This PDF is a selection from an out-of-print volume from the National Bureau of Economic Research

Volume Title: Issues in the Economics of Aging

Volume Author/Editor: David A. Wise, editor

Volume Publisher: University of Chicago Press, 1990

Volume ISBN: 0-226-90297-8

Volume URL: http://www.nber.org/books/wise90-1

Conference Date: May 19-21, 1988

Publication Date: January 1990

Chapter Title: Why Donâ€™t the Elderly Live with Their Children? A New Look

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Chapter URL: http://www.nber.org/chapters/c7116

Chapter pages in book: (p. 149 - 172)

5 Why Don't the Elderly Live with Their Children? A New Look

Laurence J. Kotlikoff and John N. Morris

Perhaps no single statistic raises more concern about postwar changes in the U.S. family than the proportion of the elderly living alone. Since 1940, the proportion of unmarried noninstitutionalized elderly living alone has risen from less than 25 percent to over 60 percent. For the old old, those over 85, the proportion has increased from 13 percent to 57 percent (Sandefur and Tuma 1987). The proportion of the old old living in institutions has also increased dramatically; in 1940, only 7 percent of those over 85 lived in institutions; today's figure is almost 25 percent. Part of the reason the current elderly are much less likely to live with children is simply that they had relatively few children and that they have outlived some or all of their children. In 1940, for each person age 80 and over there were four people age 60–65. In 1985, for each person age 80 and over there were fewer than two people age 60–65. When the baby boomers are in their 80s, there will be only one person age 60–65 for each baby boomer (Current Population Reports 1984).

While demographics appear to explain much of the change in the living arrangements of the elderly, the rising income of the elderly is viewed by many as the chief or at least a chief reason why the elderly live alone. This argument has been made by Beresford and Rivlin (1966), Carliner (1975), Chevan and Korson (1972), Kobrin (1976a, 1976b), Soldo and Lauriat (1976), Michael, Fuchs, and Scott (1980), Tissure and McCoy (1981), and Wolf (1984). One difficulty in interpreting these studies is that they fail to control for charac-

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This study was conducted as part of the National Bureau of Economic Research's Project on Aging, which is funded by the National Institute of Aging, grant 1P01AG05842-01. The authors thank Jinyong Cai, Jagadeesh Gokhale, and Dan Nash for excellent research assistance.

teristics of children. Since incomes of parents and children are correlated, the measured effects of parents' income on living arrangements may be capturing, at least in part, the influence of children's incomes. In contrast to the standard view, it may be that increases in children's incomes have lowered the likelihood of shared living. The fact that more than half the aged living with their children are themselves the homeowners (Schorr 1980) suggests that many adult children live with their elderly parents for financial reasons.

This study uses new data on the characteristics of the elderly and their children to study the effects of children's and parents' income as well as other characteristics on the shared living decision. The new data are the 1986 HRCA Elderly Survey and the 1986 HRC-NBER Child Survey. The 1986 HRCA Elderly Survey is part of an ongoing panel survey of the elderly in Massachusetts that is being conducted by the Hebrew Rehabilitation Center for the Aged (HRCA). The 1986 HRC-NBER Child Survey is an interview of the children of those elderly who participated in the 1986 HRCA Elderly Survey.

The research reported here considers 297 cases of elderly parents who have a single living child. Our first approach to studying the living arrangements of these 297 parent-child observations is to estimate reduced-form logit and probit models. Estimates of these models indicate that child characteristics such as income and marital status are as important as parent characteristics in explaining living arrangements. The probit and logit results point to the principal determinants of shared living, but understanding the precise role of income and other variables in this decision requires a structural model. Our second approach is thus to develop and estimate a structural model of shared living. The model trades off the economies to scale in shared living against the (potential) disutility of parents and children from living together. Analysis of the model indicates that, regardless of the precise form of preferences, the decision concerning shared living is economically separate from the decision concerning how much housing the parent and child should purchase and how much the parent and child should each consume; that is, living arrangements can be studied without simultaneously specifying the precise nature of parent-child bargaining. The model also clarifies how the parent's and child's income jointly affect the shared living decision. In contrast to the logit or probit specifications, in the structural model the effects of increases in income of either the parent or the child depend on the parent's and child's preferences regarding living together. By introducing error terms in the model, these preferences can be estimated. The error terms in the model are specified quite naturally as unobserved (to the econometrician) taste parameters concerning shared living.

The paper proceeds in sections 5.1 and 5.2 with a presentation of the structural model and an analysis of how changes in parent and child incomes affect the decision to live together. Section 5.3 demonstrates how the model can be empirically estimated. Sections 5.4–5.7 describe the HRCA and

HRC-NBER surveys, summarize some general findings from the two new surveys, and present cross-tabulations from our sample of 297 parents and their single children. Section 5.8 presents probit and logit models of the choice of the elderly to live with children, to live in an institution, or to live alone. Section 5.9 reports and interprets maximum likelihood estimates of the structural model. Finally, section 5.10 summarizes and concludes the paper.

5.1 A Model of Family Living Arrangements

Consider a single surviving parent who has only one child. Let U_p and U_c stand, respectively, for parent and child preferences over goods, housing services, and living arrangements. If the parent and child live alone, the parent maximizes U_p, and the child maximizes U_c. When they choose to live together, they are assumed to maximize U_F (given in [1]), which is a weighted average of their preferences, where the weight θ that is chosen by the parent and child reflects the outcome of parent-child bargaining:

$$U_F = \theta U_p + (1 - \theta)U_c . \tag{1}$$

This is a general expression for family preferences in the case of shared living since θ can take any value between zero and unity. Formulating the problem in this manner only restricts the solution to be efficient; that is, the maximization of U_F subject to the collective family (parent and child) budget produces a Pareto-efficient solution, and all Pareto-efficient solutions to the shared living choice problem can be represented as the maximand of U_F for a particular choice of the utility weight θ.

Consider the following Cobb-Douglas characterization of U_p and U_c:

$$U_p = A \log(C_p H_p), \tag{2}$$
$$U_c = B \log(C_c H_c).$$

In (2), C_p and C_c are the respective levels of consumption of the parent and child, while H_p and H_c are the respective housing services enjoyed by the parent and child. The coefficients A and B describe the parent's and child's preferences for shared living. If the parent and child live apart, A and B both equal unity; if they live together, A or B can be greater than, equal to, or less than unity, depending on whether the parent and child enjoy living together, are indifferent to shared housing, or prefer living apart. We are particularly interested in cases in which $A > 1$ and $B < 1$, or vice versa; that is, when one family member prefers living together and the other prefers living apart.

