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A DYNAMIC ANALYSIS OF HOUSEHOLD DISSOLUTION AND LIVING ARRANGEMENT TRANSITIONS BY ELDERLY AMERICANS

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ABSTRACT

This paper exploits the new non-response files of the Panel Study of Income Dynamics in order to study living arrangement transitions of elderly Americans. The focus of the paper is an estimate of the probability of household dissolution, i.e., the probabilities of transitions from living independently to living with adult children or other related or unrelated persons and the probability of becoming institutionalized, and an investigation of the factors causing such transitions.

Our main result is an astounding stability of living arrangements even after incisive life-events such as death of a spouse, onset of a disability, or in the years immediately preceeding death, in particular the large proportion of elderly who stay living independently until their deaths. Almost two thirds of all elderly are living independently in the year of their deaths. 14.4 percent share at least once housing with relatives or friends, 3.1 percent experience a stay in an institution.

Old age, being male or of low income significantly increases the risk of institutionalization. Elderly with a large family and nonwhite elderly are the groups most likely to share housing. All this might be expected. An important new finding, however, is the time trend of these probabilities. Holding all other factors constant, the risk of institutionalization increased substantially between 1968 and 1984 while the likelihood of being "taken in" by relatives or friends markedly decreased.

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1. Introduction[1]

The dissolution of an elderly person's independent household -- either to live in another household or to become institutionalized -- is an incisive life-event that has many implications for the well-being of the elderly person. Most elderly hold most or all of their wealth in housing.[2] In most cases, the dissolution of an elderly person's independent household implies the sale of the house and therefore a substantial change in the elderly's wealth position. In case of institutionalization, some of this wealth may be used tc pay for front-loaded fees; in the case of moving to own children, the wealth may be transferred to the next generation by transferring headship of the family home.

The choice of living arrangements by the elderly is also an important aspect of the economics of aging at large because of the 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 for the elderly but also some degree of medical care and social support for the elderly. If the elderly 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. Moving to adult children is also an important substitute for institutionalization. As the private and social costs of institutionalization are sky-rocketing, the family may have to become yet again resort for the elderly. This is not only a question of distribution -- whether the family or society at large pays an otherwise equal bill. One may also argue that independently living elderly are more

isolated and incur higher costs for medical care and social support, e.g., because of the psychosomatic effects of isolation or due to a lower interest in preventive care by elderly living alone.

Household dissolution decisions also have important 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. If elderly households stay in their family homes well into their 80's, the next generation will have little chance to move into the family homes while their children (the third generation) are being raised and demand for space is largest. If houses of younger families with children are relatively more spacious than those of the elderly, the elderly may become perceived as being "overhoused" with the notion of intergenerational inequity.

Household dissolution may change the eligibility for certain government programs.[3] Eligibility and transfer level for the food stamp and the supplemental social security program is determined by the income of the household, not by the income of the elderly. Elderly who received supplemental social security income may loose this income once they move to children with own income. This may induce elderly to stay living as an independent household longer than they may want to in absence of these transfer programs.

Finally, Schwartz, Danziger and Smolensky (1984) point out a perverse effect in measured income inequality: if the proportion of independently living elderly increases, then, ceteris paribus, income inequality will rise because there are more small households with low income than if they

had lived in a joint household with a combined larger income. The income distribution effect is perverse when it was a slight increase in the elderly's income that produced the increased proportion of elderly living independently. Of course, the effect is purely statistical and vanishes, when income inequality is measured not on the level of households, but on a lower level, e.g., on the level of family nuclei.[4]

This paper studies the demographic and economic determinants of the elderly's decision to stay living independently or to dissolve the independent household in order to choose some kind of shared accommodations or to move in an institution such as a nursing home or a home for the aged. The main questions being asked are:

- What are typical sequences of living arrangements in old age? How often do elderly transit between their home, their children, and an institution?

- Which events precipitate changes in living arrangements? What are typical living arrangement sequences after retirement, after death of a spouse, after onset of a disability, and in the years preceding death?

- Are there cohort or calendar-time effects in the preferences for certain living arrangements that can be distinguished from pure age effects? Are the elderly becoming more isolated in the last years?

- How many elderly remain living independently until they die? Who are the elderly living independently? Are they younger, are they wealthier, are they isolated?

- Are economic conditions (income, housing prices) important determinants for the choice among living independently, sharing accommodations, and living in an institution? Or is the decision to give up an independent household simply determined by age and health?

The paper is one of a triad of papers on household dissolution and choice of living arrangements of elderly Americans in this volume. It poses some of the same questions (and arrives at very similar answers) as the paper by Ellwood and Kane, using the same data but a very different methodology. The coincidence of all major results yields some confidence in the robustness of our results in spite of many data problems. Whereas this and Ellwood and Kane's paper concentrate on the demand for dependent and independent living arrangements, the triad's third paper by Kotlikoff and Morris is more interested in the supply side and closes a model of living arrangement choices by providing a structural model of dependent living arrangements.

Economic incentives for household formation and, by implication, household dissolution have been extensively studied for the general population in the seventies. A survey of this literature can be found in Börsch-Supan (1986). With focus on the elderly, this research has been picked up recently by two papers that employ different data sets in order to study determinants of living arrangements for the aged. Schwartz, Danziger and Smolensky (1984) employ the Retirement History Survey (RHS) to estimate a binary choice model between living independently and dependently -- that is, in another household, most commonly that of their children. In spite of the size of this data set, their empirical results were mixed, and neither health nor income effects could convincingly be proven, mostly due

to their econometric methodology and the poor health measures available in the RHS. Boersch-Supan (1988) estimated a multinomial logit model of living arrangements on data from the Annual Housing Survey (AHS) that distinguishes several dependent living arrangements rather than just one category. Both papers share two important shortcomings: their data sets prohibited an analysis that takes institutionalization into account, and neither paper performed a dynamic analysis. Overcoming these two shortcomings is in the focus of this paper.

The probability of institutionalization per se is the focus of many studies that are reviewed by Garber and MaCurdy's paper in this volume. In contrast to these papers, this paper concentrates on permanent institutionalization as opposed to the more frequent short-term stays in nursing homes. Garber and MaCurdy's paper provides some link between short and long-term institutionalization by endogenizing duration of stay.

The paper is organized as follows. As answers to the first three groups of the above enumeration of questions require panel data, and answers to all questions demand data with a lot of detail about elderly persons and their living arrangements, we will first describe the data, their novelty and problems, and present the construction of the essential variables. Section 3 provides estimates of transition probabilities for all elderly in our sample. Sections 4, 5, and 6 are then devoted to three subsamples, each relating to a particular life-event. We will first analyze transitions in response to the death of a spouse, investigate transitions after the onset of a disability in Section 5, and will finally focus on the last five years of life of those elderly who decease during the sample period. Sections 3 through 6 are organized as variations on a theme and have a common pattern. First, we will categorize observed sequences of

living arrangements and describe their frequencies. Second, multinomial logit models are employed in order to estimate the weights of potential causes for these sequences or choices of living arrangements. The final section summarizes the results and critically discusses the paper's assumptions and data sources.

