−1.3585	−3.98
PER*HEAD	.8139	2.85	.6307	2.60	.5294	2.27
PER*DREL	−1.0270	−2.13	−.5433	−2.50	−.9856	−3.60
PER*NREL	−2.2964	−6.23	2.2766	−5.16	−2.9720	−7.61
FEM*SUBF	.0257	.09	−.1337	−.46	.2011	.73
FEM*HEAD	.6700	2.12	.3791	1.23	.4587	1.56
FEM*DREL	−.4467	−1.45	−.4575	−1.84	−.6428	−2.41
FEM*NREL	−1.4096	−5.38	−.9965	−3.86	−1.4841	−5.41
Log likelihood at optimum		−1101.0		−1045.4		−998.5
Log likelihood at zero		−2027.6		−2006.2		−1961.5
Number of observations		1042		1031		1008.

Note: See table 4.11

between declining headship rates among young nuclei and a rising proportion of elderly living independently in the early 1980s? We will try to answer these questions by evaluating predicted choice probabilities generated by the multinomial logit models in table 4.12 in various scenarios.

Table 4.14 presents predicted age profiles for the three income classes. Clearly, poorer elderly not only have a lower tendency to live independently but also give up this status earlier than elderly with higher incomes. The reversal in the choice probability of living independently occurs at 70.5 years for elderly nuclei with yearly incomes below $5,000, at 75.5 years for the middle-income group, and at 78.5 years for those elderly nuclei who receive more than $10,000 yearly.

Table 4.14 Household Dissolution of Elderly Americans by Age and Income

Age	INDEP	PARE-H	PARE-S	DREL-H	DREL-S	NREL-H	NREL-S
			Nuclei with income < $5,000				
60	69.0	11.0	3.1	10.9	3.0	2.3	.6
65	69.8	10.9	3.8	9.5	3.3	1.9	.7
70	70.1	11.1	4.8	8.2	3.6	1.5	.7
75	69.9	11.5	6.0	7.1	3.7	1.2	.6
80	69.1	12.2	7.6	6.0	3.7	.8	.5
85	67.6	13.2	9.5	5.0	3.6	.6	.4
90	65.2	14.6	12.0	4.1	3.4	.4	.3
95	61.9	16.3	14.9	3.4	3.1	.2	.2
			Nuclei with income $5,000 – $10,000				
60	73.2	12.3	1.6	8.6	1.1	2.8	.4
65	76.2	10.9	2.1	6.8	1.3	2.3	.4
70	78.3	9.8	2.8	5.3	1.5	1.8	.5
75	79.2	8.9	4.2	4.0	1.9	1.3	.6
80	78.5	8.1	6.4	2.9	2.3	1.0	.8
85	75.7	7.3	10.4	2.0	2.9	.7	1.0
90	69.5	6.4	17.4	1.4	3.7	.4	1.2
95	58.9	5.4	28.9	.8	4.4	.3	1.4
			Nuclei with income > $10,000				
60	73.6	16.9	.7	6.8	.3	1.6	.1
65	79.6	12.6	1.1	4.9	.4	1.4	.1
70	84.3	8.9	1.7	3.2	.6	1.1	.2
75	87.3	6.0	2.7	1.9	.9	.8	.4
80	87.9	3.8	4.7	1.1	1.3	.6	.7
85	85.3	2.2	8.2	.5	2.0	.4	1.4
90	78.2	1.2	14.7	.2	2.8	.2	2.6
95	65.1	.6	25.4	.1	3.9	.1	4.8

Note: All predictions are based on the disaggregate model in table 4.12.

Once they dissolve their households, the upper-income classes are more likely to be received by their adult children or by more distant relatives. The pattern is different for poorer elderly among whom a large proportion stays head of a two-generation household. As opposed to the low-income strata, elderly nuclei with incomes above $5,000 become increasingly likely to also be received by distant or unrelated persons. However, this trend is statistically insignificant.