We first consider the maximization of (1) for given values of θ and then examine the choice of θ as well as the conditions under which the parent and child choose to live together. When the parent and child live together, their combined budget is

$$C_p + C_c + qH = Y_p + Y_c \,. \tag{3}$$

In (3), q stands for the relative price of housing services, and Y_p and Y_c are the incomes of the parent and child, respectively. H stands for the quantity of housing services jointly consumed by the parent and child; that is, equation (3) incorporates the assumption that housing services are a public good that can be simultaneously consumed by both the parent and the child without congestion. While one could assume some marginal congestion from shared housing, which could be modeled as a higher effective price of H, as long as the effective price of H is less than $2q$ there is an economic incentive for shared housing. In this study, we assume zero marginal congestion.

The economic gain from shared housing, which is modeled here as a lower effective price of housing, is compared with the disutility from shared housing (in which case A and/or B will be less than unity) in determining whether the parent and child will live together. More precisely, the parent and child each compare their utility when they live together with their utility if they live alone. The necessary condition for shared living is that both the parent and the child be at least as well off living together as they would be if they lived apart.

Figure 5.1 illustrates the parent-child utility possibility frontier from shared living. The point Q lies outside the frontier. If the utilities of the parent and child from living apart are given by point Q, the two will choose to live apart. If, on the other hand, separate living produced utility levels indicated by point R, the parent and child can do better by living together. The assumption that when they live together the child and parent choose efficient and mutually advantageous levels of housing and consumption means that the utility

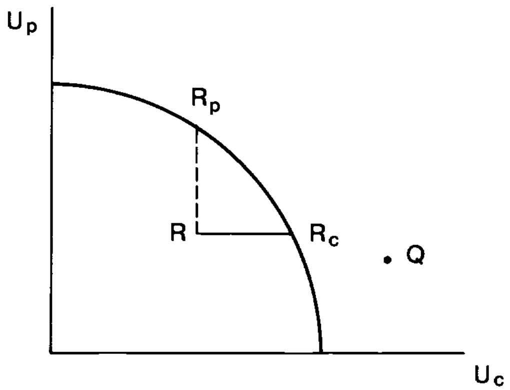

Fig. 5.1 The parent-child utility possibility frontier

outcome lies on the frontier between and including points R_p and R_c. At one extreme, point R_p, the parent receives all the gains from shared housing, while at the other extreme, R_c, all gains go to the child, and the parent is no better off than if he or she lived alone. Points on the frontier between R_p and R_c involve both the parent and the child sharing the gains from living together. The choice of the weight θ used in maximizing (1) subject to (3) determines the point chosen on the utility possibility frontier.

While the exact point chosen on the frontier requires an explicit specification of the child-parent bargaining process, the decision to live together can be examined without any reference to the specific bargaining solution. Given the assumption that efficient bargaining occurs, one can decide whether the parent and child live together simply by determining whether their utility position if they live apart lies inside or outside the utility possibility frontier available if they live together. This is a general proposition that holds regardless of the precise form of preferences. In terms of equations (1) and (3), one need show only that there is a range of values of θ that, when used in (1), imply a Pareto improvement over living apart. Knowledge of the particular value of θ actually chosen is not required. The fact that one can study living arrangements independently from studying nonaltruistic parent-child decision making (bargaining) is a great advantage since estimating this process would place greater demands on the data.

A simple procedure for determining whether the utility position from living apart lies inside or outside the frontier involves calculating two critical values of θ, θ_p and θ_c. θ_p is the value of θ that if used in maximizing (1) subject to (3) leaves the parent with the same utility from shared living as he or she receives from living alone; θ_c is defined symmetrically for the child. If $\theta_p = \theta_c$, the utility position from living apart lies on the utility frontier available if they live together. If $\theta_c > \theta_p$, then the utility position from living apart lies inside the frontier. If $\theta_p > \theta_c$, the utility position from living apart lies outside the frontier. To see this, note that, if $\theta_p > \theta_c$, the choice of $\theta \geqslant \theta_p$ produces a lower level of utility for the child than he or she enjoys from living alone, while choosing $\theta < \theta_p$ produces a lower level of utility for the parent than is available from living alone.

The conditions under which $\theta_p = \theta_c$ are of interest because they indicate the circumstances in which the parent and child would be just indifferent between living together and living apart. As demonstrated below, given Y_p, Y_c, and q, the condition $\theta_c = \theta_p$ (the utility position from living apart is on the frontier) occurs for combinations of the utility parameters A and B defined by a function $G(A, B) = 0$. Hence, the conditions under which the parent and child choose to live together can be expressed in terms of critical values of thepreferences (A and B) of the parent and child regarding shared living. While the preference parameters A and B are not observed, their determinants can be estimated.

Maximization of (1) subject to (3) yields the following demand relations when the parent and child live together:

$$(4) \qquad H = \frac{Y}{2q}, \quad C_p = \frac{\theta A Y}{[\theta A + (1 - \theta)B]2},$$

$$C_c = (1 - \theta)\frac{BY}{[\theta A + (1 - \theta)B]2},$$

where $Y = Y_p + Y_c$. Note that the demand for housing services, in this formulation, is independent of the bargaining solution, θ. Larger values of θ, the weight applied to the parent's preferences, means more parent consumption (larger C_p) and less consumption by the child (smaller C_c). Without loss of generality, we measure H in units such that $q = 1/4$.

The indirect utility functions of the parent, V_p, and child, V_c, from shared living are given by

$$(5) \qquad V_p = \log\left\{\frac{\theta A Y^2}{[\theta A + (1 - \theta)B]}\right\}^A,$$

$$V_c = \log\left\{\frac{(1 - \theta)BY^2}{[\theta A + (1 - \theta)B]}\right\}^B.$$

The indirect utilities of the parent and child from living alone, V_p and V_c, respectively, are

$$(6) \qquad V_p' = \log Y_p^2$$

$$V_c' = \log Y_c^2$$

The critical values of θ, θ_p, such that $V_p = V_p'$, and θ_c, such that $V_c = V_c'$, are given by

$$(7) \qquad \theta_p = \frac{BY_p^{2/A}}{AY^2 + (B - A)Y_p^{2/A}},$$

$$\theta_c = \frac{BY^2 - BY_c^{2/B}}{(A - B)Y_c^{2/B} + BY^2}.$$

From (7), one can show that $\delta\theta_p/\delta A < 0$ and $\delta(1 - \theta)/\delta B < 0$; the smaller the parent's disutility from shared living, the smaller is the critical weight θ_p that leaves the parent indifferent between living apart and living together. The critical child weight, $1 - \theta_c$, is correspondingly negatively related to the child's utility from shared living.

