Do Good Kids Finish First?

Characterizing the Bequest Motive in Mexico[1]

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Abstract

This paper tests several leading bequest motive theories using a uniquely appropriate longitudinal data set, the Mexican Health and Aging Study. These data include a population-representative sample of bequests and bequest intentions of parents that is matched with rich measures of child characteristics and behavior. Our results are consistent with the theory of Bernheim et al. that parents use their bequest strategically to induce children to provide services. We also find evidence that contradicts predictions of pure theories of altruism and suggestive evidence that when business assets are at stake, parents favor those children who are most qualified to manage those assets.

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1 Introduction

For the past several decades, bequests have played a central role in economic models of life cycle saving and intergenerational wealth transfer. The amount of money bequeathed each year is considerable. In the United States, most estimates of the annual flow of bequests are in the hundreds of billions of dollars (Gale and Scholz 1994; Wilhelm 1996). In Mexico, we estimate the mean value of an estate to be over 250,000 pesos (about 26,000 USD in 2002) which was more than five times the per capita Mexican GNI in 2000 (World Bank 2008). While there is widespread agreement about the importance of bequests, there is little consensus on why people leave assets when they die or how they decide how these assets should be distributed.

There are several competing theories of bequest motives in the literature, and most yield testable predictions about either the total amounts that people leave or the distribution of those assets or both. The strategic bequest motive, first proposed in Bernheim et al. (1985), posits that parents leave assets to children to compensate them for help, care, or other services. This theory does not always have strong predictions about the equilibrium bequest allocation, but some types of variation among children do imply a positive correlation of services rendered and bequest shares within the household. These services might be physical assistance with daily activities or simply more frequent phone calls and visits than the children would otherwise provide. The altruistic theory of bequests espoused in Barro (1974) and Becker (1974) says that parents leave money to their children because they care about their children's well-being. This theory implies that children, even if they are selfish, will try to maximize the total utility of the family and that parents will leave more assets to the most needy children to equalize consumption across all children.

A third major theory of bequests is the so-called accidental theory that was first proposed by Yaari (1965) and has been more recently championed by Hurd (e.g., Hurd 1987, 1989).

This theory states that individuals are risk-averse and that they die with assets that were saved in case they lived longer than expected or had large unforeseen expenses. Most individuals would get little or no utility from the actual bequest. This theory is not necessarily incompatible with either the strategic bequest motive or the altruistic theory. Because an individual's expected bequest is positive, the individual can still credibly use these assets to induce children to provide services or compensate those that are less well-off. In this paper we also present (and test) three alternative theories of bequest distribution (McGarry 1999; Baker and Miceli 2005; Cox 2003).

To this point, empirical tests of these theories have been inconclusive and mostly confined to developed countries. Most of the existing research that looks at actual bequests is not generalizable to the whole population as it uses tax records that are only collected for very large estates.[2] In this paper we use a uniquely appropriate longitudinal data set, the Mexican Health and Aging Study (MHAS), to test these theories in a developing country context. More than 500 of the 15,000 individuals interviewed in the first wave of the survey had died by the second wave and interviews that collected data about the actual bequest were conducted with next-of-kin. In addition, both waves of MHAS collected comprehensive measures of assets, characteristics of all coresident and non-coresident children, relationships between children and parents, and any bequest plans held by living parents. These data allow us to evaluate a variety of potential determinants of the distribution of bequests at the child level.

In our analysis, we find strong new evidence that is consistent with the strategic bequest motive and evidence that is difficult to reconcile with Becker's theory of altruism. Children that have more schooling than their siblings are more likely to be favored by parents in the bequest as are children who physically assisted them in the last three months of their life. The relative financial situation of each child has no predictive power over the distribution of the

[2] Two exceptions are Behrman and Rosenzweig (2004), which looks at self-reported bequests of twins, and Hurd and Smith (2007) which analyzes next-of-kin interviews in the Health and Retirement Study.

bequest. This pattern of results remains largely the same when we analyze the determinants of the bequest plans of surviving parents with the additional robust finding that children who provide financial assistance are also more likely to receive a greater than equal share of the parent's planned bequest. We find no evidence of evolutionary motives and the data suggest that when business assets are at stake, parents may favor those children who are most qualified to manage those assets.

The remainder of the paper proceeds as follows. Section 2 defines and describes the leading theories of bequest motives and summarizes the existing evidence for and against each one. Section 2 also discusses the implications of these theories for observed relationships between child behavior and characteristics, and bequest shares. Section 3 discusses the Mexican context and Section 4 describes the relevant features of the MHAS data. Section 5 describes our research design, Section 6 presents our empirical results and Section 7 concludes.