Which living arrangements would elderly Americans have chosen in the absence of the rise in real income generated by Social Security indexation? Table 4.15 presents estimated changes that would have occurred if the income of elderly nuclei had exhibited a similar development as the income of younger nuclei. Using the observed income at 1974, we computed the hypothetical elderly's income by using an income index calculated from the sample of young nuclei. Columns 1 and 3 display the changes between this and the baseline prediction for

Table 4.15 **Predicted Proportions of Nuclei Living Independently if Income of Elderly had Developed as General Income (changes; percentage points)**

	Low Income Elderly		All Elderly Nuclei		Young Nuclei
	Predicted Change Versus Baseline	Predicted Change Versus Prev. Year	Predicted Change Versus Prev. Year	Predicted Change Versus Prev. Year	Actual Change Versus Prev. Year
1974	.0	.0	.0	.0	.0
1975	−1.1	−.9	−.4	−.3	−.5
1976	−1.2	.3	−.4	.1	.3
1977	−1.3	.2	−.4	.1	−.2
1978	−.8	1.0	−.2	.3	−.8
1979	−.6	−.5	−.2	−.2	.8
1980	−2.2	−1.2	−.7	−.4	−1.2
1981	−3.6	.3	−1.1	.1	−.7
1983	−4.8	−.7	−1.4	−.2	−1.0

Note: The entries in columns 1 and 3 represent the differences between baseline prediction (using the elderly's actual income) and alternative prediction (deflating the elderly's income at the rate of the general income develpment). The entries in columns 2 and 4 represent the yearly changes of the alternative prediction. Column 5 represents the yearly changes of the actual proportions among young nuclei (table 4.2). All predictions are based on the disaggregate model in table 4.12.

nuclei with income below $5,000 and for all nuclei. The differences are substantial for poor nuclei, but they are not large enough to explain a similar decrease in headship rates among all elderly as was observed among young nuclei. This is indicated in columns 2, 4, and 5, which compare the yearly changes in the proportion of elderly living independently with the actural changes in this category among the young nuclei.

We conclude that the divergence in the income development substantially contributed to the steady increase in the proportion of elderly living independently, but that this explanation in itself is not sufficient to account for the entire discrepancy in choosing living arrangements between young and elderly Americans.

4.7 Summary of Conclusions

1. About a third of all nuclei with at least one elderly person do not live independently. As opposed to an increase in the proportion of doubled-up households in the general population in the early 1980s, this percentage has fallen among elderly Americans.

2. The emerging discrepancy in living arrangement choices between young and elderly can only partially be explained by the discrepancy

in the income development from 1974 to 1983. The residual may be attributed to inertia due to low mobility and slow adaptation to economic changes.

3. More than 17 percent of all elderly nuclei live with their adult children. In most of these cases, the parents head the common household. If the children are household heads, the parents are usually single and old with a small income.

4. Within these two-generation households, important intergenerational changes occurred from 1974 to 1983. An increasing percentage of these households are headed by the parent generation rather than the adult child. We speculate that this development can be attributed to the housing affordability crisis among young first-time home buyers.

5. Few elderly live with distant relatives (the proportion is less than 9 percent), and very few elderly share the household with nonrelatives (about 3 percent).

6. The choice probabilities among living arrangements are predominantly determined by demographic variables. There is no evidence that they respond to an aggregate price index of owner-occupied housing.

7. The "demand elasticity for shared accommodations" with respect to income is strongly negative for elderly with low incomes. However, for elderly nuclei with yearly incomes in excess of $5,000, the income elasticity is insignificant after correcting for demographic variables.

8. In elderly parents–adult children households, there is some evidence that the corresponding "supply elasticity for shared accommodations" with respect to income is positive: children who "receive" their parents have about twice than average nucleus income.

Notes

1. The 1978 National Sample contains a supplement on disabilities.

2. The AHS can be augmented with data from the National Nursing Home Survey. This is a subject for further research.

3. The creation of this data base is a large, mostly mechanical task that is not particularly glamorous but devoured most of the work for this paper.

4. Complex households are assigned to the above categories in the stated order.

5. See Becker's (1981) treatise or the paper by Ermisch (1981).

6. If the nucleus consists of a married couple, age refers to the average age of husband and spouse. Sex of nucleus head is a somewhat ambiguous concept because the head of a nucleus is only well defined in the trivial case of one-person nuclei or self-reported in one-nuclei households. Otherwise, we assigned the head status to the male.

