Long-Term Care and Family Decision Making*

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Abstract

In this paper, we use a two-stage bargaining model to analyze the living arrangement of a disabled elderly parent and transfers to the parent from her adult children. The first stage determines the living arrangement: the parent can live in a nursing home, live alone in the community, or live with any child who has invited coresidence. In the second stage, child-to-parent transfers are determined for each child in the family. Working by backward induction, we first calculate the level of transfers of time and money that each child would provide to the parent in each possible living arrangement. Then, using these calculations, we analyze the living arrangement that would emerge from the first stage game. A key assumption of our model is that binding agreements cannot be made at the first stage regarding transfers to be made at the second. Because, in the absence of binding commitments, coresidence affects the bargaining power of a coresident child relative to the parent and her siblings, the equilibrium of the two-stage game need not be Pareto-efficient.

1. Introduction

Demographic trends suggest that the demand for long-term care for disabled elderly Americans will increase over the next few decades. The impending increase in the number and proportion of older Americans has renewed interest in intergenerational relations and the role of families in caregiving. Concern about the ability and willingness of families to continue playing the dominant role in caring for the disabled elderly has been heightened by recent demographic trends. These trends include substantial declines in fertility, high levels of nonmarital fertility, divorce, remarriage, delayed childbearing, and increased female labor force participation. These trends imply that a relatively small cohort of adult children will be available for caregiving, and that many adult daughters will simultaneously face the demands of childrearing and elder care while playing a demanding role in the work force.

Concerns about the potential erosion of family caregiving have prompted a variety of public policy proposals. These range from employer accommodation laws (1993 Family and Medical Leave Act) to tax incentives (1997 Balanced Budget Agreement) and caregiver allowances for parental care (1999 Bipartisan Commission on "Saving Medicare"). Public debate has also begun to focus on the economic burden of family caregiving and on the potentially deleterious psychological and social effects of competing demands on potential caregivers (Washington Post 1998; AARP 1998). A better understanding of the process by which families come to assume the responsibility and share the burden of caring for the disabled elderly is essential for designing and evaluating long-term care policies.

To understand the effects of public policies on families' ability and willingness to provide care requires a model of family caregiving. One source of complexity is the number of decisions makers. Family long-term care is often the resultant of numerous individual and joint decisions by family members with different preferences facing different constraints. Family members, most notably, adult children, not only make caregiving decisions on behalf of disabled family members but often provide hands-on care themselves and share the financial consequences of caregiving decisions. Moreover, the preferences of the disabled elderly may differ from those of their adult children. Differences may arise about the type of care the disabled elderly receive and the setting in which they receive it; for example, children may want a parent to enter a nursing home, while the parent prefers to live independently. Or a child may want a parent to receive care from a family member, but prefer that another child provide the care. Uncertainty about the parent's future health and potential informational asymmetries among family members further complicate the modeling of family caregiving decisions. The possibility of conflict regarding the caregiving and the role of different family members in providing it suggests that family members may have incentives to behave strategically.

Differences in family structure complicate the analysis of family caregiving. Evidence suggests that disabled elderly parents who are divorced are significantly less likely to receive care from or to coreside with their children (Pezzin and Schone 1999; 2002). Step children are substantially less likely than biological children to provide care for their disabled elderly parents (Pezzin, Pollak and Schone 2001). Recent trends in family structure have almost certainly contributed to the observed decline in adult children's involvement in parental care over the past several decades (Kotlikoff and Morris 1990; Spillman and Pezzin 2000).

The predominance of adult daughters in caregiving for disabled elderly parents has been evident for some time. Daughters provide more and more diverse kinds of assistance to their elderly parents than do sons (Brody and Schoonover 1986; Coward and Dwyer 1990; Stone and Kemper, 1990; Dwyer and Coward 1991). Furthermore, sociologists have found that daughters are more likely to endorse statements supporting the importance of "filial obligation" (Roff and Klemmack, 1986; Finley *et al.* 1988). Finally, evidence suggests that the gender composition of the family influences the propensity of children to provide care to their elderly parents (Coward and Dyer 1990; Dwyer and Coward 1991; Matthews 1987).

Our goal is to develop a model of family caregiving that accounts for these observed patterns. Such a model will provide a framework for analyzing the design and targeting of policy initiatives aimed at addressing the long-term care needs of the growing U.S. elderly population. We first summarize the game-theoretic model of Pezzin and Schone (1999, 2002), describing interactions between a disabled parent and her only adult child. Pezzin and Schone describe and analyze a game with two players, an elderly parent and an adult daughter, each assumed to maximize a utility function defined over a vector of private goods, leisure (for the daughter), and a public good, representing the parent's physical health. Conditional on the parent’s disability, the production of the parent's physical health requires that the parent receive some form of care, be it formal (i.e., paid) or informal (i.e., unpaid). Parent and daughter make decisions that determine the levels of private consumption, leisure, and cash transfers from the daughter to the parent; the combination of formal and informal care used to produce the parent's physical health or well-being; and the living arrangement (either separate or coresidence). As in the separate spheres model of Lundberg and Pollak (1993), Pezzin and Schone assume that intrahousehold allocation is determine as the solution to a Nash bargaining game in which the threat point is the Cournot-Nash equilibrium of a noncooperative game.

We then introduce a two-stage, three-player game, in which the players are a disabled parent and two adult children. The first stage determines the living arrangements and the second intrafamily transfers. Even if the second stage if conditionally efficient (i.e., efficient given the living arrangements determined in the first stage), the equilibrium of the two-stage game may be inefficient. Inefficiencies can arise here in much the same way that they can arise in the two-earner couple location problem described in Lundberg and Pollak [1991]. Both cases involve a two stage game in which big, up-front first stage decisions affect second stage bargaining power, and family members cannot or do not make binding commitments regarding their future behavior.

