Anticipation and Long Term Decisions:
Determinants of Parent-Child Spatial Proximity for Older Americans

Abstract:
Living arrangements of the older segments of the population such as their coresidence status and spatial proximity from their adult children are of major policy and research interest. However, considering the great adjustment cost in changing residence, the parent and child are less likely to adjust their living arrangements constantly as a response to changes in health and wealth. A strategy for them is to make long term decisions taking into account of predicted risk of adverse events in the future. Unfortunately, this important factor has not been picked up in most of the studies in the literature. Drawing on data from wave 2000 of Health and Retirement Study (HRS), older parents' subjective survival probability are found to be negatively associated with the probability of living within 10 miles (including coresidence) from the nearest child for the married mothers. It is also found to be positively associated with the probability of living apart from any children (including living within and beyond 10 miles) for the unmarried mothers. Specific pattern for older fathers are not detected. It seems older mothers are more likely to be driven by anticipation of future health care needs in making long term decisions and older fathers are followers.

I.2. Background and Significance

Why proximity is important:

Living arrangements and intergenerational spatial proximity of the older segments of the population are of major policy and research interest. They have tremendous significance for the wellbeing of not only the older but also the younger generation, in that they provide the infrastructure for the actual flow of intergenerational interactions and supports, especially those requiring face-to-face contacts. Living arrangement and proximity not only determinant the type and frequency of the interactions (Crimmins and Ingegneri, 1990), they also define related transaction cost in terms of money and time.

A parable between spatial proximity and water supply systems could illustrate the importance. I conceptualize the support for the elderly as a water supply system. Spatial proximity represents pipes, and family support represents the water running through them. The government, in effect, serve as a 'plumber', in charge of detecting broken pipes, fixing the broken ones and making decisions on whether to build new ones.

Along with the population aging in the U.S (Martin and Preston, 1994), there is a dramatic and persistent decline in parent-child coresidence for the elderly that has been repeatedly documented (Börsch-Supan, 1990; Kotilikoff and Morris, 1990; Crimmins and Ingegneri, 1990; Wolf, 1995; Kramarow, 1995; Ruggles, 1994;

Ruggles, 1996; Ruggles, 2001; Schoeni, 1998; Schmertmann, et al., 2000). During the past 50 years, the prevalence of community-dwelling older parents who are living with adult children has dropped from over 50 percent to lower than 20 percent. Although debates about the driving force underlying this dramatic decline still prevail, one strong argument is that independence becomes more affordable when the older segments are on average getting wealthier and healthier (Börsch-Supan, 1990; Kotilikoff and Morris, 1990; Heiss, Hurd and Börsch-Supan, 2003).

As compared to rapid changes in the population age structure and household composition for the elderly, the average spatial separation between older parents and their adult children on the population level has not changed much across the recent decades. It is reported that the temporal distance between seniors and their adult children has remained essentially unchanged on a population level in the last 40 years and about two-third of seniors (having at least one living children and not coresiding with any child) are living within a thirty-minute drive from their nearest child (Crimmins and Ingegneri, 1990).

It seems that whom the older parents can live nearby is equally as important as whom they can live with. As Wolf pointed out, it is reasonable to assume that spatial proximity and ability to establish frequent and easy contacts with children/kin may ultimately matter more than shared living in the same dwelling (Wolf, 1994), especially under the recent trend toward better physical and socioeconomic circumstances for the elderly.

Chapter II. Literature Review

II.1 Health, Wealth and Anticipations

In the 1980s and 1990s, there has been a surge of interest in living arrangements of elderly Americans, which is dedicated to documenting and explaining the major domains of interactions between younger and older generations. Most of the studies focus on the size and composition of households containing elderly people and the actual flow of care and support among older and younger generations. Although spatial separation (among those who are not in coresidence) between older parents and the younger generation are found in many studies to be a crucial determinant of care transfers (Troll, 1971; Dewit, Wister, & Burch, 1988; Litwak & Kulis, 1987; Hoyert, 1991; Stoller, et al., 1992; Whitbeck, et al., 1994; Smith, 1998; Hiedemann and Stern, 1999), very few studies have looked at intergenerational spatial proximity as an outcome of its own interest.

Rather than having a lengthy review of the large amount of literature, I will summarize several patterns that pertain to the study. Most of the findings in the literature tell a consistent story that senior individuals and couples in the U.S. on average prefer to live independently as long as they can. However, their decisions upon independent living are constrained by the resources the elderly possess. Among

all kinds of resources, health, wealth, education and kin group are found to be the most important ones.

With very few exceptions, better health, higher education level achieved, and greater income and wealth are found to be positively associated with independent living (Bishop, 1986; Wolf and Soldo, 1988; Soldo et al., 1990; Wolf, 1990; Kotlikoff and Morris, 1990; Kramarow, 1995; Ruggles, 1994). Controlling for the needs of economic resources or help with activities of daily living, older parents who are married are less likely to coreside with their children (Börsch-Supan, 1990; Speare and Avery, 1992; Wolf, 1994; Pezzin and Schone, 1999) and independent living is valued more highly for married parents, while institutional care is valued more highly for unmarried parents (Kotlikoff and Morris, 1990; Hoerger et al., 1996; Pezzin and Schone, 1996, 1997; Sloan et al., 1997; Hiedemann and Stern, 1999).