7. A table similar to table 4.5 indicates that the corresponding age of the receiving child nucleus is quite young (52.8 years).

8. There is no variation in the inclusive values to identify the dissimilarity parameters.

9. See Börsch-Supan and Pollakowski (1988) for an application and sensitivity analysis using a panel of three cross sections.

10. The 3,081 observations in the estimation sample represent between 700 and 800 different nuclei.

11. See McFadden, Winston, and Börsch-Supan (1985) for details, including a derivation of the appropriate asymptotic covariance matrix. The WESML estimation approach is not necessary to consistently estimate the coefficients in the MNL model. Inclusion of alternative specific constants would serve the same purpose. However, these constants are highly collinear with PER and FEM, which makes the WESML approach more attractive.

12. There are some cases of elderly nuclei with own children under age 18.

13. The likelihood ratio test statistic is 188.2 [the log likelihood of the constrained estimation is 3159.5 (table 4.11); the likelihood of the unconstrained model (table 4.12) is 3065.4]. The chi-squared value for 50 degrees of freedom at 0.99 confidence is 76.2.

14. Note that the reported standard errors ignore intertemporal correlations. Correct standard errors are approximately twice as large.

References

Becker, G. S. 1981. *A treatise on the family*. Cambridge, Mass.: Harvard University Press.

Börsch-Supan, A. 1986. Household formation, housing prices, and public policy impacts. *Journal of Public Economics* 25: 145–64.

Börsch-Supan, A., and H. Pollakowski. 1988. Estimating housing consumption adjustments from panel data. *Journal of Urban Economics*, forthcoming.

Brown, H. J., and J. M. Yinger. 1986. *Homeownership and housing affordability in the United States: 1963–1986*. Joint Center of Housing Studies of MIT and Harvard University. Mimeo.

Chamberlain, G. 1980. Analysis of covariance with qualitative data. *Review of Economic Studies* 47: 225–38.

Ermisch, J. 1981. An econometric theory of household formation. *Scottish Journal of Political Economy* 28: 1–19.

Manski, C. F., and S. R. Lerman. 1977. The estimation of choice probabilities from choice based samples. *Econometrica* 45: 1977–88.

McFadden, D. 1973. Conditional logit analysis of qualitative choice behavior. In *Frontiers in econometrics*, ed. P. Zarembka, 105–42. New York: Academic Press.

McFadden, D., C. Winston, and A. Börsch-Supan. 1985. Joint estimation of freight transportation decisions under non-random sampling. In *Analytical studies in transport economics*, ed. A. Daughety, 137–57. Cambridge: Cambridge University Press.

Poterba, J. M., and L. H. Summers. 1985. Public policy implications of declining old-age mortality. Paper prepared for Brookings Institution Conference on Retirement and Aging.

Comment

John M. Quigley

There is much to applaud in Axel Börsch-Supan's careful empirical analysis of the household and housing choices of the elderly. First is the explicit recognition of the endogeneity of the household itself. Second is the demonstration that the decision to combine adults to form a household is amenable to economic analysis. To those of you who have seen undergraduates doubling, tripling, or living in communes in high-rent cities like Boston this may not be implausible. This way of looking at households is, however, almost totally foreign to those public officials charged with forecasting future housing or construction needs. These analyses, undertaken by HUD, by the FHLBB, even by the Federal Reserve, typically take projected age distributions of the population and mechanically transform them to numbers of households—which are then compared to numbers of available dwellings.

The third striking feature of the paper is the endogeneity of the household head in extended families. When the elderly member has the highest income, he or she is the head of the extended family. When the child has the money, the child is the head. It has become an awkward thing to unravel male-female, husband-wife, from head-spouse on questionnaire data, and apparently will become more so as incomes within households get more equal.

Fourth, the statistical methodology employed by Börsch-Supan is unambiguously appropriate to this problem. In several of the papers discussed at this conference, considerable attention was paid to reducing the information conveyed by an important measurement, for example, by converting a continuous measure of household income or hours worked into a binary variable measuring poverty or retirement status. This paper avoids these complications.