2. Data and Variable Definitions

An empirical investigation of living arrangement transitions faces many technical problems. First, the detection of transitions and an analysis of living arrangement sequences requires a longitudinal data set that covers a long time span. There are just very few long panels in the United States, the longest being the Panel Study of Income Dynamics. Second, elderly are particularly prone to become "non-responses" in a survey for systematic reasons: although their geographic mobility is low which alleviates the problem of locating elderly respondents, they may become institutionalized or decease. In most surveys, these persons are then lost in the sample. Third, a study of living arrangements needs information not only about the immediate household, but also of the family of the elderly person who may provide alternative living arrangements. Similarly, for such a study one needs to know a combination of economic, demographic, and health variables that is unusual for most general purpose surveys. Finally, the very old may have difficulties in answering questions precisely, particularly about their health status, so that the interviewer has to phrase questions more carefully and double check answers. Currently, there is no data set fulfilling all these requirements simultaneously.

Our analysis is based on the new complete family-individual based file of the Panel Study of Income Dynamics (PSID) 1968 to 1984. This file in-

cludes all persons who have ever been interviewed as member of a PSID family. In contrast to earlier PSID releases, it also includes people who are classified as non-respondents in the last available interview year (1984), e.g., persons, who have died in the course of the panel study. The data therefore provides a new opportunity to look at the economic and housing conditions of the very old, particularly those who have died, and the transitions preceding death.

Main advantage of the PSID is its long time horizon of up to 17 years. This enables us to create event histories and to detect typical sequences of living arrangements, and to estimate transition probabilities that depend on age as well as on calendar time. Another important advantage of the PSID for the study of living arrangement decisions is the collection of at least some data at the individual level (rather than household level) in the so-called family-individual file, and the careful recording of household composition as it relates to the head of household. This makes it possible to detect elderly living as subfamilies or as "secondary individuals" in households headed by their children or other persons. Finally, the non-response file keeps records for persons even when they become institutionalized. This is in contrast to all major cross-sectional data sources that comprise either the institutionalized or the non-institutionalized population, as well as in contrast to most longitudinal data sources that have only one non-response category and do not distinguish between institutionalization, death, or other reasons for non-response.[5]

In addition to its extreme unwieldiness,[6] the PSID has also several severe shortcomings that limit the kind of analysis that would be appropriate for the study of the elderly's living arrangements. Most im-

portantly, the PSID does not contain a systematic record of the functional health status of the elderly. We will depend on age and an indicator for disability status as variables proxying health. The PSID does not record structural housing characteristics that could allow for a precise definition of housing prices corrected for quality differences. Unit housing prices must be assigned from external sources such as the American Housing Survey. Another problem are the many changes and inconsistencies in data collection procedures and variable definitions during the 17 years in which the PSID has been conducted. Unfortunately, this also includes the classification of persons as institutionalized and the procedures to trace such persons. The creation of an internally consistent file requires a substantial amount of data processing, and it was not always possible to create an unambiguous and consistent variable definition for all included time periods. Finally, though some information (e.g., age, sex, and income) is recorded by individual household member, other information about individuals is either subsumed in a household total or available only for head and spouse. For example, race, number of own children and siblings, and retirement date are recorded only for heads of households and their spouses. Hence, these variables can only be assigned to individual sample members if they have been head or spouse at least once during the sample period. This excludes some kinds of analyses and creates a selectivity bias in other analyses.

As a first step preceding the analysis, the PSID family-individual file was therefore converted into a rectangular file of elderly individuals.[7] Variable definitions common for all waves were employed, and time-invariant data that were collected only for heads and spouses were assigned to these individuals in periods in which they were neither head nor spouse. As "elderly" were defined individuals who were aged 60 and above

in 1968. This includes 1134 observations. Of those, 956 are in year 1968 in the sample and represent a random sample of the population aged 60 and above.[8] An additional 178 elderly are picked up after 1968, typically, when they join a family from the original PSID sampling frame. This part of the sample is non-random as its inclusion in the sample depends on the choice of living arrangement and will only be employed when conditioning on the origin of transition removes this choice bias.

Based on the household information collected in the PSID, the main dependent variable in this study -- the type of living arrangement -- can be classified according to four categories:

- Independent living arrangements: the elderly's household does not contain any other adult person beside the elderly individual and his/her spouse, if any (living arrangement type 1).[9]

- Shared living arrangements: the elderly's household contains at least one other adult person beside the elderly individual and his/her spouse. Two cases can be distinguished:

- - The elderly is head of household or spouse of head of household (living arrangement type 2). In this case, the relationship between the elderly and all other household members is well documented.

- - The elderly is neither head of household nor spouse of head of household (living arrangement type 3). In this case, the relationship between the elderly and the other household members cannot be unambiguously determined. Most importantly, the data does not provide a distinction between an elderly person living in the household of her/his son-in-law and

an elderly person living with in the household of an unrelated person.[10]

- Institutional living arrangements: This category includes elderly who are living on a permanent basis in a health-care related facility (living arrangement type 4). Examples are living in a home for the aged or in a nursing home but not temporary hospital or nursing home stays.[11]

This categorization deserves some comments. First, it would have been desirable to distinguish between adult children/elderly parent-households and households in which elderly share accommodations with other related or unrelated persons. This is impossible because of the head-centered recording of family relationships. Most but not all shared accommodations represent adult children/elderly parent-households. Based on the national file of the 1983 Annual Housing Survey, 62.1 percent of all composite households including an elderly person were children/elderly parent(s)-households (including in-laws), in 27.2 percent of these households the elderly person shared accommodations with a related individual other than child (mostly siblings), and in the remaining 10.7 percent at least one unrelated person lived in the composite household (excluding in-laws).[12]

Second, it would have been desirable to distinguish between parents who live together with their adult children because the children have not yet left the household (this is a clear possibility for the younger aged who raised children late in their lives) and parents who have been "taken in" by their children but are legal owner of the family home and therefore head of household. This is impossible in lack of a complete life-history of all household members. On the other hand, we make a point of distinguishing headship from being a secondary individual in a composite household.

Third, the concentration on permanent nursing home stays as a measure of institutionalization does not correspond to many published numbers that also include temporary nursing home stays. Most nursing home stays are quite brief (e.g., for convalescence) and do not imply that the household was dissolved (e.g., by selling the house or moving out of an apartment). These temporary nursing home stays are treated like hospital stays and the person's living arrangement is the living arrangement before and presumably after the hospital stay. It is important to keep this in mind when interpreting the relatively small percentages of institutionalized persons in this paper.[13]

3. A Markov Model of Living Arrangement Transitions

We will first estimate transition probabilities for the entire random sample of elderly individuals. In addition to establishing some general tendencies, these transition probabilities will serve as a yardstick when we study transition probabilities in special situations such as the years preceding death, the years after death of a spouse, or the years after onset of a disability.

Table 1 provides a survey of what happens in the sample: it presents the frequencies of living arrangement sequences among the 956 elderly whose life-history can be traced from 1968 on. 602 of these elderly deceased during the sample period, and 354 elderly survived until 1984. The frequencies are reported once for the entire sample, and once for the subsample of surviving elderly.

Please insert Table 1 about here

The first result is the stability of living arrangements in spite of the long sample period and the large proportion of elderly who die during this time span. More than two thirds of the elderly in both samples do not change their living arrangements at all. Most of the elderly stay living independently through the entire sample period or until their deaths. 14.4 percent of all elderly shared at least once a household not being head or spouse of head, and 3.1 percent have been in an institution at least for one entire year during the sample period. Apart from a higher proportion of multiple changes, there is astoundingly little difference between the two subgroups in the sample, the surviving elderly and those who deceased before 1984.