On the other hand, declines in health and wealth and marriage disruptions often trigger changes in their household composition, in the direction of living closer to or moving in with others, especially the ones from their family or kin group (Worobey and Angel, 1990; Mutchler and Burr, 1991; Speare, Avery and Lawton, 1991; Speare and Avery, 1992; Silverstein, 1995).

Interestingly, this pattern is also valid for the generation of adult children. Better health, higher education level achieved, and greater income and wealth are found to be positively associated with living independently of their older parents. Adverse events experienced by adult children in these domains are also associated with higher likelihood of coresidence with their older parents (Wolf and Soldo, 1988; Kotlikoff and Morris, 1990; Speare and Avery, 1992; Pezzin and Schone, 1999). The general driving force to bring an individual to live with other family members seems to be the needs for resources, such as support, regardless of the position occupied along the family lineage.

With very limited literature, similar patterns are also found for spatial proximity, but with two significant exceptions: health (Clark and Wolf, 1992; Rogerson et. al., 1993; Lin and Rogerson, 1995; Silverstein, 1995) and homeownership (Lawton, Silverstein, and Bengtson, 1994b; Silverstein, 1995). One surprising finding is the weak association between objective health status and spatial separation. With other things equal, parental functional health (often measured by ADL, IALD) is found to be unrelated to spatial separation using a variety of data sources and model specifications in a cross-sectional setting (Clark and Wolf, 1992; Rogerson et. al., 1993; Lin and Rogerson, 1995). In longitudinal analysis, although a decline in health status is found to be positively related to the probability of convergence in spatial relation, baseline health status fails to register significance (Silverstein, 1995).

At the same time, although homeownership is mechanically associated with housing wealth, a major share of the older individual's total wealth[1], its effect goes in the opposite direction than income. Instead of being positively related to spatial separation as income is (Lin and Rogerson, 1995; Silverstein, 1995), older

[1] The majority of the wealth of most aged people is in the form of housing equity. This Housing wealth is claimed to be a potential source of support for the elderly as they age (Venti and Wise, 1990).

homeowners are found to be less likely to diverge in spatial relations from their adult children (Silverstein, 1995), and younger homeowners are also found to be less likely to be living far from their older parents (Lawton, Silverstein, and Bengtson, 1994b) after controlling for income and other factors. However, this finding is not surprising at all. As extensively studied in migration decisions, homeownership is related to considerable adjustment costs in changing its status and is a very important factor in making individuals less likely to migrate (Venti and Wise, 1990).

Noticing the adjustment costs related to changing residence, one explanation of the weak association between health and spatial distance could be that a change in spatial distance between older parents and their nearest adult child (not including moving into the same household) necessarily involves at least one settlement for a new residence among the parent-child pair. Homeownership, therefore, seems to stabilize the spatial distribution among the family members. Consequently, adjustments in spatial distance are less likely to be an immediate response to shocks in health and wealth as compared to informal care, contact, inter-vivos transfers or even change in household composition[2]. As a strategy against uncertainty in health and considerable adjustment cost in changing residence from time to time, older parents and their adult children may take the anticipated shocks into consideration when making decisions on proximity for a certain period of time. If that is the case, changes in anticipations and unexpected shocks will play major roles in shaping proximity. Instead, actual changes that have been successfully predicted may not lead to a change in proximity. Hence, the significance of the dependence of proximity on health status in cross-sectional data will be diluted.

Unfortunately, little attention has been paid to anticipation of future health and survival and most of the studies are built on the assumption that the health effect is the same cross homeowners and renters. In this proposed study, measurement of anticipation in survival will be included as a crucial explanatory variable and the potential effect modification from homeownership will also be statistically tested.

Chapter III. Theoretical model

III.1 Overview of Family Bargaining Model

Before empirical analysis, I will set up an economic model to reflect intuitions and what I expect to see from the survey data. Although I am not pursuing estimations for a structural model, an economic model can guide me towards testing hypotheses, proper statistical procedures and inference in reduced form statistical models.

Since parent-child spatial proximity is not a unilateral decision, I will conceptualize the decision making process as a cooperative game between an older parent and her[3] adult children. (1986) developed a two-player cooperative game (I call it Bernheim

[2] In the case of moving together, set-up for a new home is not a necessary condition. Hence change in coresidence status is less likely to suffer from adjustment cost problem as compared with change in spatial separation.

[3] I use female third person to represents all the players (males or females) in the model.

model) for a similar topic. I will apply the game to my study in the following steps. First, I will adapt the game for my study. Subsequently, I will introduce anticipation of future health into the two-player game. Then, I will also allow heterogeneity in children's preference for proximity to see its impact on outcomes of the game.

III.2 Game between One Parent and One Child

Based on Bernheim model (Bernheim et. al., 1986), I set up a two-player game where an older parent and an adult child collectively make long term decisions on parent-child proximity and allocation of family incomes. Once the mutual agreement has been achieved, nobody can deviate from it in the whole period[4]. It is assumed that the parent is altruistic and wealthy enough so that she always makes non-negative transfers to her child. This is equivalent to the assumption that the parent is in charge of pooling family incomes and assigning consumption to the child. The child, given the family income (consumption) allocated to her, ultimately decides the proximity.