Equating θ_p and θ_c provides the relation $G(A, B) = 0$ given in (8). Values of A and B satisfying $G(A, B) = 0$ leave the parent and the child indifferent between living together and living apart. If $G(A, B) > 0$, the parent and child choose to live together. They choose to live apart if $G(A, B) < 0$. Note that the asymptotes of the $G(\ )$ function occur at $\bar{A} = 2 \log Y_p/\log (Y^2 - 1)$ and $\bar{B} = 2 \log Y_c/\log(Y^2 - 1)$. When Y_p becomes very large relative to Y_c, $\bar{A}$ approaches one, and $\bar{B}$ approaches one when Y_c becomes very large relative to Y_p.

$$G(A, B) = Y^2 - Y_c^{2/B} - Y_p^{2/A} = 0. \quad (8)$$

Along the locus defined by $G(A, B) = 0$, we have

$$\frac{\delta A}{\delta B} = \frac{-Y_c^{2/B}A^2 \log Y_c^2}{Y_p^{2/A}B^2 \log Y_p^2} < 0. \quad (9)$$

Figure 5.2 graphs the values of A and B satisfying (8). The point D defined by $A = 1$, $B = 1$, lies above the $G(A, B) = 0$ locus and involves shared living. To see this, one need only observe from (7) that, when $A = 1$ and $B = 1$, $\theta_p/\theta_c = Y_p^2/(Y_p^2 + 2Y_pY_c) < 1$, which is the condition for shared living. Combinations of A and B lying northeast of the $G(A, B) = 0$ locus satisfy $G(A, B) > 0$ and entail shared living, while combinations lying southwest of the locus satisfy $G(A, B) < 0$ and entail separate living. Consider points in which the parent prefers to live together $(A > 1)$ and the child prefers to live alone $(B < 1)$. As Y_p rises relative to Y_c, the $G(A, B)$ curve approaches a vertical line at $A = 1$ leaving all such points in the area for which $G(A, B) > 0$. Hence, when parents prefer living together, but their children do

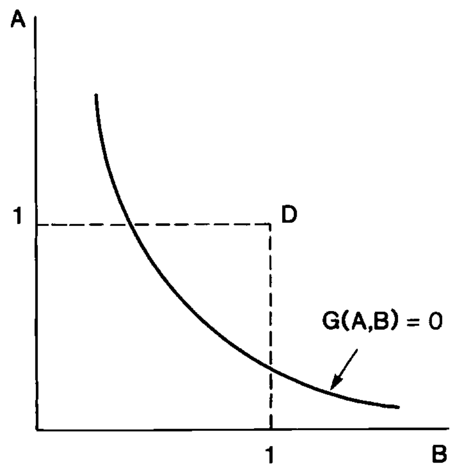

Fig. 5.2 The living together–living apart indifference curve

not, they are able eventually to bribe their children if their incomes are sufficiently high relative to their children. The opposite situation in which the child's preferences always dominate arises when Y_c is very very large relative to Y_c.

5.2 Income Effects and Living Arrangements

The $G(A, B)$ function can be used to analyze the effect of increases in the parent's or child's income on the decision to live together. The technique is to consider how income changes shift the $G(A, B) = 0$ locus. The $G^*(A, B) = 0$ and $G^{**}(A, B) = 0$ loci in figure 5.3 are examples of such shifts. Given a distribution of family pairs of A and B in the population, the $G^*(\ )$ locus clearly involves less shared living than the $G(\ )$ locus since all A, B pairs lying between the two curves now involve living apart.

The $G^{**}(A, B) = 0$ locus, on the other hand, involves less living together among families in which both the child and the parent dislike shared living $(A < 1)$ but possibly more shared living in cases in which either the parent or the child prefers living together $(A > 1$ or $B > 1)$.

To examine shifts in the $G(A, B)$ locus, we consider the implicit function $A = F(B, Y_p, Y_c)$ defined by $G(A, B) = 0$ and determine how this function changes with changes in Y_p and Y_c, holding B constant. For example, if changes in the function $F(\ )$ arising from a particular income change are positive at each level of B, the $G(A, B)$ curve shifts outward. We first consider the effect of a uniform proportional increase in Y_p and Y_c. Let λ represent a positive factor multiplying Y_p and Y_c. Equation (10) presents the derivative $\delta A/\delta\lambda = \delta F(B, \lambda Y_p, \lambda Y_c)/\delta\lambda$ evaluated at $\lambda = 1$ and values of A and B satisfying $G(A, B) = 0$.

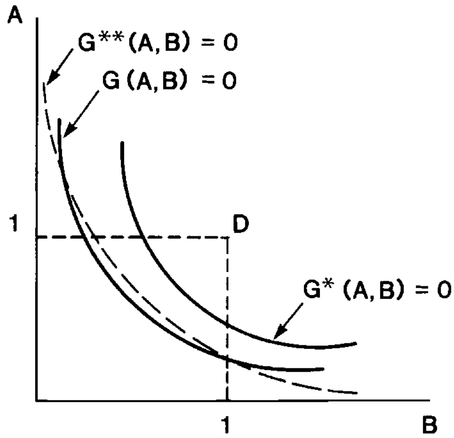

Fig. 5.3 Shifts in the living together–living apart indifference curve

(10)
$$\frac{\partial A}{\partial \lambda} = \frac{\frac{(1 - B)}{B} Y_c^{2/B}}{\frac{1}{2A^2} Y_p^{2/A} \log Y_p^2} + \frac{(1 - A)}{A} Y_p^{2/A} .$$

This derivative is clearly positive for $A < 1$ and $B < 1$. Hence, equal proportional increases in Y_p and Y_c reduce shared living among families in which both the parent and the child dislike living together ($A < 1$ and $B < 1$). On the other hand, among families where there is disagreement about shared living ($A > 1$ and $B < 1$ or $B > 1$ and $A < 1$), such income increases may or may not increase shared living.