This large proportion of stayers creates a problem in the specification of transition probabilities. First, with only relatively few transitions, the statistical base for the estimation of parametric transition probabilities is very small. We choose not to employ relatively sophisticated hazard models based on continuous time since they are more likely to generate imprecise results than simple Markovian models. The paper by Ellwood and Kane included in this volume provides an analysis of living arrangements parallel to this one using the same data but duration models based on an exponential hazard. It is interesting to note that all important qualitative conclusions from these two papers coincide in spite of the different methodologies.

Second, the large proportion of stayers suggests that a model of

Table 1: FREQUENCIES OF LIVING ARRANGEMENT SEQUENCES, 1968-1984
(absolute and relative frequencies)

Sequence Type	All Elderly[a]		Surviving Elderly[b]	
No change during sample period	691	72.3%	239	67.5%
(1) Independent	526	55.0	198	55.9
(2) With others, as head or spouse	70	7.3	25	7.1
(3) With others, as secondary individual	95	9.9	16	4.5
One change during sample period	140	14.6%	48	13.5%
(1) to (2)	34	3.6	15	4.2
(1) to (3)	4	.4	0	.0
(1) to (4)	6	.6	0	.0
(2) to (1)	71	7.4	29	8.2
(2) to (3)	2	.2	1	.3
(2) to (4)	5	.5	0	.0
(3) to (2)	11	1.2	2	.6
(3) to (4)	8	.8	1	.3
More than one change during sample period	125	13.1%	67	18.9%
Between (1) and (2) only	95	9.9	60	16.9
All others	30	3.1	7	2.0
Total	956	100.0%	354	100.0%

Note: a) All elderly aged 60 and above in 1968
b) Elderly aged 60 and above in 1968 who survived at least until 1984
Source: PSID, 1968-1984, including non-respondents

simple Markov transitions will not describe the data well. This is so because even if one- period transitions are estimated correctly, a standard first-order Markov model will predict too many transitions within two or more periods.[14] This effect may be attributed to either unobserved population heterogeneity (certain types of individuals self-select into certain categories of living arrangements) or duration dependence (the likelihood of leaving a living arrangement category decreases with the duration in this category). Because of the few transitions observed in Table 1, we will not be able to statistically distinguish between these two possibilities. As was mentioned in the preceding section, the data lacks some obviously important information (such as detailed health status). Therefore, the heterogeneity model appears most appropriate in this situation.

One solution to the heterogeneity problem that is well-suited for this application is the so-called mover-stayer model developed by Goodman (1961) and exposed in Amemiya (1985) that accounts for population heterogeneity by dividing the sample in stayers that never change their living arrangement and movers that may or may not change their living arrangement in any given period. Transition probabilities $P_{ij}(t)$ from living arrangement category I to j for a given individual, unidentified to be either a mover or a stayer, are then given by

$$P_{ij}(t) = d_{ij} S_i + (1-S_i) M_{ij}(t)$$

where S_i denotes the proportion of stayers in category i, $M_{ij}(t)$ the transition probability of movers from category i to j, and d_{ij}=1 if i=j, 0 otherwise. We will identify stayers as those elderly who do not change their living arrangement in the 17 years between 1968 and 1984 or between 1968 and their deaths. Note that unlike in other applications of the

mover-stayer model the long time horizon and the fact that death excludes further changes provides for a reliable estimate of the stayer probabilities.[15] We then estimate the matrix of mover transition probabilities M_{ij} by the sample frequencies of observed transitions by movers, the maximum likelihood estimate. Table 2 presents the transition probabilities M_{ij} for movers and the resulting unconditional transition probabilities P_{ij} according to the mover-stayer heterogeneity assumption in the above equation:[16]

Please insert Table 2 about here

The unconditional transition probabilities P_{ij} will serve as baseline estimate with which transition probabilities in special situations will be compared. Note that the matrix of two period transitions has a larger diagonal than the square of the transition matrices[17] -- it is this feature of the mover-stayer model that helps describing the stability of the elderly's living arrangements.

In order to characterize the stayer population, Table 3 reports multinomial logit estimates that relate the three stayer probabilities S_i, 1,..,3, relative to the probability of being a mover to a set of demographic and economic variables. There are no elderly who stay in an institution throughout the entire sample period (S_4=0). Two sets of estimations are provided: one for the entire sample, combining stayers who died during the sample period and stayers who survived at least until 1984; and one set of estimations for the surviving elderly only.

Table 2: TRANSITION PROBABILITIES

(i) Transition Probabilities for Movers, M_{ij}:

Type of living arrangement at origin:	Type of living arrangement at destination: (1)	(2)	(3)	(4)
(1) Independent	.8987	.0913	.0032	.0069
(2) With others, as head/spouse	.1996	.7919	.0019	.0066
(3) With others, as secondary indiv.	.0761	.0711	.7970	.0558
(4) Institution	.0345	.0000	.1034	.8621

(ii) Unconditional Transition Probabilities, P_{ij}:

Type of living arrangement at origin:	Type of living arrangement at destination: (1)	(2)	(3)	(4)
(1) Independent	.9544	.0411	.0014	.0031
(2) With others, as head/spouse	.1850	.8071	.0018	.0061
(3) With others, as secondary indiv.	.0685	.0640	.8172	.0503
(4) Institution	.0345	.0000	.1034	.8621

Source: PSID, 1968-1984, elderly aged 60 and more in 1968, including non-respondents.

Please insert Table 3 about here

Most variables employed in Table 3 are self-explanatory. AGE68 is age in year 1968. SINGLE (MARRIED) is a dummy variable denoting that the elderly was single (married) during the entire sample period. YPERM is the average income during the sample period. NONWHITE includes black, Hispanic, Asian, Pacific, and Native American elderly. KIDS (SIBS) denotes the number of own children (siblings) if reported, NOKIDS (NOSIBS) is a dummy variable denoting that the elderly has no children (siblings). Finally, the dummy variables MDKIDS (MDSIBS) indicate missing data on number of children (siblings). The variables KIDS and SIBS are only reported in years when the elderly person was head of household or spouse.[18] Thus data on own children and siblings is unavailable whenever an elderly person was never head of household or spouse during the entire sample period. This lack of precise data about potential family support in this case is a major draw-back of the data. The dummy variables MDKIDS and MDSIBS that indicate these cases eliminate any bias in the KIDS and NOKIDS variables (SIBS and NOSIBS, resp.) for those elderly in which this information is available.