Bernheim and colleagues did not study how the anticipations of future health status influence the determination of proximity and financial transfers. Motivated by this question, I will extend the model by allowing difference in the parent's health status. There are two hypothetical states in parent's health status H: does not need assistance in ADL or IADL (H = 0 which is loosely called healthy) and needs assistance (H = 1 which is loosely called frail). Frail is considered as an absorbing state. Right before the game starts, parents are healthy and the expectation about the health status afterwards during the period, the possibility π that the parent will get frail, is a common knowledge in the family. The adult child is temporarily assumed to be indifferent of her parent's wellbeing in the sense that her utility function is independent of parents' wellbeing.

I set up the utility functions as follows: The parent's utility function is defined over private consumption C^p, parent-child proximity S, and child's utility U^k, conditional on parent's health status H. As shown below, "S" represents the geographical closeness between the parent-child pair, with greater S meaning smaller spatial distance. As normally assumed, the marginal utility of private consumption and child's utility are decreasing. However, we assume that the same last unit of proximity will bring the parent higher utility when she is frail than when she is healthy.

[4] This feature is different from Bernheim's model where short term decisions are made on an everyday bases.

$$U^p = u^p\left(C^p, S, U^k \mid H\right)$$

$$\frac{\partial U^p}{\partial C^p}\Big|_{H=0} = \frac{\partial U^p}{\partial C^p}\Big|_{H=1} > 0, \qquad \frac{\partial\left(\frac{\partial U^p}{\partial C^p}\right)}{\partial C^p}\Big|_{H=0,H=1} < 0,$$

$$0 < \frac{\partial U^p}{\partial U^k}\Big|_{H=0;U=u} < \frac{\partial U^p}{\partial U^k}\Big|_{H=1;U=u}, \qquad \frac{\partial\left(\frac{\partial U^p}{\partial U^k}\right)}{\partial U^k}\Big|_{H=0,H=1} < 0$$

$$\frac{\partial U^p}{\partial(S)}\Big|_{H=1;S=s} > \frac{\partial U^p}{\partial(S)}\Big|_{H=0;S=s}, \qquad \frac{\partial\left(\frac{\partial U^P}{\partial(S)}\right)}{\partial(S)}\Big|_{H=0,H=1} < 0$$

Child's utility U^k is defined over her consumption and parent-child proximity as shown below.

$$U^k = u^k(C^k, S)$$

where

$$\frac{\partial U^k}{\partial C^k} > 0, \qquad \frac{\partial\left(\frac{\partial U^k}{\partial C^k}\right)}{\partial C^k} < 0,$$

$$\frac{\partial U^k}{\partial(S)}\Big|_{S>S^b} > 0, \qquad \frac{\partial U^k}{\partial(S)}\Big|_{S<S^b} < 0, \qquad \frac{\partial U^k}{\partial(S)}\Big|_{S=S^b} = 0, \qquad \frac{\partial\left(\frac{\partial U^P}{\partial(S)}\right)}{\partial(S)} < 0$$

Following Bernheim and colleagues (1986), I assume that child's utility first increases and then decreases in proximity. That is to say, there is a bliss point in proximity. It is represented by S^b.

The rationale for a bliss point is that proximity is closely related to many things that might conflict in the child's interest. For example, when the child is living far enough from parent, getting closer to her parent is a good thing because she can involve in family activities and spread her risks in the family network more easily. However, as spatial separation reduces, there is an increase in the concerns of reduction in independence, or diminishing opportunity for better job. The child has to consider these tradeoffs and find the threshold S^b, where the cons and the pros get even. At such a point, neither getting further closer nor apart will be preferred. The bliss point could be anywhere from living together to far away for a child depending on her personal characteristics.

As assumed by Becker (1974) and Bernheim and colleagues (1986), the altruistic parents' income are substantially high and they always make non-negative transfers to their children. So the parent is a benevolent dictator facing a family budget constraint as follows

$$C^p + C^k \le Y^p + Y^k = Y$$

where the prices of market goods C^p and C^k are normalized, and Y is the given total family income.

Since there is no explicit solution to the above maximization problem, I will graphically show the decision-making mechanisms for parent-child proximity and financial transfers. I will start with the simple case as stated in Bernheim and colleagues (1986). And then, I will introduce uncertainty in health status to illustrate the optimization solutions when the altruistic parent and the indifferent child are making long term decisions based on their expected utilities.