We next consider how redistribution from the child to the parent shifts the $G(A, B) = 0$ locus. This derivative, which holds Y constant and raises Y_p by the same amount, ϕ, that Y_c is lowered is given by

(11)
$$\frac{\partial A}{\partial \phi} = \frac{2[Y_p^{(2/A)-1} - Y_c^{(2/B)-1}]}{\frac{1}{A^2} Y_p^{2/A} \log Y_p^2}$$

This derivative is negative if $A > B$ and $Y_p < Y_c$. Hence, among families in which the parent is relatively poor and has a relative preference for living with the child, redistribution from the child to the parent increases the extent of shared living. In terms of figure 5.2, such redistribution leads to a counterclockwise rotation of the $G(A, B) = 0$ locus.

Finally, we consider changes in the $G(A, B) = 0$ locus arising from changes in the income of one family member, holding constant the income of the other member. Equation (12) examines the effect of raising Y_p:

(12)
$$\frac{dA}{dY_p} = \frac{-2Y + \frac{2}{A} Y_p^{(2/A)-1}}{\frac{1}{A^2} Y_p^{2/A} \log Y_p^2}$$

This derivative is negative for values of $A \geqslant 1$ and is positive for sufficiently small values of A. Hence, a rise in the income of the parent produces a counterclockwise rotation in the $G(A, B) = 0$ locus, thereby raising the frequency of shared living among families whose parents prefer living with their children ($A > 1$) and reducing the frequency of shared living among families whose parents prefer to live apart ($A < 1$). Increases in the child's income, holding the parent's income constant, produce a clockwise rotation in the $G(A, B) = 0$ curve, giving more weight to the child's preferences in determining living arrangements.

To summarize, in the structural model the effects of income changes on living arrangements depend in a nonlinear manner on the relative incomes of parents and children and on both their preferences. This feature differs greatly from the implicit assumption in logit and probit specifications that the effects of income changes are the same sign regardless of the particular parent-child observation in question.

5.3 Empirical Specification

Preferences toward living arrangements are likely to differ greatly across as well as within families. Hence, it seems reasonable to model the preference parameters A and B as depending partly on observable characteristics and partly on unobservable (at least to the econometrician) components. Specifically, we assume that A and B can be represented as

$$A = \alpha_p X_p + \mu_p ,$$
$$B = \alpha_c X_c + \mu_c . \tag{13}$$

In (13), X_p and X_c are vectors of characteristics determining the parent's and child's preferences, respectively.

The terms μ_p and μ_c in (13) are random errors, which, to simplify the exposition, are assumed here to be independent standard normal deviates. Referring to figure 5.2, the likelihood that a parent and child live apart corresponds to the probability that $G(A, B)$ is negative, which is given by

$$P[G(A, B) < 0] = \int_{-\infty}^{\infty} P(A = A^*)P[G(A^*, B) < 0]dA^*. \tag{14}$$

From figure 5.2, for values of A below the horizontal asymptote $\bar{A}$, $G(A, B)$ is negative. Hence, we can write (14) as

$$P[G(A, B) < 0] = F(\bar{A} - \alpha_p X_p) + \int_{\bar{A} - \alpha_p X_p}^{\infty} f(\mu_p)F\left\{\frac{2 \log Y_c}{\log[Y^2 - Y_p^{2/(\alpha_p X_p + \mu_p)}]} - \alpha_c X_c\right\}d\mu_p . \tag{15}$$

In (15), $F(\ )$ stands for the standard normal distribution function, and $f(\ )$ stands for the standard normal density function. The probability of living together is simply $1 - P[G(A, B) \leq 0]$. These expressions can be used to form the likelihood of observing a sample of parents some of whom live with their children and some of whom do not. Hence, the parameter vectors α_p and α_c can be estimated by maximum likelihood. Note that this probability statement is quite different from the standard reduced-form logit specification that one might posit. For example, parent's income enters in a complex, nonlinear fashion in the probability statement, and its influence on the probability of shared living interacts with the level of the child's income and the parent's and child's preferences for shared living.

5.4 The Data

As mentioned, this paper uses data from the 1986 HRCA Elderly Survey and the 1986 HRC-NBER Child Survey. The former survey was conducted by the Hebrew Rehabilitation Center for the Aged (HRCA), while the latter was conducted by the authors and HRCA. The 1986 HRCA Elderly Survey is part of an ongoing panel survey of Massachusetts elderly that began in 1982. In addition to the 1982 and 1986 surveys, the elderly sample was reinterviewed in 1984, 1985, and 1987. The 1986 HRC-NBER Child Survey is a survey of the children of those elderly interviewed in the 1986 HRCA Elderly Survey. One child of each elderly respondent was interviewed and asked a set of questions concerning his (her) household, his (her) parents, and his (her) siblings.

The original 1982 stratified sample of 3,856 elderly individuals was drawn from two populations. The first population (the community sample), accounting for 2,674 of the elderly in the total sample, was drawn from communities in Massachusetts. The second population (the health care sample), which accounts for the remaining 1,182 elderly in the 1982 survey, was drawn from elderly participants of all twenty-seven Massachusetts home health care corporations. Both samples were stratified to produce an overrepresentation of the older old. The sample's selection is described in more detail in Kotlikoff and Morris (1989) and Morris et al. (1987). The 1982 sample of the elderly included only the noninstitutionalized elderly, but each subsequent survey has followed the initial sample as they changed residences, including moving into and out from nursing homes.

Each of the HRCA Elderly Surveys includes detailed questions about living arrangements and health status. The 1986 reinterview of the elderly also contains a series of questions of the elderly about their children. These questions include the names, sexes, and locations of all children, frequency and type of contact with children, the extent of financial aid given to and received from children, and the amount of assistance given by children to their elderly parents in performing activities of daily living. In addition, the 1986 survey contains a set of questions about the elderly respondent's income and wealth.

At the close of the HRCA Elderly Survey, we asked elderly respondents in the community sample for permission to contact one of their children to conduct our Child Survey. While we would have preferred to randomly select the child to be interviewed, we felt that we would receive more cooperation if we allowed the parent to make the selection. Like the HRCA Elderly Surveys, the HRC-NBER Child Survey is a telephone interview. The Child Survey is roughly forty-five minutes in length. Interviews with the child's spouse were conducted if the child was unavailable. The questions in the Child Survey concerning the respondent's characteristics include age, geographic location, marital status, number of young children, work and health status, occupation, industry, education, grades in high school, income, and wealth. These questions are also asked of the respondent about his or her siblings. In addition, the child was asked to indicate (1) the frequency of contact between each sibling and each sibling's spouse and the HRCA elderly respondent parent, (2) the amount of financial assistance each sibling and his spouse give to or receive from the HRCA elderly respondent parent, and (3) the amount of time each sibling and his spouse spends helping the HRCA elderly respondent. The child was also asked about his parents' health status as well as his parents' income and net wealth.