2. Background

Because of gradual deterioration with age or sudden health shocks, elderly persons face a considerable probability of becoming disabled and unable to care for themselves. Persons with chronic disabilities need help primarily with instrumental activities of daily living (IADLs; e.g., shopping, cooking, cleaning, managing financial affairs) or basic activities of daily living (ADLs; e.g., bathing, dressing, eating). As such, the provision of "long-term care" — care to compensate for the inability to perform these everyday functions — involves primarily non-technical, low-skill labor inputs.

The economics of long-term care for the disabled elderly and the nature of intergenerational relations has sparked a growing literature. The economics literature, surveyed in Norton (2000), focuses on the supply and demand for nursing home care and long-term care insurance, and pays little attention to the family. Early studies that discuss the role of the family concentrate primarily on support from children to parents in the form of shared housing, analyzing the determinants of living arrangements (Börsch-Supan, 1989; Börsch-Supan, *et. al.*, 1989; Ellwood and Kane, 1990; Kotlikoff and Morris, 1990; Börsch-Supan, *et.al.*, 1992b; Börsch-Supan, McFadden and Schnabel, 1993). ftn: ((A separate vein of research has focused on the motives for intergenerational transfers (Altonji, Hayashi and Kotlikoff, 1992; Hayashi, 1995; Bernheim, Shleifer and Summers, 1985; Cox and Rank, 1992; Pezzin and Schone 2001).))

The first generation of research on families' care arrangements relied on Becker's model of the family (Wolf and Soldo, 1994; Ettner, 1995 and 1996; Kemper and Pezzin, 1996). More recent work has used bargaining models to examine family care arrangements. Pezzin and Schone (1999a) specify a model of informal caregiving, labor force participation, and cash transfers in a broader framework of intergenerational household formation.

Heidemann and Stern (1999) and Engers and Stern (2002) develop and estimate a game theoretic model of long-term care. Their model is intended to explain whether the parent enters a nursing home, lives independently with no care provided by her children, or, if the parent does receive care from her children, which child becomes the primary caregiver. In their formulation, each adult child decides whether to attend a meeting in which living and care arrangements for the disabled parent are determined. The children who participate reach a binding agreement, and the non-participants are excluded from the decision making and bear no responsibility for caring for the parent or making side payments to other family members. For each child, the decision of whether to attend the meeting depends on the value she places on participating in the decision, the side payments that she anticipates, and the effect that her presence at the meeting would have on the final outcome. These models do not address the issue of intergenerational household formation, nor do they allow for the possibility that children other than the primary caregiver may provide care to the parent (Stern, 1993; Stern, 1995).

Much of the work examining family caregiving has focused on the parent-child dyad. Papers that model family caregiving with two or more children include Engers and Stern (2002), Checkovich and Stern (2002) and Pezzin and Schone (2001). Although most studies have included variables summarizing characteristics of the remaining family network (Kotlikoff and Morris 1990; Pezzin and Schone 1999 and 2002; Stern 1994 and 1995), little work has focused on the interactions among the adult children.

To analyze interactions among adult children, we build on recent research that has modeled intrahousehold allocation within a game theoretical framework (Manser and Brown 1980; McElroy and Horney 1981; Lundberg and Pollak 1993 and 1994). Game theoretic models are especially suitable for analyzing intergenerational living and transfer arrangements because they recognize the divergent and often conflicting interests and preferences of family members and specify a process for translating these preferences into outcomes. In the next three sections we analyze the parent-two children game, examining both living arrangements and interhousehold transfers.

3. A Caregiving Game with Two Children

We begin by complicating the Pezzin-Schone caregiving model in some dimensions -- most obviously, by introducing a second adult child as a potential caregiver -- while simplifying it in others. We assume that there are family public goods that enters the utility functions of the parent and both children. Pezzin and Schone consider the case of a single family public good, interpret the public good as the parent's physical health, and assume that it is produced within the parent's household. Unlike Pezzin and Schone, we allow for the possibility that the children care about the parent's "private consumption" as well as her physical health. In this section we interpret the public good as "health care services" -- "health services," for short -- and assume that it is purchased in the market; this interpretation enables us to defer the discussion of time allocation and household production until section 6. That discussion centers on explaining why cash transfers and time transfers are imperfect substitutes. We denote health services by H and, for definiteness, think of it as hours worked by a paid caregiver who provides assistance with ADLs and IADLs. In section 6 we drop the assumption that the public good is purchased in the market, reintroduce time and time allocation and, using a household production framework, analyze

We consider four possible living arrangements for the parent: living in a nursing home (A^n), living on her own in the community (A^o), living with child 1 (A^1), and living with child 2 (A^2). The parent's utility in each of these living arrangements depends on her consumption of two goods: a private consumption good (C) and health services (H). We use the superscripts {n, o, 1, 2} to indicate the living arrangement and the subscripts {p, 1, 2} to indicate family members. Thus, $C^o{}_2$ denotes private consumption by child 2 when the parent lives alone, and $H^1{}_p$ denotes the parent's consumption of H when she lives with child 1. We assume that children care about their own private consumption, about the parent's private consumption, and about the parent's consumption of the public good (i.e., C_p and H_p are arguments of each child's utility function). We do not, however, require that the children defer to the disabled parent's preferences over (C_p, H_p), and we do not exclude the polar case in which the children give zero weight to the parent's private consumption.