The paper's substantive conclusions are that an elderly person's choice of living conditions—independence, living with children, etc.—is sensitive to the age and sex of that householder and to whether the person's spouse is still living. At incomes less than $5,000, household choice is also responsive to income; for the lower half of the income distribution of the elderly, annual income matters a lot. Axel finds the irrelevance of housing price (the user cost of housing capital) to these choice surprising. I find it less so since such a large fraction of the elderly are homeowners with clear title and no mortgage payments. Using the Panel Study of Income Dynamics (PSID) data, I discovered recently that less than 50 percent of younger households with

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outstanding mortgages were able to compute the components of user cost in a consistent manner. For example, the outstanding mortgage balance, the monthly payment, and the mortgage term were internally inconsistent and yielded implausible interest rates for a great many households.

Despite the lack of statistical significance of the price term in the logit models, the tabulations reported in the paper suggest that, over time, as interest rates rose and housing prices increased, a larger fraction of elderly households took in their children as subtenants. Anecdotal evidence from elsewhere under a variety of different institutions supports this kind of effect. For example, in Budapest, where price controls and a stagnant supply have made the shadow prices of rental housing very large, elderly renters routinely take in young households as subtenants, providing shelter or assigning them the right to assume rental contracts in return for household help and private nursing care (Hårsman and Quigley 1988). The socialist alternative.

The real problems I see with this paper do not arise from Axel's clear and careful analysis, but rather from his choice of data set. The decision to use the Annual Housing Survey (AHS) locks the analyst into three sets of data problems. First, the AHS is a sample of dwelling units. As such it excludes intermediate care facilities, nursing homes, and various kinds of congregate facilities. There is simply no way to describe these alternatives or to use the generic utility indicators, which have been so carefully estimated, to simulate the effects of policy changes (or merely income or price changes) upon the propensity to choose these unexplored options. The importance of these options is growing. Garber's paper (ch. 9, in this volume) suggests that 5 percent of the elderly live in congregate facilities, making it the second or third most likely living arrangement. It's surely the most expensive.

Second, the AHS contains not a scrap of information on the health status of the elderly. Casual empiricism applied to the elderly of the middle class—my own family stories and those of virtually everyone I know—suggests that the independence of the elderly in their living condition is as fragile as an arthritic hip or a burst blood vessel. Of course, this is consistent with Axel's finding that the income elasticity of choice among middle-class elderly households is low. But this latter description is way off point.

Third, the pooling of a decade's worth of data on a panel of dwelling units—to achieve sufficiently large samples for the rarer alternatives—is quite dangerous. Since the sampling frame is dwelling units, a panel of "stayers" is mixed with a sample of "movers," causing serious problems in inference and interpretation. This problem is not merely the inaccurate degrees of freedom and misleading standard errors noted by the author. It is well known that the probability of "staying" at

$t + 1$ is higher for those who have "stayed" at t. This individual-specific but unobserved heterogeneity could be accounted for, as Axel notes, but only by poaching on the Rust computer budget. But there's another problem here that arises because the attachment to residential amenities and "neighborhood" increases as households remain stayers. I've recently tried to sort out these effects, estimating mobility models from the PSID. It appears that, even when unobserved heterogeneity is controlled for, in the Heckman-Flynn sense, the mobility hazard is at least inversely proportional to duration (Quigley 1987). This is quite consistent with the arguments of Dynarski (1985) about the increasing importance of neighborhood attributes and amenity (or, in the terminology of Venti and Wise, of nonmonetary transactions costs which increase with duration). It would be very hard to address duration effects or the timing of choices within the framework Börsch-Supan has chosen.

These problems are unfortunate; they limit the applicability of the specific findings of an otherwise interesting and creative effort. One can believe the cross-sectional descriptive results presented and still doubt the conclusions about the causal effects of income and price upon the household choices of the elderly.

References

Dynarski, Mark. 1985. Housing demand and disequilibrium. *Journal of Urban Economics* 17(January):42–57.

Hårsman, Björn, and John Quigley. 1988. Housing markets and housing institutions: An international comparison. Center for Real Estate and Urban Economics, University of California, Berkeley. Mimeo.

Quigley, John M. 1987. Interest rate variations, mortgage prepayments and household mobility. *Review of Economics and Statistics* 69(4):636–43.