The sample size of the initial 1982 Elderly Survey is 3,856. In contrast, the 1986 completed sample size of elderly was 2,889, with most of the attrition since 1982 due to deaths. In the 1986 data, over 90 percent of the elderly are above age 70, over 40 percent are the old old (above age 85), and over two-thirds are females. The size of the HRC-NBER Child Survey is 850. Of these 850 children, 341 have no living siblings. In this study, we consider these 341 children with no siblings and their elderly parents who were also interviewed in 1986. Of the 341 single child/parent observations, 297 have complete data. The remaining 45 observations are missing data, typically on the income of either the child, the elderly parent(s), or both.

5.5 Some Initial Findings from the 1986 HRCA Elderly Survey and the HRC-NBER Child Survey

Since the 297 observations examined here represent only a portion of the data, it may be useful to summarize some of the initial findings reported in Kotlikoff and Morris (1989) based on the entire 1986 Elderly and Child Surveys. These data paint a bimodal picture of contact and assistance of the elderly by their children, with a majority of elderly receiving significant attention and care and a significant minority receiving little or no attention or care. Clearly, the realities of demographics limit the potential support that children can provide parents. Over one-fifth of the HRCA elderly in 1986 had no children, and another fifth have only one child. Elderly couples are more likely to have children than the single elderly; over a quarter of the single elderly have no children. Daughters are often viewed as more important providers of care to the elderly than sons. But, in total, 40.5 percent of the elderly have either no daughters or just one daughter, and over half the elderly either have no daughters or have no daughters who live within an hour.

Only 13.1 percent of all elderly and only 15.4 percent of vulnerable elderly live with their children. Of those elderly with children, fewer than one-fifth live with their children. Indeed, over half of single elderly males and females and over 40 percent of single elderly males and females who were deemed vulnerable based on an ADL ability score live completely alone. The fraction of respondents in institutions in 1986 is 11.8 percent for the entire sample and over 25 percent for the vulnerable elderly. Taken together these figures suggest only modest support of the elderly by children in the form of shared living quarters.

The geographic location of parents obviously limits their access to their children. Over one-third of the elderly either have no children or have no children who live within an hour. Despite their health problems, the vulnerable elderly are only slightly more likely to live with or near their children. Of those elderly who have children but are not living with them, only 44.6 percent have more than one child within an hour. In a typical month, over a quarter of children of the elderly do not physically spend time with their children; in contrast, almost a quarter of children, including those living with the HRCA elderly, spent over thirty hours in the previous month in physical contact.

While physical contact may, in some instances, be limited, most elderly with children have some form of contact, be it telephone contact or visits, during the week. Of the elderly with children, 84 percent either live with their children or have daily or weekly contact with one or more children. The institutionalized, the group with perhaps the greatest need for child contact, sometimes receive the least attention. Almost one-third of the institutionalized elderly either have no children or have very little contact with their children over the course of a year. For the noninstitutionalized, the corresponding fraction is less than one-quarter.

Although many of the elderly in the HRCA sample are quite poor, direct financial support of elderly parents by children is rare. Only 3 percent of the HRCA elderly report receiving regular monthly financial help from their children. Of the elderly that are very poor (annual incomes below $5,000), the corresponding percentage is only 4 percent. These figures seem surprising, and what is even more surprising is that there are few transfers to the poor elderly even in cases where there are a large number of middle- and upper-income children.

5.6 Characteristics of the Selected Sample—the Elderly

There are 297 elderly respondents in the 1986 HRCA Elderly Survey corresponding to the 297 children. Ten percent of these respondents live in nursing homes, 20 percent live with their children, and the rest, 70 percent, live alone, which in this context means either completely alone, with their spouse, or with other individuals who are not their children. The 297 elderly respondents are typically quite old; over half, 150, are age 85 and over. For those age 85 and older, the proportion living in nursing homes is 16 percent, the proportion living with children is 23 percent, and the proportion living alone is 61 percent. Two-thirds of the elderly are females; interestingly, only one of the thirty institutionalized elderly is a male. The elderly sample is disproportionately white (94 percent) and single (72 percent).

We have created five dummy variables to characterize the elderly respondents' health status. These are Independent (H1), Minor Functional Problems (H2), Requires Assistance with Independent Activities of Daily Living (H3), Requires Some Assistance with Activities of Daily Living (H4), and Requires Substantial Assistance with Activities of Daily Living (H5). Each of the elderly was allocated to one of these categories on the basis of responses to over thirty questions on functional ability, ability to perform independent activities of daily living, and objective information about ongoing diseases and infirmities. We also considered several other health variables, including dummies for neurological problems, inability to move from a chair without assistance, and Alzheimer's disease. These variables did not add significantly to the prediction of living arrangements given the dummies H1–H5. Of the thirty institutionalized elderly, twenty-eight have positive H4 or H5 health indicators. Of the fifty-eight elderly living with their children, twelve (21 percent) have positive H4 or H5 indicators. Of the 209 elderly living alone, twenty-one (10 percent) have positive H4 or H5 indicators.

The incomes of the elderly are typically fairly low. Slightly over half the elderly reported income below $7,500. Another 39 percent reported incomes between $7,500 and $20,000. Only twenty-three of the elderly, 8 percent, report incomes over $20,000. It is interesting to note that none of these twenty-three higher-income elderly live in nursing homes and that only two of the twenty-three live with their children.

5.7 Characteristics of the Selected Sample—the Children

The ages of the 297 children of the elderly range from twenty-seven to seventy-nine. A surprisingly high number, 185, of the 297 children in the sample (all of whom were referred by the HRCA elderly respondent) are female. Slightly over half are younger than 55; over two-thirds are between ages 45 and 65. Children living with their parents tend to be somewhat older; 19 percent of children living with parents are age 65 or older, compared to 8 percent for children whose parents live alone. Most of the children, 76 percent, are married; but, among children living with their parents, the proportion married is only 45 percent. Over half the children went to college, and only thirty of the 297 children failed to complete high school. There is no clear correlation in the raw data between child's education and the living arrangements of the parents.

In contrast to the parents, whose median income is approximately $7,000, the median income of children is approximately $30,000. A total of sixty-one children reported incomes above $50,000, and twenty-one reported incomes below $10,000. Of the sixty-one elderly whose children have incomes above $50,000, fifty-three, 87 percent, live alone. This figure contrasts with the 70 percent figure for the overall sample. Most of the children, 85 percent, report their health to be good, 14 percent report their health to be fair, and only 1 percent report their health to be poor.