Economists' usual assumption about preferences -- what Becker (1981) calls "altruistic" and Pollak (2002) calls "deferential" preferences -- implies that the children defer to the disabled parent's preferences over vectors (C_p, H_p). We dislike both the terminology and the assumption, although our specification includes it as a polar case. Becker's usage forces us to say that a child who weights the disabled parent's consumption of the private good and health services differently than the parent is not altruistic because the child rejects the parent's preferences. In the introduction to the 1991 edition of his Treatise on the Family, Becker concedes that "The most unsatisfactory aspect of my discussion...[in the 1981 edition is]...the failure to combine the discussion of 'merit goods' and altruism" (p. 10). Pollak (1988) proposed a model in which parents were concerned with their adolescent or young adult children's consumption patterns rather than with their children's utilities (e.g., parents may be willing to pay for college tuition or the down payment on a house, but not for a Mercedes or a trip around the world.) Just as merit goods can motivate governments to provide tied transfers (e.g., food stamps), merit goods can also motivate family donors, when they have the ability to tie, to provide tied transfers.

We model family interactions as a two-stage game. The first stage is noncooperative and determines the living arrangements. A specific example of will help. First the children decide, separately and simultaneously, whether or not to invite the parent to coreside. Then the parent chooses among the feasible living arrangements: she can move into a nursing home, live on her own, or accept the invitation of any child who has invited her to coreside. At the second stage, taking as given the living arrangement determined at the first stage, the children and the parent make decisions that determine resource allocation under that living arrangement. We can model the second stage as a noncooperative game, a cooperative game, or a mixture of both. Alternatively, we can finesse some but not all of the difficulties of specifying the second-stage game by instead specifying a "sharing rule."

A sharing rule specifies each family member's second-stage behavior as a function of family economic and demographic variables (e.g., wages, prices, wealth; the gender and marital status of each child), policy variables (e.g., the eligibility rules and schedules that determine levels and types of available government transfers), and the living arrangement, which is determined in the first stage. We have adopted and adapted the idea of a sharing rule from

Chiappori (1988a, 1992). In the context of allocation between spouses within marriage, Chiappori's postulates a single-value, Pareto optimal sharing rule without attempting to derive it from an underlying model of bargaining within marriage. Unlike Chiappori, we do not require sharing rules to be single-valued or Pareto-optimal.

Regardless of whether we derive a sharing rule from a second-stage game or postulate it directly, we assume that family members cannot make binding agreements at the first stage regarding transfers or allocations at the second stage. Hence, the transfers that a child makes and the allocation that a parent chooses at the second stage are determined, or at least ratified, at the second stage: they do not implement binding agreements made at first stage.

Interesting coalitions cannot arise with one child, but with two or more children, coalition formation become central. With one parent and one child, bargaining is relatively tractable because, like bargaining between spouses within marriage, we can model family interactions as a two-person game: the only nondegenerate coalition contains all players. In three person games there are four possible coalitions -- one three-person coalition, and three two-person coalitions. If all coalitions were equally likely, the complexity of bargaining would increase rapidly with the number of family members, until the number of players became large enough to justify competitive analysis. But all coalitions are not equally likely, and we focus on three of particular interest: the coalition of all family members, the coalition of the parent and the coresident child, and the coalition of all children.

Any second-stage game with a unique solution induces a sharing rule, although not necessarily a single-valued, Pareto-optimal sharing rule. By beginning with the sharing rule, we avoid not only the need to analyze the second-stage game but also the need to specify it, or even to specify whether it is cooperative or noncooperative. Arguing against noncooperative game theory, Shubik (1989, p. 103) asserts that it "is generally not so useful to describe complex, loosely structured social interaction." Family bargaining -- whether between spouses within marriage or between and among adult children and disabled parents over long-term care --

exemplifies such interactions. Shubik erroneously concludes from his argument against noncooperative game theory that cooperative game theory must be more useful. We are less enthusiastic than Shubik about cooperative game theory for two reasons. First, although cooperative game theory allows us to proceed without specifying the "rules of the game" -- the strategies available to each player, or in extensive form, the sequence of moves and the information available to each player at each move -- the rules of the game are often crucial determinants of the outcome, and any analysis that ignores them is seriously misleading. Second, the efficiency of social arrangements and practices is a central concern of economics, yet cooperative bargaining models assume that outcomes are Pareto-efficient; hence, cooperative bargaining models are incapable of investigating the efficiency or outcomes or the conditions that make it more likely that families will achieve and sustain efficient outcomes. We conclude that modeling complex, loosely structured social interactions is very difficult, and that which family interactions are better modeled as noncooperative games and which as cooperative games is a matter of research strategy.

Like any dynamic game, the two-stage sequential game is solved by backward induction. In section 5 we calculate the sharing rule corresponding to the second-stage game. In section 6 we assume that the parent and the children have been able to calculate the sharing rule and consider the first stage game which determines the living arrangement.

4.Intrafamily transfers, the Sharing Rule, and the 2nd Stage Game

We now consider alternative specifications of the second-stage game under each of the four living arrangements.

A^o. Suppose that the parent lives on her own in the community.

A^o.i. A noncooperative, one-shot, voluntary contribution game with tied transfers.

Time and cash transfers are highly imperfect substitutes. We develop a model in which the children can "tie" time transfers -- more precisely, transfers of health services -- and consider whether the relative ease of tying such transfers provides a plausible explanation of why time transfers and cash transfers appear to be poor substitutes.