III.2.1 Optimization of the Game without Anticipations in Health

Without any bargaining, the outcome of the game is a solution to the following maximization problem.

$$\begin{cases} (S^*, C^{k*}) = \arg\max|_{C^k} \left[U^p \mid S^* \right] \\ (S^*, C^{k*}) = \arg\max|_{S} \left[U^k \mid C^{k*} \right] \end{cases}$$

$$\text{s.t. } C^p + C^k \le Y^p + Y^k = Y$$

This maximization problem is shown in figure 1. The horizontal axis represents parent-child proximity, S, and greater values in S represent greater spatial closeness. The vertical axis represents child's consumption[5] that has been assigned by the parent. Point C (S^1, C^{k1}) in figure 1 is assumed to be the global maximization point for the parent's utility. Centered at point C, circles I^{p1} and I^{p2} are two of the parent's indifference curves. As argued by Bernheim and colleagues (1986), they are circles because of the tradeoffs between the parent's and child's consumption and the discrepancy in their preference for proximity. Inner circles represent higher utility levels.

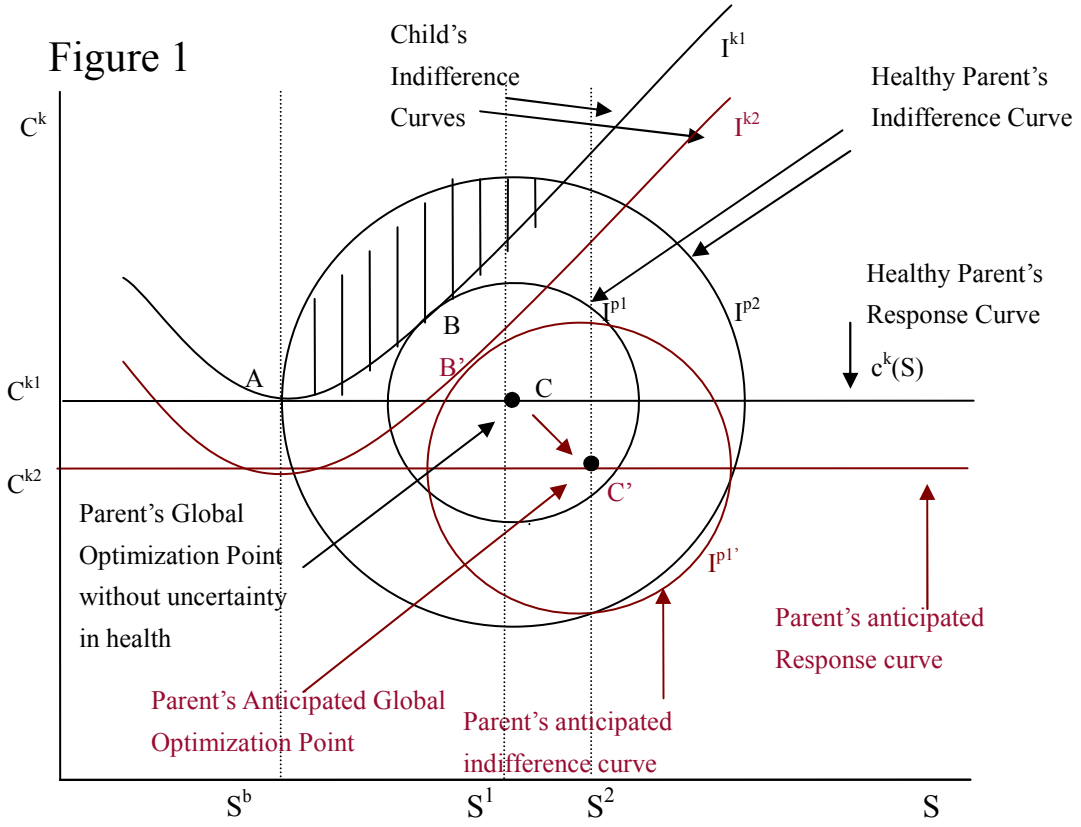
For each proximity value, the parent assigns certain amount of consumption to the child. The locus of these points, $c^k(D)$, is defined as the optimal response function for the parent. It is forced to be horizontal, since I assume that parent's marginal substitution rate between her own and her child's consumptions is independent of proximity. Equivalently, changes in proximity will not alter the parent's allocation of consumption.

In addition, I superpose in (S, C^k) plane the child's indifference curves I^{k1} and I^{k2}, which represent consecutively increasing utility level as they move upwards. They are convex downwards and first decrease and then increase in proximity for the reason that proximity first brings positive and then negative utilities to the child. I further assume that the child's bliss point in proximity is independent of the child's

[5] Since we have assumed that the family resources are pooled, parent's consumption, and hence preference can be represented entirely in the (S, C^k) plane.

consumption[6]. Hence, at any given level of consumption, the child's bliss point will stay on a vertical line as indicated by S^b. Anticipating the consumption assigned by parent, the child effectively chooses point A to optimize her utility, where one of child's indifference curve and the parent's response curve are tangent with each other. Point A will fall on the vertical line originated from the child's bliss point S^b, since in our particular case, $c^k(S)$ is a horizontal line and will be tangent with child's indifference curves only at its bottom, where the value of S is exactly S^b. Point A is called an outcome without any family bargaining.

Figure 1



Although point A is child's best response to the parent's transfer, it is not necessarily the equilibrium for the cooperative game since Pareto improvement for both parent and child is still possible. As shown in figure 1, the shaded area represents the set of Pareto improvements. Thus, through bargaining, the parent and her child can settle somewhere in the shaded area. Since proximity is not determined unilaterally, they also have to decide who should change residence. The cost for relocation will not be modeled explicitly in the model. Presumably, how to share the cost is also decided over bargaining within the parent-child pair.