5.8 Logit and Probit Estimates

Table 5.1 reports results for a logit model specifying the probability of living alone, living in an institution, and living with children. The independent variables are the age of the parent, Age; the sex of the parent, Male = 1 for

Table 5.1 **Estimates from the Logit Model**

Coefficients for the Probability of Living in an Institution		
Variable	Coefficient	t-Statistic
Constant	1.468	.290
Marry	NA	NA
Income	.093	.915
Age	−.037	−.545
Male	−.911	−.723
H1	NA	NA
H2	NA	NA
H3	−3.175	−3.129
H4	−.626	−.736
KMarry	1.590	2.067
KIncome	.631E-2	.363
KAge	.664E-2	.142
KMale	1.054	1.564
KHealth	.594	.693
KEd	.531	.774
Coefficients for the Probability of Living Alone		
	Coefficient	t-Statistic
Constant	−.167	−.060
Marry	.916	1.686
Income	.456E-1	1.135
Age	−.184E-1	−.500
Male	.102	.233
H1	.651	.910
H2	1.158	1.460
H3	.796	1.029
H4	.568	.654
KMarry	1.608	4.047
KIncome	.211E-1	1.825
KAge	−.483	−.173
KMale	.806	2.039
KHealth	−.226	−.441
KEduc	.273	.722

a male, 0 otherwise; the marital status of the parent, Marry = 1 for married, 0 otherwise; the income of the parent, Income; four health dummies for the parent, H1, H2, H3, and H4; the age of the child, KAge; the marital status of the child, Kmarry = 1 married, 0 otherwise; the sex of the child, Kmale = 1 for a male, 0 otherwise; the income of the child, KIncome; the years of education of the child, KEduc; and the self-reported health status of the child, KHealth = 1 if the child reported excellent or good health, 0 otherwise.

Surprisingly few of the parent coefficients from the logit model are significant, but the signs of the coefficients of parent variables generally accord with previous findings. In particular, higher levels of parent's income increase the probability of living alone, as does being married and being male. Compared to those elderly with severe health problems (those in the fifth health category), other elderly are more likely to live alone and are less likely to live in a nursing home.

The new child variables in the logit indicate that those elderly whose children have higher incomes, are married, or are male are more likely to live alone or live in an institution. Both KMarry variables are significant, as is the KMale coefficient in determining the probability of living alone. The KIncome variable in the probability of living alone is almost significant.

The probit model presented in table 5.2 considers the subsample of 267 elderly who are not in nursing homes. As in the logit results, table 5.2 indicates that the probability of living with children rather than living alone decreases with the parent's and child's income. This probability is smaller if the child

Table 5.2 Estimates from the Probit Model

Coefficients for the Probability of Living with Children versus Living Alone		
Variable	Coefficient	t-Statistic
Constant	.084	.052
Marry	−.574	−1.899
Income	−.218E-1	−1.176
Age	.956E-2	.446
Male	−.653E-1	−.260
H1	−.390	−.934
H2	−.661	−1.465
H3	−.503	−1.127
H4	−.313	−.600
KMarry	−.989	−4.231
KIncome	−.115E-1	−1.800
KAge	.460E-2	.289
KHealth	.128	.431
KEduc	−.178	−.808
KMale	−.450	−2.028

is male or if the child or parent are married. Surprisingly, the parent health variables are not significant, although they have the expected sign. The child health coefficient is also insignificant; according to the table, parents whose children are in excellent or good health are more likely to live with their children. While the age neither of the parent nor the child is significant, older parents are more likely to live with their children, as are parents with older children. Finally, parents with more educated children are less likely to live with their children, although this coefficient is also insignificant. In sum, the logit and probit coefficients, although often insignificant, generally accord with our priors and suggest that child characteristics are important codeterminants of the living arrangements of the elderly.

5.9 Results from Estimating the Structural Model

The estimated coefficients from the structural model based on the 267 observations of children and their noninstitutionalized parents are presented in table 5.3. A likelihood ratio test indicates that, as a group, the coefficients are highly significant. The variable Health is a dummy that takes on the value one if the parent's health indicator is H4 or H5 and zero otherwise. The first five coefficients in the table multiplied by their respective variables correspond to the term $\alpha_p X_p$ in (13), while the second five coefficients multiplied by their respective variables correspond to the term $\alpha_c X_c$ in (13). Hence, positive coefficients in the table mean that the expected value of either A or B is larger, as is the probability of shared living. According to the table, this probability is smaller for married parents or parents with married children. It is also smaller if the child is male. In contrast, the probability of shared living is larger for male parents, older parents, parents with older children, parents with less well educated children, and parents who fall into the worst two health categories.

The estimated coefficients from the structural model can be used to determine values of $\alpha_p X_p$ and $\alpha_c X_c$ for each observation. The mean values of

Table 5.3 Estimates from the Structural Model

Variable	Coefficient	t-Statistic
α_p Constant	−1.911	−.731
Marry	−.673	−1.424
Age	.353E-1	1.068
Male	.316E-1	.764E-1
Health	.178	.276
α_c Constant	1.356	1.201
KMarry	−1.565	−2.443
Kage	.118E-1	.802
KMale	−.768	−.291
KEduc	−.452E-1	−.165

$\alpha_p X_p$ and $\alpha_c X_c$ across all observations are .848 and .482, respectively. Since both these figures are less than unity, both children and parents prefer, on average, to live apart, but children have a stronger preference toward separate living. Not all parents and children have values of $\alpha_p X_p$ and $\alpha_c X_c$ less than unity. Quite the contrary; 129 of the 267 parents (48 percent) and sixty-four children (24 percent) have estimated values of $\alpha_p X_p$ and $\alpha_c X_c$, respectively, in excess of unity. Hence, almost half of parents and almost one-quarter of children appear to prefer shared living. Figure 5.4 presents the distribution of pairs of $\alpha_p X_p$ and $\alpha_c X_c$ for each parent-child pair. Points in the southeast and northwest quadrants indicate parent-child pairs in which there is a conflict with respect to preferences regarding shared living. Points in the northwest quadrant correspond to cases in which parents prefer to live with their children (assuming $\mu_p = 0$) and children prefer to live apart from their parents (assuming $\mu_c = 0$). Points in the southeast quadrant correspond to parents who prefer to live apart from their children but children who prefer to live with their parents. Since 129 of the 267 parents want (assuming $\mu_p = 0$) to live with their children but only fifty-eight do so, it appears that a large number of parents live alone against their will. According to the model, if their incomes were sufficiently high, these parents could persuade their children to live with them.