Suppose that the second-stage game has the following sequential structure. Each child can make two types of transfers to the parent: a tied transfer that the parent can use only for the purchase of health services, and an untied transfers that the parent can allocate as she chooses between health services and private consumption. The government also can make two types of transfers to the parent, tied (e.g., medicare) and untied (e.g., social security). The government, however, is not a strategic player and its transfers are determined by fixed schedules that are common knowledge. ftn: ((From the standpoint of any particular family, the government's schedules are fixed; from a political economy perspective, however, these schedules are endogenous.)) We return below to the effect of government policy on the behavior of families.

We denote the total discretionary income available to the parent in living arrangement o by Y^o. Her discretionary income is the sum of her income from assets and private pensions (Y_p), her income from the government (Y_g), and untied transfers provided by her children ($Y_1 + Y_2$). She can spend her discretionary income on private consumption or on health services. The government and the children may also provide the parent with "tied" transfers that she can use only to purchase health services. The level of transfers the government and the children provide can be contingent on the living arrangement. ftn: ((We assume that tied transfers are tightly tied -- more so than food stamps -- so that the parent cannot convert them into discretionary income.))

Consider the following sequential structure for the second-stage game. The children move first; each child determines the level of tied and untied transfers, as well as his or her own labor supply and private consumption. The parent moves second and allocates her resources, given the feasible set implied by the tied and untied transfers she has received.

The parent determines her consumption of C and H by maximizing her utility function, $U^p(H_p, C_p)$, subject to the constraints:

$$C_p \leq Y_p + Y_g + Y_1 + Y_2 = Y^o$$

$$C_p + H_p \leq Y_p + Y_g + Y_1 + Y_2 + T_g + T_1 + T_2 = T^o$$

together with nonnegativity constraints on C_p and H_p. Thus, the vector (Y^o, T^o) defines the set of feasible allocations for the parent. The feasible set is illustrated in Figure 1.

Because the tied transfer constraint need not be binding, we must distinguish between two cases.

CASE I: $C_p = Y_p + Y_g + Y_1 + Y_2$ and $H_p = T_g + T_1 + T_2$.

In this case the tied transfer constraint is binding. The parent's health expenditure is equal to the sum of the tied transfers provided by the children and the government, and the parent spends all of her discretionary resources on private consumption. In this case, an additional dollar of tied transfers will have a different effect on the parent's consumption than an additional dollar of untied transfers. This corresponds to the parent choosing the point B (as in Binding) on the feasible set in Figure 1.

CASE II: $C_p < Y_p + Y_g + Y_1 + Y_2$ and $H_p > T_g + T_1 + T_2$.

In this case the tied transfer constraint is not binding, the parent spends some of her discretionary resources on health services, and an additional dollar of tied transfers will have the same effect on the parent's consumption pattern as an additional dollar of untied transfers. This corresponds to the parent choosing a point along BE in Figure 1.

In case I if the children care only about health services and not about the parent's private consumption, then they provide only tied transfers and the effect of an additional dollar of tied transfers is an additional dollar's worth of health services for the parent. ftn: ((The government may provide both tied and untied transfers, with the balance reflecting both its valuation of C_p relative to H_p and its valuation of the autonomy of the disabled elderly.)) In case II, even if the children care only about health services, they are indifferent between whether they provide additional assistance in the form of tied transfers or untied transfers. The effect of an additional dollar of tied transfers on the parent's consumption of health services, like the effect of an additional dollar of untied transfers, is equal to the parent's marginal propensity to purchase health services from her discretionary income. ftn: ((If the government is solely concerned with the consumption pattern that results from its actions and cares only about health services, then in Case II it would be indifferent between tied and untied transfers: if it values individual autonomy, however, it would prefer untied transfers.))

Stepping back from the details of this specification of the second-stage game, we see that it is a noncooperative two-stage game in which the children move first and the parent second. More specifically, the two children move simultaneously, choosing levels of tied and untied transfers; the parent moves second, allocating her resources between private consumption and health services subject to the appropriate constraints. The parent is a utility maximizer but, because she has the last move and cannot make binding commitments, she is not a strategic player. The children are strategic players: each is concerned with the parent's consumption of health services, and perhaps also with the parent's private consumption, but each would like her sibling to contribute more and to contribute less herself. The children play a one-shot Cournot-Nash game whose Nash equilibrium we can calculate from their "reaction functions" which show each child's best response to the transfers made by the other (Figure 2). Modeling the provision of the public good as a one-shot, noncooperative game, we conclude that the public good will be underprovided: if both children make positive contributions to the public good, then both children would prefer a solution in which both made greater contributions. ftn: ((This underprovision result holds at interior solutions, but not at corner solutions where only one child contributes. Underprovision emerges when both contribute because the transfer of an additional dollar by one child will be partially offset by a reduction in transfers from her sibling. A child who does not contribute cannot make an offsetting reduction.))

We now show that explaining the imperfect substitutability of time and cash by the children's ability to tie time transfers (i.e., health services transfers) depends crucially on assuming that the parent and children play a one-shot game.

A°.ii. A noncooperative, repeated, voluntary contribution game.

Now suppose that the second-stage game is a repeated game. More specifically, suppose that at the beginning of every period each child can make tied and untied transfers to the parent, and at the end of every period, the parent determines C_p and H_p subject to the appropriate constraints. Neither the parent nor the children can carry over resources from one period to another, so that the stage games played in successive periods are identical. The stage games are related only because family members can "punish" each other by the allocations they select (e.g., the children can reduce their contributions to the public good; the parent can refuse some or all of the tied transfer.)