The positive coefficients of the SINGLE and MARRIED variable indicate that the probability of being "mover" increases by experiencing a marital status change which in almost all cases represent death of a spouse. This is of course not surprising, and we will analyze the living arrangement adjustments after the death of a spouse in the following section. Male elderly are much more likely to be movers than female elderly. Note that this effect is measured holding marital status constant. As we will see,

Table 3: A LOGIT MODEL OF STAYER PROBABILITIES
(Parameter estimates, t-statistics in parentheses)

		Log odds of staying in .... rather than changing					
		(1) Independent		(2) With Others, as Head/Spouse		(3) With Others, as Secondary Indiv.	
VARIABLE	Sample Mean	All[a]	Surv.[b]	All	Surv.	All	Surv.
CONST	1.0	-0.778	1.386	-2.000	-16.687	-8.135	-81.048
		(-0.8)	(0.7)	(-1.1)	(0.0)	(-2.8)	(-0.2)
AGE68	68.4	0.011	-0.020	-0.030	-0.002	-0.031	0.069
		(0.8)	(-0.6)	(-1.3)	(0.0)	(-1.1)	(0.6)
KIDS	2.7	-0.012	0.111	0.054	0.088	0.097	0.096
		(-0.3)	(1.7)	(1.2)	(1.2)	(1.0)	(0.8)
NOKIDS	.18	0.585	0.840	-0.300	0.010	0.960	-10.450
		(2.4)	(2.1)	(-0.6)	(0.0)	(0.8)	(0.0)
MDKIDS	.14	-0.448	0.020	-0.100	-12.024	5.149	3.764
		(-1.1)	(0.0)	(-0.2)	(0.0)	(6.2)	(2.1)
SIBS	4.6	0.029	-0.045	0.067	0.009	0.612	9.380
		(0.7)	(-0.8)	(1.0)	(0.1)	(1.9)	(0.2)
NOSIBS	.04	-0.162	-0.011	-0.435	-13.255	-1.652	62.374
		(-0.4)	(0.0)	(-0.4)	(0.0)	(0.0)	(0.1)
MDSIBS	.25	-0.510	0.036	-0.348	-12.018	6.600	75.719
		(-1.5)	(0.1)	(-0.5)	(0.0)	(2.8)	(0.2)
NONWHITE	.16	-1.498	-2.380	0.735	1.520	-0.944	-1.220
		(-6.0)	(-4.8)	(2.3)	(2.8)	(-2.0)	(-1.1)
FEMALE	.54	0.349	0.467	0.512	12.773	0.353	0.012
		(1.7)	(1.3)	(1.2)	(0.0)	(0.7)	(0.0)
YPERM	2.84	-0.026	0.008	-0.053	0.006	0.049	-0.131
		(-1.5)	(0.3)	(-1.1)	(0.1)	(0.6)	(-0.5)
SINGLE	.30	0.378	-0.404	2.147	2.267	1.375	0.415
		(1.8)	(-1.2)	(3.8)	(2.1)	(2.4)	(0.4)
MARRIED	.43	1.617	0.557	2.928	14.692	0.579	-12.486
		(7.3)	(1.4)	(4.8)	(0.0)	(1.1)	(0.0)
Likelihood at convergence (L(β)):				All: -735.66		Surv.: -261.06	
$Rho^2 = 1 - L(\beta)/L(0)$:				0.444		0.468	
Percent correctly predicted:				67.26		64.69	
Number of observations:				956		354	

Note: a) All elderly aged 60 and above in 1968
b) Elderly aged 60 and above in 1968 who survived at least until 1984
Source: PSID, 1968-1984, elderly aged 60 and more in 1968 who never changed their living arrangement, including non-respondents.

this effect will become even more pronounced when we study the cases in which a spouse deceased. Race has a very strong impact on the stayer probabilities. Being nonwhite decreases the probability of staying independent or as secondary individual, but increases the probability of heading a composite household. There are no measurable income effects, nor does the elderly's age in year 1968 affect the mover-stayer probabilities.[19]

Although the measurement of the "supply-side" variables for shared living arrangements -- the number of own children and siblings -- is marred by the above-mentioned incomplete information on these two variables, we can ascertain that the probability of being a stayer in the category "Independent Living Arrangements" increases with being childless, just as the presence of children and siblings increases the probability to be stayer in the two shared accommodation categories. These latter two effects are however very small. We conclude that most shared living arrangements are of a transitory nature. The probability of staying as secondary individual is most strongly affected by the MDKIDS and MDSIBS indicator variables. This is not surprising because by construction these variables work essentially as choice-specific constants for the choice of living arrangement type 3.

There is little significant difference between the two subgroups in our sample. Due to the smaller sample size, the results for the surviving elderly are less precise. This is particularly true for the third column (staying with others as secondary individual).

We will now turn to the transition probabilities of those elderly who changed their living arrangement at least once during the sample period.

As is obvious from Table 2, some of these transition probabilities are very low, and it is therefore impossible to separately relate all 16 transition probabilities in a meaningful way to the above set of relevant demographic and economic variables. Table 4 provides some results for the transitions between living arrangement types 1 and 2, and, most interestingly for our topic household dissolution, the transitions into type 3 (living with others as secondary individual, in most cases being "taken in" by adult children) and type 4 (institutionalization). The upper panel describes the binary choice between staying in either a type 1 or type 2 living arrangement and a transition to type 2 or 1, respectively, conditional on having been identified as mover at least at some point in time, not necessarily this time. Possible transitions to the other two categories 3 and 4 are being ignored, making usage of the logit functional form and the independence of irrelevant alternatives. The lower panel pools all origins in order to gain degrees of freedom in estimating the transition probabilities into the latter two living arrangement types.

Most of the variables have already been introduced in Table 2. In addition, we now measure some demographic and economic changes that occurred concurrently with the transition. DINCOME denotes the magnitude of a real income change, DMARR denotes a change in marital status (1=becoming married, 0=no change, -1=loss of a spouse, divorce, or separation), and DLIM indicates a change in limitation status (1=health status worse than previous year, 0=no change, -1=health status better than previous year).

Please insert Table 4 about here

Table 4: LOGIT MODELS OF MOVER TRANSITION PROBABILITIES
(Parameter estimates, t-statistics in parentheses)

Variable	Log odds of moving .... rather than staying: from (1) Independent to (2) Shared as head		from (2) Shared as head to (1) Independent	
CONST	-2.614	(-1.67)	0.889	(0.58)
KIDS	0.061	(1.70)	0.005	(0.16)
SIBS	0.030	(0.96)	-0.041	(-1.45)
NONWHITE	0.348	(1.63)	0.348	(1.79)
AGE68	0.015	(0.96)	-0.006	(-0.39)
FEMALE	-0.354	(-1.83)	-0.165	(-0.90)
INCOME	-0.021	(-0.65)	0.011	(0.43)
DINCOME	-0.001	(-5.83)	0.045	(1.16)
MARR	-0.739	(-3.50)	0.295	(1.52)
DMARR	-1.529	(-4.34)	1.319	(3.23)
DLIM	0.280	(1.62)	-0.249	(-1.35)
YEAR	-0.013	(-0.55)	-0.006	(-0.25)
$L(\beta)$	-544.6846		-501.9912	
Rho^2	0.5780		0.2969	
% correct	90.92		79.71	
NOBS	1862		1030	

Variable	Log odds of moving to ... rather than staying or moving elsewhere to (3) Sharing as secondary indiv.		to (4) Institutionalized	
CONST	15.324	(4.6)	-17.501	(-3.3)
KIDS	0.187	(3.1)	-0.245	(-1.3)
NOKIDS	1.943	(3.8)	-0.875	(-0.9)
MDKIDS	3.444	(4.9)	-1.542	(-1.2)
SIBS	0.057	(0.6)	-0.131	(-0.8)
NOSIBS	2.232	(2.8)	0.017	(0.0)
MDSIBS	1.610	(2.3)	3.750	(3.2)
NONWHITE	0.824	(2.3)	-0.223	(-0.3)
AGE68	0.045	(1.7)	0.175	(3.7)
FEMALE	-0.931	(-2.5)	-2.225	(-3.1)
INCOME	-0.030	(-0.4)	-1.595	(-4.2)
DINCOME	0.022	(0.3)	-1.688	(-4.5)
MARR	-2.033	(-5.1)	-2.324	(-3.0)
DMARR	-1.606	(-2.6)	-5.800	(-5.6)
DLIM	0.103	(0.2)	-0.103	(-0.1)
ORIGIN1	-3.430	(-6.3)	-1.691	(-2.7)
YEAR	-0.265	(-5.2)	0.072	(1.5)
$L(\beta)$	-132.1030		-55.3071	
Rho^2	0.6029		0.7832	
% correct	89.38		96.20	
NOBS	480		368	

Source: PSID, 1968-1984, elderly aged 60 and more in 1968 who at least once changed their living arrangement, including non-respondents.