Since there is no closed form solution for the equilibrium of the bargaining game between the two players, I will have to focus on the best available choice for the older

[6] It is very likely that bliss point associated with consumption. With more consumption, the child is more likely to have a bliss point that is further apart from the parent, because the importance of spreading risks among family members reduces. However, this association will only strengthen our theoretical prediction.

parent when I make comparisons between different scenarios. As shown in figure 1, B represents parent's best available equilibrium. At point B, indifference curves I^{k1} and I^{p1} are tangent to each other, where the parent achieves highest utility without undermining her child's utility.

III.2.2 Optimizations of the Game with Anticipation of Future Health

However, considering the great adjustment cost involved in changing residence, the parent and child are less likely to adjust immediately after shocks. A strategy for them is to predict the risk of adverse events and maximize the expected utilities for a long term. The optimization problem for the long term decision is given as below.

$$\begin{cases} (S^{**}, C^{k**}) = \arg\max|_{C^{k**}} \left[E(U^p) \right] = \arg\max|_{C^{k**}} \left[(1-\pi) * U^p_{H=0} + \pi * U^p_{H=1} \right] \\ (S^{**}, C^{k**}) = \arg\max|_{S^{**}} \left[E(U^k) \right] = \arg\max|_{S^{**}} \left[(1-\pi) * U^k_{H=0} + \pi * U^k_{H=1} \right] \end{cases}$$

subject to

$$C^p + C^k \le Y^p + Y^k = Y$$

As shown in figure 1, point C' is the new global maximization point where the parent is maximizing her expected utility. C' has to be on a new parent's response curve which is a horizontal line below $c^k(S)$, since deteriorating health will result in increase in parent's consumption, which in turn undermines child's consumption. The response curve is still horizontal since we stick to the assumption that parent-child proximity has no impact on parent's marginal substitution rate between her child's consumption and her own consumption.

At the same time, parent-child proximity at C′ has to be greater than C, because uncertainty in health makes the parent value the previous global optimal proximity S^1 more than it would have been if the parent is healthy. It gives her incentive to move toward right hand side (living closer). A formal proof will be given in Appendix 1. Accordingly, the parent's indifference curves including $I^{p1'}$ will be circles centered at C′: (S^2, C^{k2}), the new global optimization point.

Following the same procedure we have gone through in figure 1, we know that point B′ in figure 2 will be the new best available equilibrium for the parent, where parent's indifference curve $I^{p2'}$ and child's indifference curve I^{k2} are tangent with each other.

With the comparison between point B and B′, it is clear that the parent with uncertainty in health prefers to live closer to her child. To achieve it, they will have to give away more resources to her child.

Chapter IV. Data and Method

In the following sections, I will describe the data, outcome and independent variables. Then, I will outline the hypotheses to be empirically tested in each topic, followed by the specifications of the statistical model I propose to use.

IV.1. Data:

Survey Design

The study will draw on data from Asset and Health Dynamics of the Oldest Old (AHEAD) and Health and Retirement Study (HRS). AHEAD and HRS are particularly well suited for the purposes of this study because one module was specifically designed to study living arrangements and how they relate to health and economic status.

HRS and AHEAD studies were created as separate but related surveys. The HRS is a biennial panel with several auxiliary files. It is sponsored by the National Institute of Aging and administered by the Institute for Social Research (ISR) at the University of Michigan. The panel started in 1992 with 12,562 respondents in 7,702 households (Hurd, 2003). The study oversamples Hispanics, Blacks, and residents of Florida, and provides weighting variables to make it representative of the community-based population. The baseline survey was conducted face-to-face in the homes of respondents born in 1931-41. In addition, the spouses of married respondents, regardless of age, are interviewed. Follow-up surveys were conducted by telephone every two years from 1994 to 2004 with proxy interviews after death. AHEAD collected data over nationally representative samples of the cohorts born in 1923 or earlier with over-sampling of blacks, Hispanics and Floridians in 1993 and 1995. In 1998, and every two years thereafter, the HRS, AHEAD and two new sub-samples – War Baby (WB: 1942 - 1947 birth cohorts), and Children of the Depression Age (CODA: 1924 - 1930 birth cohorts) - were interviewed at the same time. While the HRS and AHEAD data starts with a sample of the non-institutionalized, the panel tracks the elderly when they enter a nursing home or similar institutions. These data also contain a proxy interview after the death of the respondent so that the living arrangement at the time of death can be ascertained.

AHEAD as well as the other cohorts in HRS have core sections with questions in the following broad classes: Employment (current and former jobs); health measures including self-assessed health, performance measures, disease conditions, cognition, mood, and ADL and IADL limitations; income and assets; family structure and intergenerational transfers both of financial help and time help, housing, insurance, and pensions.

In addition to the core content, the survey obtains a roster of the extended family including a number of characteristics of each child of the HRS and AHEAD respondent. Characteristics include education, income, home ownership, marital status and parental status. Children from the family roster were linked during the computer-assisted interview to both financial help and time help given to the HRS and AHEAD respondent. This linkage will permit analyses of motivations for transfers.