If family members are sufficiently patient, then the repeated game has a very large set of subgame perfect equilibria. The folk theorem asserts that any feasible, individually rational allocation is a subgame perfect equilibrium of the repeated game. Some of these equilibria are Pareto-optimal, but many are not. An objection to the repeated game formulation and the application of the folk theorem is the assumption of a long time horizon: long term care does not continue indefinitely, and end game considerations may affect behavior from the outset. Another objection, to which we return below, is a consequence of the nonuniqueness of equilibrium in the second stage game.

A°.iii. A cooperative game.

Now suppose that, as Shubik would have us assume, the second-stage game is cooperative. We can conclude immediately that the equilibrium is Pareto optimal because, by assumption, all equilibria of cooperative games are Pareto optimal. The specification of a cooperative game makes no mention of strategies or moves, but requires a specification of the payoffs attainable by each coalition. We also require a solution concept. We consider two: the core and the Nash bargaining solution.

The core is the set of feasible, undominated allocations -- allocations that cannot be improved upon by any coalition. Because a core allocation cannot be improved upon by the coalition of all players, every core allocation is Pareto optimal. An objection to the core as a solution concept is that it not only fails to predict a unique equilibrium but that the set of equilibria is very large, although the folk theorem implies that the set of equilibria in the repeated game is even larger. The Nash bargaining solution, the leading solution concept in bargaining models of marriage, resolves the nonuniqueness problem by selecting a particular core outcome as the solution (Figure 3). Which core allocation it selects depends on the specification of the threat point.

A^n. Now suppose that the parent lives in a nursing home. Because the logical structure of the second-stage game when the parent lives in a nursing home is sufficiently similar to its structure when she lives on her own in the community, we discuss it no further.

A^1. Now suppose that the parent lives with one of the children, for definiteness, with child 1. We begin with the one child case, considering the strategic implications of coresidence for bargaining between the coresident child and the parent. We then turn to the two-child case, considering the implications of coresidence for bargaining between the noncoresident child, the coresident child, and the parent. Coresidence complicates bargaining in three ways. First, coresidence affects bargaining power (e.g., reservation utilities; threat points). Although coresidence shifts bargaining power in favor of the parent, this shift does not necessarily work to the parent's advantage; recognizing the effects of coresidence on future bargaining power, children are less likely to invite coresidence. Second, with two children, coresidence increases the strategic asymmetry between the children. Of course strategic asymmetry is present when the parent lives independently in the community -- for example, the children may differ in gender and in labor force attachment, and one child may live across the street from the parent while the other lives across the continent. ftn: ((Konrad, et al. (2002) argue that location should be treated as endogenous.)) But coresidence heightens strategic asymmetries between the children. Second, coresident family members may coordinate their behavior and play as a "team" against the noncoresident child. When they do, the second stage game contains a mixture of cooperative and noncooperative elements.

With one child, coresidence shifts the balance of bargaining power in favor of the parent, where the implied comparison is the situation in which the parent lives independently in the community. Bargaining power may shift because the child feels guilty, because the parent is better positioned to nag, or because the child is more aware of the parent's needs. In a multistage noncooperative game, the coresident child may be trapped because evicting the parent would impose high psychic costs on the child or adversely affect the child's relationships with other family members. In cooperative games, guilt operates through the child's preferences and causes the child to act as if she places more weight on the parent's private consumption or health services than she otherwise would. The child's concern that ending coresidence would jeopardize her affective relationships with other family members can be interpreted in terms of sanctions. Nagging is a strategy more readily available to a coresident than a noncoresident parent, but the word "strategy" suggests a noncooperative game. If we model parent-child interactions as a cooperative Nash bargaining game, we can take account of the effects of nagging by adjusting the threat point. Coresidence may increase the child's awareness of the parent's needs, but increased awareness suggests incomplete information. We can capture the awareness effect of coresidence, although not the underlying mechanism, by allowing coresidence to affect the weight the child places on the parent's private consumption or health services.

With two children, coresidence strengthens the bargaining power of the noncoresident child as it weakens the bargaining power of the coresident child. The noncoresident child, knowing that her sister is acutely aware of the parent's needs and cannot easily evict the parent, can contribute less knowing that the coresident child will take up the slack. Following our discussion of the case in which the parent lives independently, we could model interactions between the parent and the children as (i) a noncooperative, repeated, voluntary contribution game, (ii) a noncooperative, repeated, voluntary contribution game, or (iii) a cooperative game. We do not elaborate because we have already discussed the analytic structure and the way in which the reservation utilities and the threat points differ. Instead, we focus on two new issues that arise with coresidence.

The first involves coalition formation. Pezzin and Schone (1999, 2002) consider the one child case and assume that when the parent and the child coreside, their interactions are cooperative. The implications of this appealing assumption for the two-child case are not yet clear. It is tempting to assume that when the parent coresides with one of the children, interactions between the parent and the coresident child are a cooperative game, and interactions between the noncoresident child and the household consisting of the coresident child and the parent are a noncooperative game. The assumption that the parent and the coresident child play as a team is fully justified if the actions of the noncoresident child affect the resources of the coresident household without affecting the relative bargaining power of the parent and the coresident child. If bargaining power is affected, then the interests of the parent and the coresident child do not fully coincide. Mixed games of this sort substantially expand the range of admissible second-stage games. If we can construct a utility function for the coresident household, then we can model interactions between the coresident household and the noncoresident child as a cooperative or a noncooperative game, but the conditions under which we can construct such a utility function require further investigation.