We will first comment on the left part of the upper panel in Table 4 that reflects the choice between a transition from living independently to sharing a household as head or spouse of head, and staying independent. The loss of a spouse (DMARR),[20] change in the severity of a disability (DLIM), and a loss in income (DINCOME) are the most important determinants that precipitate this transition. All other things equal, elderly women tend to stay independently whereas elderly men rather tend to share accommodations. These results correspond to the same effects in the stayer population. Not being married in the first place strongly increases the likelihood of a transition, as does the presence of children, of siblings (though statistically not significant), and being nonwhite. Neither age nor calendar time significantly alters the transition probabilities between living arrangement types 1 and 2, nor does the level of income.

Not surprisingly, the reverse transition -- breaking up a composite household to become independent, right part of upper panel in Table 4 -- is essentially characterized by the opposite mechanisms. Some of these transitions appear to be statistical artifacts, such as the marriage with a person who was already living in the household as an unrelated secondary individual. This may be indicated by the strong coefficient of DMARR. Note that nonwhite as well as male elderly are more likely to change living arrangements, as was the case in the reverse transition.

The lower panel indicates the probabilities of being taken in by others and becoming institutionalized. As is evident, both probabilities increase with age, in particular the risk of institutionalization. Being or becoming single and being male also increases these probabilities. The presence of children or siblings decreases the risk of institutionalization, and increases the likelihood of being taken in, as is expected.

Again, the measurement of this "family support-supply effect" suffers from the large number of observations for which a precise number of children or siblings cannot be ascertained (as indicated by the variables MDKIDS and MDSIBS). Most transitions into institutionalization or subfamily status are from living arrangement types 2 through 4, as indicated by the strong negative coefficient on the variable ORIGIN1 that denotes transitions from living independently, once again reflecting the stability particularly of the independent living arrangement category. Finally, and this is worth emphasizing, we observe a strong negative income effect on the likelihood of entering an institution. Institutions are clearly viewed as inferior living arrangements.

As opposed to the probabilities in the upper panel, the transition probabilities into institutions and being taken in are non-stationary. This is indicated by the effect on the variable YEAR which measures calendar time. The probability of institutionalization, controlling for all other factors included in the lower panel, exhibits an increasing trend, although measured imprecisely. The likelihood of being taken in, however, decreases between 1968 and 1984, with a large and statistically highly significant coefficient. This result has a strong and important implication: there appears to be a decreasing inclination of the family or friends to take care of "their" elderly, and an increasing reliance on institutions such as nursing homes with their related private and social costs. The parameter estimate of the risk of institutionalization is not measured statistically precisely because it is based on relatively few transitions. If one anyway takes this estimate as best available guess, then it translates to a yearly increase of about 7 percent, that is, a doubling of the risk of institutionalization within 10 years.[21]

4. Living Arrangement Changes after Death of a Spouse

The analysis in the preceding section suggested that death of a spouse is the most important life-event precipitating a change in living arrangements. The logit regressions in Table 4 related living arrangement adjustments to a concurrent change in marital status. This section will take a closer look at the dynamics of what happens after the death of a spouse by studying not only changes in the concurrent year but also in consecutive years.

In our sample, 317 elderly experienced the death of their spouses and survived at least one further year. Table 5 presents the frequencies with which living arrangement transitions occur in the year of the spouses' death and in the following years.

Clearly, the transition probabilities in the year of the spouse's death (panel B) are quite different from what they are in the general population (panel A, from Table 2). Starting from living independently, the transition probability of joining another household as head of household becomes twice as large. The transition probabilities to subfamily status and into an institution increase even more than tenfold (first row in panel B). If the elderly couple headed a composite household, the death of the spouse also resulted in a much elevated likelihood that this common household is broken up, either leaving the surviving spouse alone in the family home or as a new independent household (second row in panel B). Note that the probability of becoming institutionalized is very high in the year in which the spouse deceases. In a formal test, the equality of panels A and B is strongly rejected.[22]

Please insert Table 5 about here

A comparison of the panels in Table 5 clearly shows that most living arrangement adjustment in response to death of a spouse have taken place already in the concurrent year. Though panels C through E are still statistically different from panel A, the size of the chi-squared test statistic is much lower as compared to the test between panels A and B. One year after the spouses death, the probabilities of a transition between shared and independent living are still elevated, but this is reversed in the second year.

Table 6 presents some logit estimation results for the first year transitions. They confirm the general tendencies detected in Table 4 for all movers also for this special case of transitions most likely precipitated by the death of a spouse. Unfortunately, the small sample size prevents a more detailed analysis, for instance, a stratification by living arrangement prior to death of spouse.

Please insert Table 6 about here

The presence of children or siblings increases the probability of being taken in after the spouse's death. Old age, low income to begin with, or an income loss increase the likelihood of a transition into an institution. Female elderly are more likely to stay living in the family home than widowers. If a health limitation develops concurrently with the

Table 5: TRANSITION PROBABILITIES AFTER DEATH OF A SPOUSE

Type of living arrangement at origin:	Type of living arrangement at destination: (1)	(2)	(3)	(4)
(A) Unconditional Transition Probabilities (from Table 2):				
(1) Independent	.9544	.0411	.0014	.0031
(2) With others, as head/spouse	.1850	.8071	.0018	.0061
(3) With others, as secondary indiv.	.0685	.0640	.8172	.0503
(4) Institution	.0345	.0000	.1034	.8621
(B) Year concurrent with Death of Spouse (317 observations):				
(1) Independent	.8565	.0826	.0217	.0390
(2) With others, as head/spouse	.3556	.6000	.0000	.0444
(3) With others, as secondary indiv.	.0244	.1220	.8049	.0488
(4) Institution	.0000	.0000	.0000	1.000
Chi-squared statistic (B-A): 1005.60				
(C) One Year Later (301 observations):				
(1) Independent	.9362	.0638	.0000	.0000
(2) With others, as head/spouse	.2041	.7959	.0000	.0000
(3) With others, as secondary indiv.	.0000	.0000	.9670	.0330
(4) Institution	.0000	.0000	.3333	.6667
Chi-squared statistic (C-A): 47.77				
(D) Two Years Later (267 observations):				
(1) Independent	.9656	.0287	.0000	.0057
(2) With others, as head/spouse	.1429	.8771	.0000	.0000
(3) With others, as secondary indiv.	.0000	.0000	1.000	.0000
(4) Institution	.0000	.0000	.0000	1.000
Chi-squared statistic (D-A): 57.05				
(E) Three Years Later (239 observations):				
(1) Independent	.9542	.0458	.0000	.0000
(2) With others, as head/spouse	.1860	.8140	.0000	.0000
(3) With others, as secondary indiv.	.0000	.0000	1.000	.0000
(4) Institution	.0000	.0000	.0000	1.000
Chi-squared statistic (E-A): 40.63				

Source: PSID, 1968-1984, 317 elderly aged 60 and more in 1968 who lost their spouse, including non-respondents.