Another issue that can be explored using the model's estimated coefficients is the effect on the probability of living together of changes in income. In this exercise, reported in table 5.4, we evaluate $\alpha_p X_p$ and $\alpha_c X_c$ at the mean values of X_p and X_c and consider different combinations of Y_p and Y_c. The table

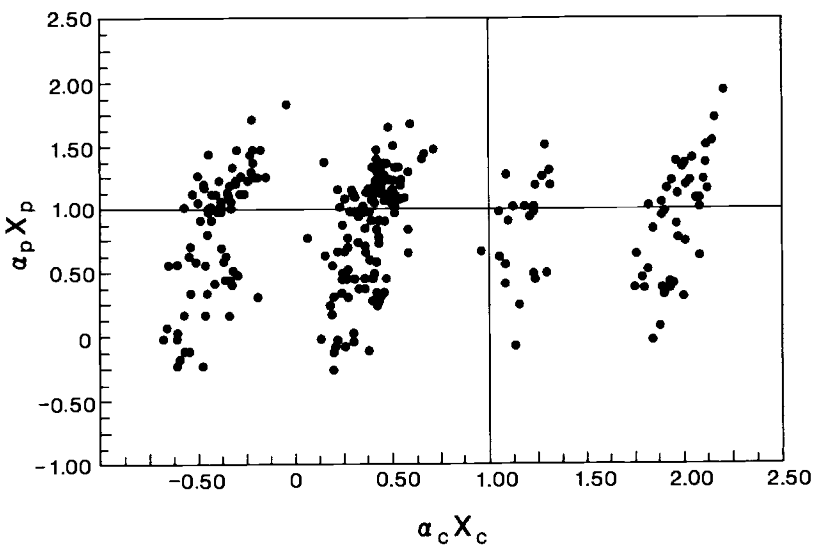

Fig. 5.4 Distribution of $\alpha_p X_p$ and $\alpha_c X_c$

Table 5.4 Probability of Living with Children for Selected Combinations of Parent and Child Incomes

Y_p ($)	Y_c ($)	Probability	Y_p ($)	Y_c ($)	Probability
1,000	1,000	.549	1,000	1,000	.549
5,000	1,000	.327	1,000	5,000	.269
10,000	1,000	.311	1,000	10,000	.253
20,000	1,000	.306	1,000	20,000	.247
50,000	1,000	.302	1,000	50,000	.243
1,000	50,000	.244	50,000	1,000	.303
5,000	50,000	.207	50,000	5,000	.237
10,000	50,000	.192	50,000	10,000	.211
20,000	50,000	.181	50,000	20,000	.191
50,000	50,000	.175	50,000	50,000	.175

indicates that, at the mean values of $\alpha_p X_p$ and $\alpha_c X_c$, significant changes in the probability of living together occur only if the child's or parent's income is fairly low. Stated differently, because the mean preferences indicate a mutual dislike for shared living, the income of the parent or the child must be quite low to produce a reasonably large probability of shared living.

A related experiment is to ask how equalizing the incomes of children and parents, while keeping the total constant, affects the probability of living together. To analyze this question, we used the estimated values of $\alpha_p X_p$ and $\alpha_c X_c$ for each parent and child and computed the probability of shared living given current income positions. We then computed the probability based on equalized income. The differences in probabilities for the 267 observations are quite small. For 173 observations, the probabilities changed by less than 1 percentage point. For forty-four observations, the probabilities changed by between 1 and 2 percentage points. For forty-one observations, the probabilities changed by between 2 and 10 percentage points; and for only two observations did the probabilities change by more than 10 percentage points.

Taken together, these two experiments suggest that the intrinsic preferences of the parent and child regarding shared living rather than the relative or absolute incomes of the two are most important in determining the probability of shared living. In terms of figure 5.1, the position of curve $G(A, B)$ is not highly sensitive to even substantial variations of Y_p and Y_c around observed values, and the key determinant of the living arrangement is the location of A and B in the axis. This finding that income effects play a rather minor role in determining living arrangements is supported as well by the probit results. Evaluated at the mean levels of income, which are $36,704 for children and $9,719 for parents, the probability of shared living is .170. If the child's income is reduced from $36,704 to $12,000, the probability of shared living only increases to .230. If the child's income is raised to $65,000, the probability only declines to .088. Holding the child's income at the mean, if the parent's income is increased to $20,000, the probability of living together only declines from .170 to .101; lowering the parent's income to $4,000 raises the probability to only .191.

5.10 Summary and Conclusion

This paper uses new data on the characteristics of children and parents to study their decision to live together. Theoretical analysis of this decision indicates that living arrangements can be studied separately from the question of child-parent bargaining. The analysis also points out that income effects with respect to living arrangements are likely to be family specific; in some families, increases in the incomes of children or parents will lead them to live apart, in others to live together.

Empirical findings from logit and probit models as well as the structural model suggest that characteristics of children are important codeterminants of living arrangements. They also support a view that income differences are not as important as may previously have been thought in explaining living arrangements.

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Comment Axel H. Börsch-Supan

The elderly's choice of living arrangements is the subject of three papers in this volume. My papers and that by Ellwood and Kane follow the traditional approach in much of the housing literature: they are empirical investigations of the elderly's demand for several types of living arrangements, in particular, living with their own adult children as an alternative to living independently, on the one hand, and becoming institutionalized, on the other hand. But there are two sides of the market for housing as well as for living arrangements, in particular, two parties who make an elderly parent-adult child living arrangement possible: the elderly parent on the demand side and the adult child on the supply side. It is the merit of the paper by Larry Kotlikoff and John Morris to make this simultaneous choice explicit.

The two sides have to match, and the likelihood of a match will depend on characteristics of the elderly parent as well as of the adult child. Thus, the least one should do is to relate all these characteristics to observed choices in some kind of reduced form of the complicated matching process. Kotlikoff and Morris are much more ambitious. They model the matching process explicitly and rather boldly by postulating a structural model derived from first economic principles. The model is quite ingenious as it succeeds in separating the preferences of elderly parent and adult children from the mechanics of the bargaining process that makes or breaks the match. This allows Kotlikoff and Morris essentially to ignore how this bargaining process comes about and yields a fairly simple characterization of the probability of living together that fits nicely in random utility theory.