The second involves monitoring. Allocation within a coresident household poses issues somewhat similar to those analyzed in bargaining models of marriage: both involve a bargaining game between two family members who live together. Furthermore, just as we need to analyze allocation within marriage to understand the marriage market, we need to analysis allocation within coresident households to understand the decision to coreside. ftn: ((Of course we also need to understand the marriage market to understand allocation within marriage.)) With one child, allocation within the coresident household and the coresidence decision are the principal issues. With two children, allocation within the coresident household plays an additional role: the noncoresident child must decide on time and cash transfers to the coresident household, taking account of the coresident household's sharing rule. Empirical work on allocation within marriage establishes that resources controlled by the wife have a different effect on household expenditure patterns than resources controlled by the husband. In the coresident household, control over resources may also affect behavior and, if it does, transfers received by the parent and transfers received by the coresident child will have different effects. Formally, resources controlled by the parent and resources controlled by the coresident child are separate arguments of the coresident household's sharing rule.

The position of the noncoresident child parallels that of the noncustodial parent described by Weiss and Willis (1985, 1993) in their analysis of child support by divorced fathers. Weiss and Willis assume that the child's well-being is valued by both parents, but that each parent is also concerned with his or her own private consumption and unconcerned with the private consumption of the ex-spouse. The divorced father, because he does not live with the child, is poorly positioned to monitor his ex-wife's allocation of child support payments between her own consumption and the child. The difficulty of monitoring precludes binding, enforceable agreements, and the father is rationally concerned that his ex-wife will "tax" any contributions he makes by reducing her own support for the child. The Weiss and Willis argument implies that divorced fathers will undercontribute relative to what they would contribute if binding, enforceable agreements were possible. The analysis rests on the intuition that those outside a household cannot effectively monitor.

The Weiss and Willis insight is appealing, but their model fails to capture it. Their model is a one-shot Stackelberg game: at the first stage, the father contributes resources to the mother; at the second stage, the mother allocates resources between herself and the child. Asymmetric information and the difficulty of monitoring play no role in their formal analysis. The Stackelberg model captures the conclusion that absent fathers rationally undercontribute child support, but monitoring difficulties play no role. The undercontribution conclusion vanishes if we assume full observability and allow sufficiently patient ex-spouses to play a Stackelberg game over and over, as a stage game in an infinitely repeated game: the folk theorem implies that all individually rational outcomes are subgame perfect equilibria of this repeated game. Imperfect observability also raises the possibility of signaling: the mother may want to signal that, if the father contributes more, she will not reduce her own contribution in response to his increased contribution. But recognizing this possibility requires expanding the model so that the mother has some ability to signal.

Child support and long-term care pose similar issues: the position of the noncoresident child contemplating a contribution to the coresident household is similar to that of the divorced father contemplating child support. The noncoresident child, concerned that the coresident child will exploit her position, will undercontribute to the coresident household relative to what would be contributed if binding, enforceable agreements were possible. This result is consistent with the observation that, when the parent coresides with one child, the noncoresident children contribute very little. An extreme case in which the position of the noncoresident child is essentially identical to that of the divorced father arises when the parent has a mental disability such as severe Alzheimer's that prevents her playing a role in allocation decisions of the coresident household. Under these circumstances, the coresident child makes all allocation decisions in the coresident household, just as the mother allocates resources in Weiss and Willis.

5. Living Arrangements and the First Stage Game.

We now turn to the first stage game. Because the parent cares about living arrangements, private consumption and health services, she might prefer to live on her own with fewer consumption goods and health services than live with child i with more. We assume that, given values for $\{(C^n, H^n), (C^o, H^o), (C^1, H^1), (C^2, H^2)\}$, the parent can rank the four possible living arrangements (e.g., A^o preferred to A^1, A^1 preferred to A^n, etc.). We also assume that, given these values, each child also can rank the four possible living arrangements. Each child's preferences reflect both his or her concern for the parent's private consumption and health services, as well as the implications of each living arrangement for the assistance the child will provide and, hence, for the resources remaining for the child's own consumption.

In the first stage example described above, the parent will choose her preferred living arrangement from the available options determined by the children's invitations. To do this, the parent uses her calculation of the utility levels attainable in each living arrangement. She faces at most four alternatives, depending on whether both children offer coresidence, neither child offers coresidence, or one child offers coresidence and the other does not. Two loose end remain: nonuniqueness in the sharing rule, and nonuniqueness in the parent's choice.

The ability of the parent to choose among living arrangements is immediate if the sharing rule associates a unique allocation with each living arrangement. Efficiency plays no role, but faced with the multiplicity of equilibria in the repeated game or the core, the parent cannot choose unless she can assign probabilities to each allocation in the set. If the sharing rule associates probabilities with each allocation in the set, then choosing among living arrangement is like choosing among lottery tickets, but absent such probabilities, she cannot choose.

Suppose now that the parent has a choice of two living arrangements, and that the sharing rule associates a unique allocation with each. Suppose, however, that the parent is indifferent between them. Such ties are no problem for the parent but, as we shall see, ties are a problem for the children who must decide whether to invite coresidence.

As an initial example, we model the invitation stage as a simultaneous noncooperative game between the siblings. Each child has two strategies: offering coresidence or not offering coresidence. For each combination of strategies (e.g., both offer coresidence; child 1 offers coresidence and child 2 does not), we assume that the resulting levels of utility are known to each child (e.g., if both offer coresidence, they know that the parent will choose to live with child 1), or at least they can assign probabilities.

The first stage game which determines living arrangements is analogous to the first stage game which determines location in the two-earner couple location problem described and analyzed in Lundberg and Pollak (2001). In that game, spouses play a two-stage game in which the first stage determines the city and the second stage determines allocation within marriage. When the spouses prefer different cities, inefficient outcomes are possible even though the second stage game is efficient conditional on the city determined in the first stage. A similar result holds in the long-term care game -- an inefficient living arrangement may emerge from the two stage long-term care game, even though the second stage is conditionally efficient. A crucial feature of both the two-earner couple location game and the long-term care game is the inability of family members to make binding, enforceable agreements.