Table 6: LOGIT TRANSITION PROBABILITIES: AFTER DEATH OF SPOUSE
(Parameter estimates, t-statistics in parentheses)

	Log odds of transition to .... rather than to (1) Independent		
Variable	(2) With Others, as Head/Spouse	(3) With Others, as Secondary Indiv.	(4) Institution
CONST	14.555 (3.1)	-3.676 (-0.4)	-23.051 (-2.2)
AGE68	-0.022 (-0.7)	0.029 (0.6)	0.123 (2.4)
KIDS	0.085 (1.1)	0.248 (1.5)	0.121 (0.7)
NOKIDS	-0.369 (-0.5)	1.387 (1.0)	0.630 (0.6)
MDKIDS	0.653 (0.5)	5.650 (3.1)	-0.466 (-0.3)
SIBS	-0.079 (-0.8)	0.191 (0.8)	-0.130 (-0.5)
NOSIBS	-0.165 (-0.2)	-5.485 (-0.1)	1.643 (0.9)
MDSIBS	-0.951 (-0.8)	3.374 (1.7)	4.670 (2.8)
NONWHITE	1.283 (2.7)	0.510 (0.6)	1.620 (1.8)
FEMALE	-0.560 (-1.2)	-2.533 (-2.7)	-2.344 (-2.3)
INCOME	-0.156 (-1.1)	-0.748 (-1.5)	-0.841 (-2.1)
DINCOME	0.016 (0.1)	0.343 (1.1)	-0.935 (-2.2)
DLIM	0.630 (1.1)	2.333 (2.4)	-0.585 (-0.6)
ORIGIN1	-2.856 (-6.3)	-2.237 (-2.0)	-0.581 (-0.6)
YEAR	-0.165 (-3.1)	-0.021 (-0.2)	0.171 (1.6)
Likelihood at convergence (L(β)):		-140.0808	
$Rho^2 = 1 - L(\beta)/L(0)$:		0.6812	
Percent correctly predicted:		85.80	
Number of observations:		317	

Source: PSID, 1968-1984, 317 elderly aged 60 and more in 1968 who lost their spouse, including non-respondents.

death of a spouse, the surviving elderly is most likely taken in by the family or by friends rather than being institutionalized. Nonwhite elderly are less likely to stay independently than white elderly.

Living arrangement prior to the spouse's death is accounted for by the variable ORIGIN1 (if independent) and, though indirectly, by the missing data indicators. Note that because MDKIDS and MDSIBS essentially serve as indicator variables for categories 2 and 3, introduction of variables such as ORIGIN2 and ORIGIN3 would result in almost perfect collinearity with MDKIDS and MDSIBS. The negative sign of ORIGIN1 (the reference case) and the positive signs of the statistically significant missing data variables indicate the smaller likelihood of a change as compared to staying in living arrangements 1, 2 and 3.

Stationarity of these transition probabilities is clearly rejected: the results confirm the existence and the direction of the time trends already discovered in Table 4. All other determinants equal, institutionalization is becoming more likely, and being taken in by family or friends is becoming less likely as time proceeds from 1968 to 1984.

5. Living Arrangement Changes after Onset of a Disability

The logit estimates for all elderly movers in Table 4 did also confirm the common sense notion that disability status is an important factor determining an elderly's living arrangement. This section makes an attempt to identify cases in which a disability occurs suddenly in order to investigate the time pattern of living arrangement adjustments precipitated by this event.

In fact, changes in disability status are quite hard to measure, in general and particularly in the PSID. The question in the survey ("Are you limited by a health condition?") provides for four answers ("A lot", "Somewhat", "A little", and "No") that depend on the subjective self-rating of the elderly person. Prior to 1976, only two categories were provided ("Yes" and "No").[23] Not too surprisingly, limitation histories are characterized by a lot of ups and downs that may partly reflect actual subjective feelings, and partly arbitrariness in the choice of categories. In addition, many elderly experience a gradual decline in health status with no clear onset of a disability that could be classified as "one event."

We define the onset of a disability quite conservatively as a permanent change in disability status: in order to qualify, disability status must be "No" for at least 5 years, then "Yes", "Somewhat", or "A lot" for at least another 5 years. With this definition, we count 237 elderly in our sample who experience a well defined and sudden change in health status. Table 7 presents the actual number of transitions that occur in the year of the health change and in the three years thereafter. Elderly persons who are in a nursing home are excluded in this sample because their limitation status is not recorded.

Please insert Table 7 about here

Unfortunately, main conclusion from these transitions is that the numbers of actual changes are too small to draw reliable conclusions. A formal test of whether the corresponding conditional transition probabilities are equal to those predicted in the lower panel of Table 2, is signi-

Table 7: TRANSITIONS AFTER ONSET OF A DISABILITY

Type of living arrangement at origin:	Type of living arrangement at destination: (1)	(2)	(3)
(i) Year concurrent with Onset of Disability:			
(1) Independent	147	9	3
(2) With others, as head/spouse	3	41	2
(3) With others, as secondary indiv.	0	0	31
(ii) One Year Later:			
(1) Independent	135	4	0
(2) With others, as head/spouse	5	41	1
(3) With others, as secondary indiv.	0	0	22
(iii) Two Years Later:			
(1) Independent	109	5	0
(2) With others, as head/spouse	5	37	0
(3) With others, as secondary indiv.	0	0	19
(iv) Three Years Later:			
(1) Independent	84	6	0
(2) With others, as head/spouse	4	28	0
(3) With others, as secondary indiv.	0	0	17

Source: PSID, 1968-1984, 237 elderly aged 60 and more in 1968 who experienced a well-defined onset of a disability, including non-respondents.

ficant in the period concurrent with the disability change, barely significant one year later, and insignificant two and three years later.[24] If a reliable result can be extracted from Table 7, then it is a larger probability to stay in living arrangements type 2 and 3 (i.e., living together with children, other relatives, or unrelated persons) in response to a sudden health change to the worse. Unfortunately, the lack of disability data for institutionalized persons made it impossible to detect transitions into nursing homes after the death of a spouse.

It should be noted that these weak results are only apparently in contrast to the strong significance of the variable DLIM (change in the severity of limitation relative to the previous period) in the previous logit analyses. This section limits itself to the obviously rare cases of sudden well-defined unidirectional health changes, whereas the variable DLIM picks up many small changes. In fact, the idea of a sudden onset of a disability rather than a gradual change that eventually implicates living arrangement adjustments may be inappropriate, or, if such a thing as a sudden onset exists, the measurement of it by a subjective self-rating rather than a functional index of ability may be misleading. Some evidence for the latter explanation can be found in Boersch-Supan, Kotlikoff, and Morris (1988). They show that among the health variables available in their data set functional ability is the one that best explains living arrangement changes, rather than subjective health indexes or indicators of actual medical conditions.