2 Theoretical Background

2.1 The Accidental Bequest Motive

The accidental bequest theory is derived from a simple life cycle model of saving. Individuals choose their consumption path (c_t) over the life course to maximize the sum of their expected discounted utility from consumption and any utility they get from leaving wealth as a bequest. More formally, they solve the following optimization problem:

$$\begin{aligned} V(w_s) &= \max_{c_s,\ldots,c_T} \sum_{t=s}^{T} \beta^{t-s}(a_t u(c_t) + m_t b(w_t)) \\ w_{t+1} &= (1+r)w_t + y_t - c_t \end{aligned} \tag{1}$$

$$\begin{aligned} u(c) &= (1-\gamma)^{-1}c^{1-\gamma} \\ b(w_t) &= \alpha w_t \end{aligned}$$

y_t is income, w_t is wealth, a_t is the probability of being alive in period t, m_t is probability of dying in period t, and $b(w_t)$ is the utility received from leaving a bequest of w_t.

If individuals know exactly when they are going to die (i.e., a_t and m_t are 0 or 1 for all t) and they get no explicit utility from leaving a bequest ($b(w_t) = 0$ for all w_t) then they will choose to die with exactly zero assets. However, if individuals face mortality uncertainty and are sufficiently risk-averse, Yaari (1965) shows that they will always die with positive assets even when they have no explicit bequest motive. Hurd (1989) goes on to show that observed individual saving behavior is consistent with a life cycle model containing actual mortality risk, reasonable amounts of risk aversion, and no explicit bequest motive.

Hurd's conclusions are fairly controversial and some recent research has found evidence of an explicit bequest motive. Kopczuk and Lupton (2007) estimate a life cycle model using data from the U.S. Health and Retirement Study (HRS) that allows for heterogeneity in bequest motive. Their findings are consistent with more than three quarters of their sample receiving direct utility from leaving a bequest. Other researchers (Poterba 2001; Page 2003) have found that individuals increase their inter vivos giving when estate taxes are increased; a response that is only consistent with an explicit bequest motive. Finally, it is important to note that the accidental bequest theory takes no stand on how individuals will distribute their sometimes sizable estates. That is, these estates can serve as insurance for a longer than expected life at the same time as they provide assets to reward or compensate heirs.

2.2 Altruism

Altruism was first presented formally as a motivation for bequests in Barro (1974) and Becker (1974). In this model, parents and children play a two stage game. In the first stage, children take actions (a_k) that influence their own income (y_k) as well as the income of their parent (y_P). In the second stage parents make transfer payments to each child through their bequest. Parents value their own consumption and the utility of their children while children are selfish and value only their own consumption:

$$\begin{aligned} \text{Child } k \text{ solves:} \quad & \max_{a_k} U_K(c_k) \\ & \text{s.t. } y_k = f^k(a_k),\ y_P = f^P(a_1, \ldots, a_K) \\ \text{Parent solves:} \quad & \max_{c_1,\ldots,c_K,c_P} U_P(c_P, U_K(c_1), \ldots, U_K(c_K)) \\ & \text{s.t. } c_P + \sum_k c_k = y_P + \sum_k y_k \end{aligned} \tag{2}$$

Because the parent plays second, he or she is able to adjust the consumption of each child using the bequest and each child's consumption will be increasing in the total income for the household. Thus each child will choose an action that maximizes total income in order to maximize his or her own consumption. This will always lead to a Pareto optimum. In addition, if parents value their children equally, they will use bequests to equalize the consumption of each child by giving more to those children who earn less. There is no need for the parent to use the bequest strategically (i.e., reward particular actions) to get exactly what they want.

The main prediction of this theory is that children who are more needy should receive larger shares of the bequest than children who are better off, but empirical research to date has found very little evidence of this. Wilhelm (1996) examines U.S. estate tax data and finds little correlation between a child's earnings and his or her share of the total inheritance. This result does not generalize to the whole population because estate tax is only reported for very high value estates. Researchers have had some success finding support for parental altruism in inter vivos transfers (McGarry and Schoeni 1995, 1997), but even here, other researchers have found inconsistent behavior (Cox 1987; Cox and Rank 1992; Altonji et al. 1997).

2.3 The Strategic Bequest Motive

While the theory of altruism has some intuitive appeal, its prediction of Pareto optimal outcomes relies on the strong assumption of transferable utility. That is, if parents and children value something in addition to consumption that is not losslessly transferable then parents have an incentive to act strategically. Bernheim et al. (1985) use the example of simple contact or visits between parents and children as something that parents might value more highly and want to induce their children to provide more than the children might otherwise choose.

Bernheim et al. augment the Becker model in two ways. First, they allow the children's actions to enter the utility function of both parents and children. While not explicitly stated by Bernheim et al., the incorporation of transferable utility does not change the fact that needier children receive larger bequests and the amount of service provided by children is not correlated with their share of the bequest in equilibrium. The reason is that parents are unable to incentivize children to provide more service than they selfishly want to provide. The second modification introduced by Bernheim et al. addresses this by allowing parents to precommit to a bequest schedule that ties child actions to estate shares. Parents in poor health might want to induce their children to provide physical assistance, and in the same way, parents who own property but are liquidity constrained might value financial transfers from a child while they are alive and reward that child with a share of the bequest when they die.