To demonstrate how the first stage game can yield inefficient outcomes, we assume away two extraneous complications. Instead of recognizing four living arrangements, we recognize only three, collapsing living independently and living in a nursing home into a single alternative. We also assume away the transfers of the second stage game and instead assume that family members have direct preferences over living arrangements. We first specify family members' preferences -- recall that we are constructing an example in which inefficient equilibria can occur -- and then specify alternative games.

Suppose that the disabled parent's preferences are:

coreside with Child 1,

coreside with Child 2,

lives independently.

Suppose that Child 1's preferences are:

parent coresides with Child 2,

parent coresides with Child 1,

parent lives independently.

Suppose that Child 2's preferences are:

parent coresides with Child 1,

parent coresides with Child 2,

parent lives independently.

That is, parent prefers to live with child 1, but would rather live with child 2 than live alone. Each child prefers that the parent coreside with the other child, but each child prefers to coresidence with the parent rather than have the parent live independently.

We first consider three specifications of the noncooperative first-stage game in which the children move before the parent, then three specifications in which the parent moves before the children and, finally, a specification in which the parent and both children move simultaneously.

I. Children Move before the Parent.

We consider two sequential games in which either Child 1 or Child 2 moves first, and a simultaneous move game. When Child 1 moves first, she does not invite (v') the parent to coreside; the best response of child 2 is to invite (v) the parent to coreside, and the parent accepts the invitation. When Child 2 moves first, she does not invite the parent to coreside; the best response of child 1 is to invite the parent to coreside, and the parent accepts the invitation. The simultaneous move game has two pure strategy equilibria: (a) Child 1 invites coresidence, and child 2 does not; the parent accepts the invitation of child 1. (b) Child 2 invites coresidence, and child 1 does not; the parent accepts the invitation of child 2. ftn: ((The simultaneous move game also has a mixed strategy equilibrium which we shall not discuss.)) In all three of these games the parent moves last and, because her actions cannot affect the actions of the children, the parent is not a strategic player.)) When the parent moves first, however, she is a strategic player.

II. Parent Moves before the Children.

Now we suppose that the parent can commit herself to reject particular invitations, if she receives them. More specifically, the game begins with the parent choosing among three moves.

(i) preemptively reject an invitation from Child 1 (r1)

(ii) preemptively reject an invitation from Child 2 (r2)

(iii) make no preemptive rejection any invitation (r')

The children then play one of the three games described above (i.e., one of the two sequential games or the simultaneous game). Finally, the parent chooses a living arrangement: she can live independently or accept any invitation she has received unless she has preemptively rejected it.

The analysis of these games is straightforward. The parent begins by committing herself to rejecting an invitation from child 2. The equilibrium of all three games -- the two sequential games and the simultaneous game -- is an invitation from child 1, which the parent accepts. The parent's ability to commit enables her to achieve her preferred outcome.

III. The Parent and the Children move Simultaneously.

The simultaneous game has 12 strategy profiles and 5 of these are equilibria. Recall that the disabled parent has 3 possible strategies (r1, r2, r'), and each child has two possible strategies (i, i'). The 5 equilibria are:

(r1, i', i) parent lives with child 2

(r2, i, i') parent lives with child 1

(r2, i, i) parent lives with child 1

(r', i', i) parent lives with child 2

(r', i, i') parent lives with child 1.

6. Time Allocation and Household Production

Families play a crucial role in providing hands-on care and in enabling disabled family members to access nonfamily care. Using a transaction cost framework, Ben-Porath (1980) and Pollak (1985) analyze activities and environments in which families are more efficient providers of services than markets, governments, or nonprofit organizations. Their discussions focus on family firms, family farms, and household production. Folbre and her coauthors have argued persuasively that "caring labor," a category that includes care of the disabled, is an activity in which families have significant transaction cost advantages.

We now introduce time allocation and household production into our model. Instead of assuming that health services are purchased on the market, as we have thus far, we now assume that health services are time inputs into the production of the parent's "physical health or well-being" (Pezzin and Schone, 1999a, p. 479). We distinguish among four types of time inputs: time inputs by child 1 (T_1), time inputs by child 2 (T_2), time inputs purchased on the market (T_m), and time inputs provided by the government (T_g).

The simplest specification assumes that the four types of time inputs are interchangeable -- as Gertrude Stein might have written, an hour is an hour is an hour -- and that time enters household production only through an index function, H, defined as their sum:

$$H = T_1 + T_2 + T_m + T_g.$$

Time provides children with a plausible mechanism that they can use to tie transfers: the parent cannot convert the children's time transfers into cash, even if she would like to do so. Our earlier assumption that the children can provide tied transfers that the parent can spend only on health services becomes more attractive if we reinterpret the transfer as time rather than cash. We do not, however, think that the principal reason children are much more likely to provide time than cash transfers is the possibility of tying.

Time inputs are not interchangeable. We can easily generalize our assumption about how time enters household production by considering the linear specification

$$H = \beta_1 T_1 + \beta_2 T_2 + \beta_m T_m + \beta_g T_g.$$

This specification implies that the four time inputs are perfect substitutes without requiring interchangeabity. With the linear specification, we can convert the four types of time inputs into comparable "efficiency units" that reflect their productivities. That is, the linear specification recognizes "quality" differences among the four time inputs, but assumes that these differences are "quantity augmenting." ((ftn: Simplifying assumptions similar to this are pervasive in economics; examples include "factor augmenting technical progress" and "quantity augmenting quality change."))