6. Living Arrangement Changes in the Years Preceding Death

This last section investigates where the elderly spend the last five years of their lives. We will count time backwards (measuring something

like "negative age") and construct a panel that starts with the year of each elderly's death for those 602 elderly for whom date of death is observed. Of those, 448 elderly have at least five years of complete data. Table 8 presents the cross-sectional distribution of living arrangement types by year before death, and Table 9 displays the frequency of all living arrangement sequences observed in this sample.

Please insert Tables 8 and 9 about here

The main message from these two tables is, once again, the stability of living arrangements -- even in the years immediately preceding death. Almost four out of five elderly (79.7 percent) do not change their living arrangements during this time. Note that this fraction is even larger than in the elderly population as a whole. Though one might expect a decreasing mobility with very old age in general,[25] there is also an increase in the necessity to adjust living arrangements in this segment of life, for instance induced by an increasing frailty in the years preceding death. Obviously, at least in this PSID sample, the first mechanism is stronger than the second.

More than half (55.4 percent) of the elderly have been living independently until their deaths. Every fifth of all elderly (20.1 percent) has been taken in by her/his children, relatives, or friends at least once through the last five years before death, most of them (15.2 percent) at least for these five years. Finally, about six percent of the elderly became institutionalized during this time period, almost all of whom stay so until their deaths.

Table 8: LIVING ARRANGEMENTS BY YEAR BEFORE DEATH
(percentages)

Year	(1) Independent	(2) With Others, as head/spouse	(3) With Others, as secondary ind.	(4) Institu-tionalized
5	64.1%	16.7%	18.5%	.07%
4	64.7	15.8	18.3	1.1
3	65.2	15.8	17.6	1.3
2	64.7	15.8	17.6	1.8
1	62.5	16.1	16.3	5.1

Note: Year 1 represents year of death.

Table 9: LIVING ARRANGEMENT SEQUENCES: LAST FIVE YEARS BEFORE DEATH
(absolute frequencies)

Sequence	Frequency	Sequence	Frequency
11111	248	22111	6
11112	11	22114	2
11113	1	22211	4
11114	5	22214	1
11121	1	22221	7
11122	5	22222	39
11144	2	22224	3
11211	2	24333	1
11221	1	24444	1
11222	3	32222	2
12111	1	33211	1
12122	2	33222	1
12211	1	33331	1
12221	1	33332	2
12222	2	33333	68
14111	1	33334	4
21111	5	33344	1
21112	1	33433	1
21122	1	33444	2
21222	3	43333	1

Note: Sequence 11112 denotes the choice of living arrangement type 2 in the year of death, and of type 1 in the preceding four years. The four living arrangement types are denoted by:
1 = Independent
2 = With others, as head/spouse
3 = With others, as secondary individual
4 = Institutionalized

Source: PSID, 1968-1984, elderly aged 60 and more in 1968 who died before 1984.

The few changes observed in the sample would put any dynamic analysis on very weak feet. Hence, we will recur to cross-sectional analysis in this section. Table 10 provides a cross-sectional analysis of where the elderly choose to live within their last five years of life. The sample consists of all observations with complete data.[26]

Please insert Table 10 about here

The analysis in Table 10 confirms what we have learned so far and shows that some of these effects are particularly pronounced for the very old and most vulnerable elderly. Female elderly are more likely to live independently than male elderly. Black or Hispanic elderly have a higher likelihood of living in shared accommodations, as do elderly with many children. Being married has the expected strong positive effect on living independently. Finally, the variable YEAR that indicates calendar-time (not time before death) once again displays the trend towards institutionalization and away from composite households. Note that in this sample of the very old the magnitude of this trend is particularly pronounced. This is a disturbing finding as it appears to indicate a trend towards isolation of those who are particularly vulnerable.

A new variable included is denoted by AGEKID and measures the age of the oldest child. The strong negative coefficient of this variable in the leftmost column that characterizes composite households headed by the elderly person appears to indicate the presence of adult children who have never left home. As was mentioned already in Section 2, it would have been

Table 10: CROSS-SECTIONAL CHOICE PROBABILITIES: FIVE YEARS BEFORE DEATH
(Logit Parameter estimates, t-statistics in parentheses)

Variable	Log odds of living in .... rather than in (1) Independent: (2) With Others, as Head/Spouse	(3) With Others, as Secondary Indiv.	(4) Institution
CONST	6.640 (4.0)	12.038 (2.4)	-26.803 (-4.1)
AGE68	-0.018 (-1.5)	-0.043 (-1.2)	0.030 (0.7)
KIDS	0.139 (5.5)	0.211 (4.3)	-0.076 (-0.5)
NOKIDS	-2.447 (-6.7)	-1.777 (-1.4)	-2.305 (-1.7)
AGEKID	-0.047 (-6.2)	-0.042 (-1.6)	-0.029 (-1.1)
SIBS	-0.085 (-2.5)	-0.134 (-1.3)	-0.543 (-2.7)
NOSIBS	0.298 (1.1)	1.468 (2.0)	1.641 (2.0)
NONWHITE	1.359 (7.8)	1.832 (4.4)	0.358 (0.5)
FEMALE	-0.471 (-2.5)	-1.676 (-3.7)	-1.873 (-3.3)
INCOME	-0.018 (-1.2)	-0.024 (-0.5)	-0.757 (-4.1)
MARRIED	-1.029 (-5.8)	-4.493 (-6.6)	-3.523 (-6.0)
LIMITED	-0.014 (-0.2)	-0.497 (-2.3)	-0.704 (-2.3)
HBURDEN	0.012 (2.5)	-0.061 (-0.9)	0.023 (1.7)
YEAR	-0.057 (-2.4)	-0.120 (-1.7)	0.352 (4.0)
Likelihood at convergence (L(β)):		-911.1028	
$Rho^2 = 1 - L(\beta)/L(0)$:		0.6326	
Percent correctly predicted:		80.60	
Number of observations:		1789	

Source: PSID, 1968-1984, elderly aged 60 and more in 1968 who died before 1984.

desirable to separate these cases from other shared living arrangements. However, the lack of complete life-histories of all household members makes this impossible.

Two economic variables are included. The elderly person's income has a measurable effect only on the probability to become institutionalized, the negative sign shows the inferiority of this alternative -- a familiar result by now. The newly introduced variable HBURDEN is the proportion of income which the household must spend on housing; actual gross housing costs (either rent or user costs of homeownership plus utilities) are divided by household income. For institutionalized persons, it measures the last housing burden before institutionalization. For elderly heads, a large burden is a small but significant incentive to share housing. A large housing burden appears also to be a factor that increases the likelihood of entering an institution.

7. Summary and Conclusions

We employed the newly-available non-response file of the Panel Study of Income Dynamics to study the living arrangements of elderly Americans. In spite of being a general purpose study that contains all some 1100 elderly aged 60 and above, this file is on first sight particularly suited to study the elderly's living arrangements since it includes long histories of living arrangements and their demographic and economic determinants and since it keeps the elderly in the sample when they decease during the sample period or, most importantly, become institutionalized. No other representative data set combines such a long time horizon as the PSID with a complete recording of non-responses due to death or institutionalization. On the other hand, problems with the data -- being only partly individual-

oriented with an incomplete recording of family relationships once secondary individuals are living in a composite household, inconsistencies in the treatment of institutionalization, and a sample size too small for the few observed transitions -- substantially inhibited the possible kinds of longitudinal analyses. A longitudinal study specifically for the elderly is still highly desirable for dynamic analyses of the elderly's living arrangement transitions.