Analytical Sample

In this study, I will draw on the data from the HRS 2000 wave to perform a cross-sectional analysis. The basic eligibility for this study is the following: (1) Community dwelling at the baseline; (2) Aged between 65 and 85; (3) Having at least one child in contact; (4) not living with any of their adult children; (5) Cognitively able to answer subjective questions.

IV.2. Outcome and explanatory variables

To answer the research question whether subjective survival probability of community dwelling parents negatively associated with their proximity to children, I am going to empirically test the following testing hypothesis.

Testing Hypothesis:

Parents' baseline subjective survival probability is negatively associated with parents' proximity from children and probability of transition into closer proximity to children, holding other things equal.

Outcome variables:

The outcome variables for this study are spatial proximity and coresidence status. In HRS and AHEAD survey, respondents are asked about their household composition and whether their specific child, who is in contact but not coresiding, is living within 10 miles. 10 miles is a commonly accepted threshold in the literature as a threshold to define whether parents and their children are living close to each other (Clark and Wolf, 1992).

It should be acknowledged that joint living is qualitatively different from living near in terms of the decision-making process and the magnitude of interactions involved. This feature has to be carefully considered in model specifications and interpretations. For simplicity, I exclude those who are coresiding with at least one of their children from my analytical sample.

Accordingly, I will generate a summarized measure "Proximity" to incorporate spatial closeness for the community dwelling elderly. For the older parents, the variable "proximity" is defined as "living close" if specific parent is not living with any child but within 10 miles from the nearest child, and "living far away" if the parent is living beyond 10 miles from the nearest child.

Explanatory and Controlling Variables

Since most of the independent variables will be used throughout the empirical analysis, I prefer to outline their definitions beforehand. Explanatory and controlling variables can be grouped into parental characteristics, family characteristics, and child-specific characteristics, in view of different perspectives of the analysis. For topics from parents' perspectives, only parental and family characteristics will be employed. For topics from the children's perspective, all of the three groups will be

relevant, but in a hierarchical manner.

Individual subjective survival probability:

1) Individual subjective survival probability is an important variable in this study. It is used to operationalize the concept of anticipation of future health. It reflects a subjective trajectory of health into the future, which is measured by the self-reported probability of surviving a 10 year period. The question is framed as follows.

> Using any number from 0 to 100 where "0" means that you think there is absolutely no chance and "100" means that you think the event is absolutely sure to happen, what is the percent chance that you will live to be 80 (if the subject's age is 69 or less); 85 (if subject's age is 70-74); 90 (if the subject's age is 75-79); and so on and so forth.

This reported probability will be normalized into a 10-year survival rates (between 0 and 1.0) that are comparable across the sample. Since there are focal points (data heaping) problem, I further operationalize this variable into a categorical variable with cutoff point at 0.25 and 0.75. These two cutoff points are arbitrarily chosen. I define the subjective survival probability between 0 and .025 as "low confidence", those between 0.25 and 0.75 as "moderate confidence", and the rest as "great confidence".

Other Parental Factors

2) Health status is an important constraint on parents' resources. The measures we will use to reflect the gradient in health include Ability of Daily Living (ADL), Instrumental Ability of Daily Living (IADL), and Cognition function. In case of potential co-linearity problems among ADL and IADL, I will also summarize them into a new categorical variable.

Self-rated health is also included as a specific aspect of parental health. It is a categorical variable with five outcomes: excellent, very good, good, fair, and poor. This is a measure of subjective evaluation of current health.

3) Social Economic Status (SES) such as highest achieved education, social security status, personal income, net value of non-housing financial wealth, home ownership, housing equity will be examined. It is noteworthy that "housing equity" is a special financial wealth that is a structural factor related to many facets of living and care arrangements and their transitions. An additional feature related to it is that great adjustment cost is involves when people make changes in housing equity.

5) Health insurance. Medicare status will be employed as a reflection of the choices from outside the family.

7) Parent's demographics such as age, gender, marital status, ethnicity, and religion are important factors that shape the preference for intergenerational interactions.

The summary of these variables is displayed in table 1.

Table 1. Definition and Mean Values of Variables Used in Analysis: 2000 HRS* US

Variable Name	Definition	Sample Mean and Distributions Un-weighted	
		Female[c]	Male
Dependent Variable			
Parent-Child Coresidence	0= living with no adult children	60.32%	58.06%
	1= living with at least one adult children	39.68%	41.94%
Key Explanatory Variable			
Categorical Subjective Bequest Possibility	0 – 0.25	26.25%	25.07%
	0.25 – 0.75	50.75%	52.94%
	0.75 – 1.00	23.00%	21.99%
Controlling Variables			
Total non-housing Wealth	$: min=0, max= 50,050,000	143,346.6	160,752.7
		(428,526.3)	(371,127.3)
Yearly Income	$: min=0, max= 300,000	1,752.3	4,818.8
		(7,694.0)	(18,374.3)
Type of Residence	1 = Owned	72.94%	78.87%
	2 = Rent	13.17%	9.54%
	3 = Other	13.88%	11.59%
Age	year of age. min=65, max= 100	73.11	72.87
		(5.51)	(5.36)
Age group	65-74	60.09%	61.28%
	75-84	39.91%	38.72%
Race	1 = Caucasian	90.90%	91.46%
	2 = African American	7.48%	6.96%
	3 = Other	1.62%	1.58%
Marital Status	married	54.08%	80.13%
	partnered	1.2%3	2.11%
	married without spouse/divorced/separate/never married	8.95%	7.80%
	widowed	35.75%	9.96%
Number of Living Child	min=1, max= 20	3.31	3.53
		(1.94)	(1.99)
Number of Marriages		1.31	1.34
		(.63)	(.67)