We focus on two differences in the quality or productivity of different time inputs that the linear specification permits. First, the children are not assumed to be equally skilled at providing care: some children (e.g., daughters) may be better at providing care than others (e.g., sons). With our linear specification, equal quality implies $\beta_1 = \beta_2$. Second, family labor and nonfamily labor are not assumed to be equivalent. For example, an hour of a child's time may provide more health services than an hour of a hired worker's time. We might expect such a difference if family members are more highly motivated than hired workers. Such differences underlie the argument of Folbre (1995), Folbre and Weisskopf (1998), and England and Folbre (1999, 2002) that family members are likely to provide higher quality "caring labor" than hired workers. Family members, they argue, will provide better care than paid employees because family members have intrinsic motives for providing high quality care, whereas paid employees have only extrinsic motives. In terms of the linear specification, the higher quality of family time implies $\beta_1 > \beta_m$ and $\beta_2 > \beta_m$. A similar -- and perhaps stronger -- argument applies to government employees, suggesting that $\beta_1 > \beta_g$ and $\beta_2 > \beta_g$.

The difficulty of monitoring and supervising caregiving is central to the caring labor story. If output were easy to measure, then nonfamily workers could be paid for their output on a piece rate basis. If care-giving were easy to monitor and supervise, then caring labor could move more readily from the family into the market. To incorporate monitoring and supervision into our analysis requires a nonlinear specification. We consider two examples. (a) Suppose that family members not only provide hands-on care but simultaneously (i.e., while they are providing hands-on care) also supervise hired caregivers. This simultaneous specification is consistent with an index of time inputs of the form:

$$H = \beta_1 T_1 + \beta_2 T_2 + \psi[\beta_{1s} T_1 + \beta_{2s} T_2]\, \beta_m T_m + \beta_g T_g.$$

In effect, the presence of family labor affects the productivity of hired labor; the coefficients β_{is} reflect the child's skill at supervision. (b) Suppose now that family members must allocate their time between providing hands-on care (T_{ih}) and supervising hired workers (T_{is}). An example of such a specification is

$$H = \beta_1 T_{1h} + \beta_2 T_{2h} + \psi[\beta_{1s} T_1 + \beta_{2s} T_2]\, \beta_m T_m + \beta_g T_g$$

where $T_{ih} + T_{is} = T_i$. ftn: ((This supervision story raises the question of why the parent herself is not supervising the hired workers. A possible answer is that physical or mental disability prevent her from doing so. Mental disability, however, complicates both our game theoretic analysis, in which the disabled parent is a rational player, and standard welfare analysis, in which individual's preferences and consumer sovereignty are dominant themes.))

In an essay on transaction costs and the family, Pollak (1985) discusses some of the reasons why family and nonfamily labor are imperfect substitutes: "The transaction cost approach draws attention to this distinctions [between family and nonfamily labor] by offering two reasons why family and nonfamily labor might be imperfect substitutes: the incentive and monitoring advantages of family organization ... and the idiosyncratic information and knowledge ... that family members are likely to possess."

Idiosyncratic information and knowledge are important in providing long term care. Family caregivers are more likely than hired worker to know the parent's preferences and medical history, and to know their way around her home. In terms of our index function, H, superior knowledge makes the time of a child more productive than that of a hired worker. ftn: ((Many of the services required by the disabled are heterogeneous and choosing among heterogeneous market services (e.g., hiring a home health care worker) raises access issues, or issues very similar to access issues. These access issues can be analyzed informally under the rubric "transaction costs," but the path to more formal analysis is unclear. When the disability has cognitive components, finding an appropriate nonfamily caregiver often requires the assistance of family members.

We now turn briefly to the relationship between time inputs and the output of household production. We begin with a general household production function for the parent's physical health or well-being:

$$W = \chi[T_1, T_2, T_m, T_g, Z]$$

where W is the parent's physical health or well-being and Z is the vector of all inputs other than time. Our assumption that an index of time inputs enters the household production function implies a production function of the form:

$$W = \phi[h(T_1, T_2, T_m, T_g), Z].$$

That is, by using an index function we have been implicitly assuming that the time inputs are separable from the non-time inputs, in the sense that the marginal rates of substitution among time inputs are independent of the non-time inputs.

Our index, H, is ordinal rather than cardinal: our analysis would be unchanged if we replaced $h(T_1, T_2, T_m, T_g)$ by $\theta\{h(T_1, T_2, T_m, T_g)\}$, where $\theta' > 0$, and then undid the effect of this transformation by appropriately redefining the household technology, ϕ. Because neither the index function nor the output of household production -- the disabled parent's physical health or well-being -- is cardinally measurable, marginal products and returns to scale properties of the index are not well-defined. As Pollak and Wachter [1975] pointed out in a more general context, without a cardinal measure of the output of the household technology, functions such as ϕ and h are like utility functions rather than production functions. From this perspective, we can do no more than focus on the substitutability of one type of time input for another.

7. Conclusion

We have used a two-stage bargaining model to analyze the living arrangement of a disabled elderly parent and transfers to the parent from her adult children. The first stage determines the living arrangement, the second child-to-parent transfers. Working by backward induction, we first calculate a sharing rule that specifies the level of transfers of time and money that each child would provide to the parent in each possible living arrangement. We then analyze the living arrangement that would emerge from the first stage game. Because the living arrangement affects bargaining power in the second stage game, and binding agreements regarding transfers cannot be made at the first stage, the equilibria of the two-stage game need not be Pareto-efficient.

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