Main result of the paper is the stability of living arrangements. Even after incisive life-events such as death of a spouse or onset of a disability, and even within the last five years before death often associated with a quick deterioration of health, only very few elderly adjust their living arrangement, say, in order to move into the household of their children or to live in an institution.

This stability, however, puts the analyst in an awkward position as the resulting small absolute number of changers in the PSID creates a problem for the dynamic analysis. It is our opinion that there are just too few people to support a rich dynamic analysis. A good example for this point is the analysis in the preceding chapter. A well-suited statistical model would have been a fixed effects model that accounts for time-invariant but unobserved differences ("heterogeneity") among the elderly, such as frailty.[27] However, the conditioning on fixed effects necessary for consistent parameter estimation also removes all other time-invariant determinants because these are collinear with the fixed effects. To put it simply, only time variation identifies the dynamics of a dynamic model. Little time variation in the remaining variables and few transitions observed in the sample render the resulting fixed effects model completely unsatisfactory.[28]

We therefore employed very simple models, hoping that simplicity will ensure robustness. Baseline transition probabilities were estimated using a mover-stayer model that accounts in the most simple way for unobserved heterogeneity, and the transition probabilities in the three special cases investigated were parametrized as parsimoniously as possible. We think this strategy is more appropriate than employing continuous-time hazard models. On one hand, the data appears to be too weak to allow for proper identification of heterogeneity and state dependence that could provide the rich dynamics hazard models are able to generate. Ignoring state dependence and unobserved heterogeneity, however, may render hazard models inappropriate when important variables such as health are unobserved.

In spite of all these problems, we arrived at quite a few results that appear to be robust and are important for the assessment of where the elderly chose to live and what implications this choice has for the elderly's well-being. These results are robust as they can be drawn not only from the different models in this paper but also from Ellwood and Kane's (1989) analysis based on a simple exponential hazard model. They are important as they indicate where, if at all, public policy could improve the well-being of the elderly: there appear to be only a few intervention points -- most importantly death of a spouse -- when active decisions about living arrangements are being made.

- o Loss of a spouse is the most important event that precipitates living arrangement transitions. Almost all of these transitions take place in the same year as the spouse's death.

- o Living in an institution is clearly an inferior living arrangement In terms of income, even in the years immediately preceding death when medical attention is most valued.

- o Male elderly are more likely to live with others or to become institutionalized than female elderly who most likely stay living independently until their deaths. This is holding all other determinants, particularly marital status, constant.

- o There is a pronounced difference in the choice of living arrangements between white and nonwhite elderly. Nonwhite elderly are much more likely to live with others in a composite household.

- o In spite of the perceived inferiority of institutions, the risk of institutionalization has substantially risen from 1968 to 1984, while the likelihood of being "taken in" by relatives or friends has fallen dramatically.

This disturbing tendency towards isolation of the elderly — particularly pronounced among the very old who are also the most vulnerable — is the most important message of this paper. As pointed out in the introduction, this growing isolation of the elderly has downstream consequences in terms of medical expenses and social support that are rather costly for society at large and that have to be borne by a decreasing proportion of younger

people -- not mentioning the psychological and physical problems for the elderly themselves caused by growing isolation.

FOOTNOTES

1. I am indebted to Peter Schmidt who provided valuable research assistance, and to Reinhard Kox who ably managed the file handling. Financial support was received from the National Institutes of Health, Institute on Aging, Grant #1-P01-AG05842-01.

2. Merrill (1984).

3. Schwartz, Danziger and Smolensky (1984).

4. Boersch-Supan (1988).

5. Such as the Longitudinal Retirement History Survey (LRHS), the Survey of Income and Program Participation (SIPP) or the American Housing Survey (AHS) for the non-institutionalized population, and the National Nursing Home Survey (NNHS) and the Survey of Institutionalized Persons (SIP) for the institutionalized population. One exception is the longitudinal study by the Hewrew Rehabiltation Center for the Aged, cf. Boersch-Supan, Kotlikoff, and Morris (1988) for an analysis.

6. The complete family-individual file has almost 600 Megabytes. To make matters worse and due to moving in and out, panel members sharing the same household are scattered throughout the file.

7. The data processing programs are available at request for a fee covering duplication and handling charges.

8. Excluded is a small percentage of elderly individuals whose living arrangement history could not been ascertained because of interview refusal or failure to locate them.

9. There are a few cases where an elderly household had children under 18. These are included in this category.

10. With the exception of years 1982-84.

11. We perceive entering an institution as an active choice that possibly depends on demographic and economic characteristics as well as health. This does not necessarily imply, however, that the elderly person has to make the choice by her- or himself.

12. Boersch-Supan (1988).

13. See Garber and MaCurdy (1989) for an analysis of lengths of nursing home stays.

14. Cf. Amemiya (1985).

15. E.g., McCall (1971).

16. Unconditional in the sense that they describe the transition probability of an individual unidentified to be either a mover or a stayer.

17. For a proof, cf. Amemiya (1985), page 419.

18. In addition, KIDS is not reported at all in 1968.

19. From a retrospective point of view when date of death is known, remaining years to death ("negative age") maybe a more interesting variable than AGE68. If this were so, there should be a significant difference between the coefficients in the two subgroups which is not the case.

20. This is loosely spoken. Almost all cases of DMARR=-1 are deaths of spouses but there are also a few divorces in old age.

21. The parameter estimate of the risk of being taken in implies a yearly decrease of over 26 percent at sample average. This percentage change -- this is a relative change, not a change in absolute percentage points -- is too large to be meaningfully extrapolated for 10 years because in the highly nonlinear logit model the effect of a change depends on the magnitudes of the choice probabilities.

22. The test is constructed as a joint test of the 16 conditional transition probabilities. Because only the rows, not the columns in each table are adding up, the chi-squared statistics have 12 degrees of freedom. At 99 percent confidence, the critical value is 26.22.

23. To make matters worse, in some years, limitation status was asked only for head and spouse, resulting in missing data for those elderly who changed disability status while not being head or spouse of household.

24. At 99 percent confidence.

25. The results in Tables 3 and 4 neither prove nor reject this hypothesis. Feinstein and McFadden (1988) report increasing mobility rates for elderly aged 75 and above based on PSID data, but do not investigate the very old. Venti and Wise (1988) cannot find systematic age differences in the narrow age distribution of the Retirement History Survey.

26. There are two econometric problems with these estimates: selectivity bias and panel bias. Both appear innocent in this case. The way in which data on children and siblings is imputed implies that elderly who live as secondary individuals in a composite household and institutionalized elderly have a larger than proportional share of missing data. However, the resulting sample selectivity is innocent due to inclusion of constants and the logit functional form (McFadden 1978). The pooling of cross-sections in this nonlinear model may result also in biased coefficients. The bias appears to be of no quantitative importance in this case as coefficients estimated from single cross-sections are of similar magnitudes and equal signs.

27. Cf. Chamberlain (1980) for the development of this model and Börsch-Supan (1987) for some applications.

28. See also the difficulties experienced by Schwartz, Danziger and Smolensky (1984), and the large standard errors in Ellwood and Kane (1989).

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