Table 1. Definition and Mean Values of Variables Used in Analysis: 2000 HRS* (Cont.)

Variable Name	Definition	Sample Mean and Distributions Un-weighted	
Dependent Variable		**Female[c]**	**Male**
Education	1 = LT High School	21.76%	21.67%
	2 = GED	2.93%	4.27%
	3 = High School Grad.	39.16%	26.62%
	4 = Some College	20.97%	19.82%
	5 = College and Above	15.19%	27.62%
Social Security	0 = no	3.44%	3.74%
	1 = yes	96.56%	96.26%
Self-reported Health	Excellent	9.90%	10.70%
	Very good	31.63%	31.61%
	Good	31.59%	32.46%
	Fair	19.00%	19.02%
	Poor	7.88%	6.22%
ADL	# of difficulties in bathing, dressing, eating, getting out of bed, walking around	.29	.200
	min=0, max= 5	(.80)	(.65)
IADL	# of difficulties in using phone, managing money, taking medication, shopping for groceries, , preparing hot meals	.20	.12
	min=0, max= 5	(.63)	(.49)
Sample Size		2406	1814

*Data source: RAND Cleaned HRS 2000 and HRS 2000 final release

a. Proportion are reported for categorical variables

b. Means and Variances (in parenthesis) are reported for continuous or count variables.

c. sample 1 is the total sample of elderly parents aged 65 and over with at least one child or IADL

IV.3. Method:

Logit Model for Parent-Child Proximity

$$\Pr ob(Y_i = 1 \mid X_i) = \frac{\exp(z_i)}{1+\exp(z_i)}$$

$$where \qquad z_i = \beta_0 + \beta_1 A_i + F_i^{'}\beta_2$$

In the equation above, Y_i is individual i's proximity to his or her nearest child. if the spatial separation is smaller than 10 miles, and Y_i equal to 0 if otherwise. z_i is a row

vector representing the linear combination of independent variables within the model.

X_i is a column vector representing constant term, major explanatory variables and controlling variables. Vector X_i includes the following components:

Parental subjective survival probability for the next 10 years, represented by scalar A.

Parental and family characteristics for the elderly respondent i, represented by column vector F_i.

To identify non-linear patterns and effect modifiers, functional forms and interaction terms among regressors will also be included and statistically tested. For example, age is assumed to be non-linearly related to proximity. We will add a set of dummy variables to represent different age groups, and allow them to be able to interact with the key explanatory variable, subjective survival probability. I also suspect that homeownership largely defines the adjustment cost for change residence. Hence, the impact of anticipation of future health on parent-child proximity will be different across people having own house or not. To test this postulation, I will also include interaction terms between homeownership and subjective survival probability.

V. Results:

In the empirical analysis, I stratify the data into two subsamples by gender. For each gender, a logit regression is performed and the results are shown in table 2.

Column 1 in table 2 shows the coefficients and significance for the regressors for older mothers. Subjective survival probability is found to be statistically negatively associated with parent-child proximity only for the mothers. The group of older mothers who very confident in their survival is less likely to living within 10 miles from their nearest children. The probability of living within 10 miles is also higher for those older mothers with moderate confidence as compared with those with low confidence. But this effect does not register significance at 0.1 level. The coefficients for the interactions between “being widowed” and indicators for subjective survival probability are negative and statistically significant. That is to say that as compared to currently married mothers, those widowed mothers have a greater tendency to live within 10 miles from their nearest children if they have greater confidence in the chance of surviving next 10 years. This tendency is not statistically different between currently married mothers and currently unmarried (or not partnered) mothers due to reasons other than widowhood. Except marital status, none of the interaction terms of subjective survival probability register significance. That is to say we do not have any statistical evidence from my model that the effects of subjective survival probability for older mothers are different across age group, and homeownership.