The formalism of the model can be stripped down to five essential ingredients: two parameters that characterize the preference between privacy and joint living, one for the elderly, A, and one for the child, B; the elderly's income, Y_p, and the income of the child, Y_c; and a bargaining weight θ that represents the elderly's say in the joint household's decisions. The main logic of the model is as follows. If there is a bargaining weight θ such that the resulting joint utility dominates the utility of living alone for both elderly and child, they will find out about it one way or another, and we, the econometric

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observers, do not have to worry about its magnitude. We just have to check whether there is at least one value of θ such that the above condition holds.

Postulating such a model is one thing; testing it is yet another challenge. The authors are to be applauded for doing both. Most important, one needs a data set of elderly and their living arrangements that includes characteristics describing the elderly person *and* his or her adult children. As such data were not available, Kotlikoff and Morris collected the data themselves, complementing a panel of elderly in Massachusetts that was started in 1981 by Morris with data collected from the children. It is worth noting that this is the first, and it is to be hoped not the last, major data collection effort in the Economics of Aging Project. As the results of this paper show, more data on elderly *and* their children are badly needed.

The data include some 300 elderly parent–adult child pairs of predominantly vulnerable elderly in Massachusetts. The authors include only elderly with one adult child since they decided that they should exact the burden of an additional interview on only one child per elderly, a child chosen by the elderly, not randomly. The restriction on elderly with only one child may well bias the results as elderly with more than one child ever born are more likely to live jointly with one of their children. In short, this is a small, very specific, and possibly self-selected sample. One should keep this in mind when generalizing the results of this paper.

The authors transform their behavioral model in a testable probability equation by postulating that the preference parameters A and B are linear combinations of observable characteristics such as marital status, sex, age and health of parent and child, denoted by the vectors X_p and X_c, plus unobservable normally distributed preference components. Utility maximization subject to the budget constraint at given incomes Y_p and Y_c for all possible values of the bargaining weight θ produces an implicit function in A and B, denoted by $G(A, B)$, that characterizes the locus of indifference between living jointly and living separately. A positive $G(A, B)$ implies living together, a negative $G(A, B)$ implies living alone. Thus, the $G(A, B)$ function acts like a very specific, nonlinear indirect utility function in the familiar random utility model. The maximum likelihood estimation follows directly from this interpretation.

Let me now turn to the empirical results. Unfortunately, after all the effort and the admirable set-up of the structural model, the reader is rather disenchanted detecting only one significant coefficient in the tightly specified structural model. Even if the parameters of the structural model are jointly significant, this is the more frustrating as reduced-form logit and probit models produce considerably better results. The small and specific sample may explain the disappointing results, but it appears to me that these poor results are indicators for other problems as well.

What distinguishes the reduced-form logit and probit models from the structural model? The key is the functional form of the indirect utility difference between living alone and living together. Logit and probit are based on a linear combination of the deterministic components in A and B *and* income plus unobservables:

$$\text{(i)} \quad u^R(X_p, X_c, Y_p, Y_c) = \alpha_p X_p + \alpha_c X_c + \beta_p Y_p + \beta_c Y_c + \mu_p + \mu_c ,$$

where ϵ is logistic in the logit model and normal in the probit model. The structural model imposes a much more specific nonlinear functional form:

$$\text{(ii)} \quad u^S(X_p, X_c, Y_p, Y_c) = (Y_p + Y_c)^2 - Y_p^{2/(\alpha_p X_p + \mu_p)} - Y_c^{2/(\alpha_c X_c + \mu_c)}$$

(eq. [8] in the paper). Most notably, in the reduced-form models the effect of income on living arrangement choice is governed by separate parameters β_p and β_c, while in the structural model income does only indirectly enter this choice and is consequently "missing" in table 5.3. (Why the authors also change some of the X_p and X_c in this table remains inconceivable.)

The lack of freedom in the pattern and magnitude of income effects is my main criticism of the structural model and appears to be the most likely cause of the inferior performance relative to the two reduced-form models. The functional form of the income effects result from one assumption: the Cobb-Douglas specification of direct utility (eq. [2]) with a common exponent for housing and other consumption. It restricts the budget share of housing to a constant 50 percent. This is rather unrealistic. First, the share of housing expenditures varies widely among elderly as some live in owned homes that are long paid off and others in rental housing. Moreover, the sheer magnitude of this share is much too large. In a structural model as tightly specified as this one, this misspecification is rather likely to lead to a poor fit and to a bias in the other coefficients.

It is worth noting that the direct utility function can easily be changed to be more general without spoiling the model's simplicity—a utility function separable in housing and consumption but with A and B affecting only housing and not consumption will do the trick. I would also prefer this specification for other reasons—why should the elderly (the child, respectively) enjoy all other consumption just as much more or less as shared housing when living jointly?

A second, more general criticism of the structural model is its built-in pure selfishness. However, asks the moralist, if there is no altruism in parent-child relations, where else should it be in this world? Should it not at least be conceivable that the child has a higher utility from helping a parent who needs it compared to one who does not need it—for example, by taking in a sick or a poor parent? None of the parent's characteristics such as health or income enter the child's utility in this selfish model world.

Since the structural model has no interaction between the two utilities, the model is also unable to test the assumption of pure selfishness. The basic econometric problem is that interaction effects—say, elements of X_p also included in the exponent of Y_c in (ii)—are hard to identify, effectively only by functional form. However, if interaction terms are not identified, we are back at reduced forms such as (i). Hence, another possible explanation of the superior performance of the reduced-form equations is a certain degree of altruism in parent-child relations.

In summary, it appears to me that the structural model imposes too many restrictions that are not reflected in the data. More flexibility in the utility specification would allow for more realistic budget shares and some degree of altruism without going all the way to reduced forms—although the econometric maneuvering room is tight. Notwithstanding this criticism, I admire the model for its simplicity and the bold attempt to cut through the mesh of bargaining and joint utility maximization.

An important and robust result is that childrens' characteristics matter in the elderly's choice of living arrangements. This finding should be a strong incentive to include information on children in new surveys of the elderly such as the authors did for this study.

The structural model produces a very useful categorization of elderly-child pairs into four groups: those who agree in either living together or living separately, and those pairs in which one partner would like sharing but the other refuses to join. The possibility of this categorization is the main attraction of the authors' model, and it is a very relevant one for policy analysis. The paper's main substantive message results from this categorization. It is a sad message about the isolation of the elderly in our society and worth repeating as it confirms a message relayed by the other two studies on living arrangements in this volume: many elderly live alone not because they prefer to live alone but because their children prefer not to live with them.