Table 2. Logit model estimation for probability of living beyond 10 miles from nearest children for older Americans (Robust Estimation)

Living beyond 10 miles	Female	Col (1)		male	Col (2)
	Coef.	P>z		Coef.	P>z
Age 65-74					
Age 75-84	0.124	0.567		0.040	0.866
Age 85+	0.595**	0.044		-0.190	0.573
Subjective Surv. Prob.					
SSP 0.25-0.75	0.222	0.299		-0.331	0.138
SSP 0.75-1.00	0.499**	0.032		-0.166	0.508
Homeownership (ref. own)					
Rent	-0.176	0.447		0.261	0.412
Other	-0.107	0.810		0.027	0.964
Marital status (married or partnered)					
Widowed	-0.225	0.281		-0.654	0.034
Unmarried	0.752**	0.023		-0.287	0.454
Number of marriage	0.319***	0.000		0.408***	0.000
Number of Living children	-0.249***	0.000		-0.225***	0.000
Education	0.167***	0.000		0.210***	0.000
Social security	0.296	0.267		0.114	0.666
Self rated health	-0.011	0.819		-0.003	0.951
ADL	-0.144*	0.067		0.131	0.133
IADL	0.107	0.244		-0.220*	0.076
Logged total non-housing wealth	0.277*	0.075		0.067	0.660
Logged yearly income	0.004	0.823		-0.022	0.152
Black	0.059	0.675		0.015	0.929
Age75-85 * SSP .25-.75	-0.122	0.634		0.134	0.636
Age75-85 * SSP .75-1.00	0.176	0.583		-0.160	0.656
Age85+ * SSP .25-.75	-0.236	0.585		0.693	0.176
Age85+ * SSP .75-1.00	-0.428	0.523		1.645	0.033
rent * SSP .25-.75	-0.067	0.826		0.218	0.587
rent * SSP .75-1.00	-0.537	0.156		-1.343**	0.017
Other * SSP .25-.75	0.336	0.579		-0.419	0.607
Other * SSP .75-1.00	0.290	0.714		1.656	0.312
Unmarried * SSP .25-.75	0.014	0.955		0.495	0.222
Unmarried * SSP .75-1.00	-0.089	0.771		1.303**	0.017
Widowed * SSP .25-.75	-1.185**	0.005		0.852*	0.084
Widowed * SSP .75-1.00	-1.660***	0.000		0.295	0.596
_cons	-4.714**	0.025		-1.664	0.420
obs	2406			1814	

* alpha=0.1; ** alpha=0.05; *** alpha=0.001

Among the controlling variables, dummy variables “aged 85 and over”, “currently widowed” are statistically significant, indicating that being younger and unmarried (other than widowed) are associated with lower probability of living within 10 miles. Logged total non-housing wealth, number of marriage, number of children, level of education and difficulties in ADL are also statistically significant. Among them, greater non-housing wealth, greater number of marriage, higher education level, fewer living children in contact and fewer difficulties in ADL are found to be related to smaller probability of living within 10 miles.

Column 2 in table 2 shows the coefficients and significance for the regressors for older fathers. Main effect of subjective survival probability does not register significance at 0.1 level for older fathers. The coefficients for the interactions between “aged 85 and older” and “having great confidence in survival” are positive and statistically significant. That is to say that as compared to older fathers aged between 65 and 74, the effect of having great confidence (as compared with having low confidence) in the chance of surviving on the probability of live within 10 miles from their nearest children is of greater magnitude for those aged 85 and over.

The coefficients for the interactions between “renter” and “having great confidence in survival” are negative and statistically significant. That is to say that as compared to homeowners, the effect of having great confidence (as compared with having low confidence) in the chance of surviving on the probability of live within 10 miles from their nearest children is of smaller magnitude for those older fathers who are renters.

The coefficients for the interaction between “currently unmarried due to reasons other than widowhood” and “having great confidence in survival”; and interaction between “currently widowed” and “having moderate confidence in survival” are both positive and statistically significant. That is to say that as compared to currently married, the effect of having great confidence (as compared with having low confidence) in the chance of surviving on the probability of live within 10 miles from their nearest children is of greater magnitude for those older fathers who are currently unmarried due to reasons other than widowhood, and the effect of moderate confidence is of greater magnitude for those who are currently windowed.

Among the controlling variables, dummy variable “widowed” are statistically significant, indicating that widowhood are associated with higher probability of living within 10 miles for older fathers. Number of marriage, number of children, level of education and difficulties in ADL are also statistically significant. Among them, greater number of marriage, higher education level, fewer living children in contact and fewer difficulties in ADL are found to be related to smaller probability of living within 10 miles.

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Appendix 1.

C′ has to fall on the right to C, since marginal utility of any given proximity will get higher when parent's health deteriorates. The following calculation helps us to see this. For any given S^*,

$$\frac{\partial U^p}{\partial(S)}|_{H=1} > \frac{\partial U^p}{\partial(S)}|_{H=0}, \quad \textit{and} \quad \frac{\partial U^p}{\partial U^k} \times \frac{\partial U^k}{\partial(S)}|_{H=0} = \frac{\partial U^p}{\partial U^k} \times \frac{\partial U^k}{\partial(S)}|_{H=1},$$

and consequently

$$\frac{dU^p}{d(S)}|_{H=1} = \frac{\partial U^p}{\partial(S)}|_{H=1} + \frac{\partial U^p}{\partial U^k} \times \frac{\partial U^k}{\partial(S)}|_{H=1} > \frac{\partial U^p}{\partial(S)}|_{H=0} + \frac{\partial U^p}{\partial U^k} \times \frac{\partial U^k}{\partial(S)}|_{H=0} = 0$$

Therefore, at point C, the parent will have incentives to deviate towards a closer proximity until the overall marginal utility becomes zero.