Because large representative samples of bequests and the characteristics and behavior of the parents and children involved in these bequests are rare, researchers have used more indirect methods to test the strategic bequest theory. In their original paper, Bernheim et al. (1985) find that parents who have more bequeathable assets get more attention from their children than poorer parents, presumably because these parents have more bargaining power. However, when Perozek (1998) used different data and a richer set of controls, she did not find this correlation. Hurd and Smith (2007) find some direct support for the strategic bequest motive in the HRS as children who help their parents with activities of daily living tend to get larger shares of the bequest.

While it may seem obvious that the strategic bequest theory would predict a positive correlation of services provided and bequest share in the household in equilibrium, this is not always the case. For example, if parent and child utility functions are separable and children only differ in their financial situation, parents will sometimes bequeath more to the wealthier child and receive less service from this child. Intuitively, this happens because the price of services from the wealthier child is higher. Similarly, if a parent just happens to prefer one child to the rest, that child may be rewarded by having to provide less service and receiving a higher bequest. On the other hand, if parents have a preference for service from a particular child, this will induce a positive correlation of services and bequests. The theory is silent when parents prefer one child *and* prefer service from that child. These results are presented formally and proven in Appendix A, but the main point is that the strategic bequest theory makes weak predictions about the within family relationship of services and bequests while the competing theories predict a zero correlation of services and bequests after controlling for differences in wealth.

2.4 Alternative Theories

In addition to the three major theories elaborated above, three additional theories that have testable implications have recently been proposed. Baker and Miceli (2005) suggests that in some societies, when business assets such as arable land are at stake, owners will leave such assets to the child that is most qualified to use them. They show that this behavior is rational in the absence of well-functioning asset markets, but that if there are returns to children of rent-seeking, then fixed inheritance rules such as primogeniture or equal division may predominate. Mexico, especially in rural areas, has thin markets for land, so one might expect parents to leave farm businesses to their most able children. This theory is difficult to test because ability is difficult to measure. If the level of formal schooling is a valid proxy for this ability or if children who are coresident have more experience working in the business, then the theory predicts a positive correlation between these characteristics and the bequest share when the parent owns a business.

Cox (2003) suggests that evolutionary biology plays a role in the bequest process as parents should leave more assets to those children that are most likely to propagate their genes. Cox draws out several testable implications of the theory, but the clearest is that parents will favor full biological children over step-children or adopted children. Empirical support thus far has been mixed. Judge and Hrdy (1992) find no linkage using historical estate data from Sacramento, California, but Light and McGarry (2004) find that mothers with only biological children are significantly more likely to plan equal bequests than mothers with stepchildren or adopted children. Hurd and Smith (2007) find further evidence in support of this theory in that step children seem to receive a smaller share of the bequest than fully biological children in the HRS.

While bequests and inter vivos transfers are both ways in which parents transfer resources to children, the observed patterns are quite different. In particular, parents are somewhat more likely to give money to children that experience a decline in their income while no one has yet found any correlation of current income and bequest share. McGarry (1999) proposes that parents use inter vivos transfers to compensate children for negative shocks, and that they use bequests to equalize permanent income. The theory predicts the observed correlation of current income and inter vivos transfers, and if schooling is used as a proxy for permanent income, it also predicts a negative relationship between a child's schooling and their share of the estate. McGarry's empirical work using HRS data finds no correlation of current income and the likelihood of a child being named in the will, but it also finds a positive correlation of schooling and this likelihood which contradicts her theory.

3 Mexican Context

In Mexico, inheritance is generally governed by the local laws of the state in which a person lived at the time of death but local laws often emulate the federal laws. Under the federal law, if an individual has a will she or he must leave support for any children age 18 and younger and children who are unable to work. The will must also make allowances for a surviving spouse if the spouse is unable to work, has not remarried, and lacks sufficient assets to support herself or himself. Finally, the will must also make allowances for any surviving parents or siblings who are age 18 and younger or unable to work (Zamora et al. 2004).

It is very common for individuals to die without a formal will in Mexico. In these cases, relatives of the same degree inherit property that was owned solely in equal parts. A surviving spouse has inheritance rights equal to those of the deceased children. Joint or communally owned property remains owned by the living owner(s). Property accumulated during the marriage is owned jointly unless prenuptial agreements were made. Property owned separately before marriage remains separately owned during the marriage (Zamora et al. 2004).

Beyond the nation's laws, however, there are numerous reasons why developing countries such as Mexico might have different inheritance patterns than those we observe in more developed countries.[3] First, there is much less institutional support for people in old age, which means that many older individuals rely on family support once they leave the labor force. Although government and private sector jobs do provide pension plans, many individuals in Mexico are in the informal or self-employed sector where there are no formal means of old-age support. Overall, only about 30% of men and 15% of women age 60 and older receive any pension support although sex differences disappear if one considers receiving one's own or spouse's pension (30% for women versus 32% for men (Wong and Parker 1999). In addition, there are far fewer market services for elder care such as nursing home facilities or home nursing care. As a result, many older individuals, especially older women, rely on family members in old age.

Families in Mexico are large, especially for those cohorts studied here. In the analytic sample described below, individuals have an average of six children. As individuals age, they become more likely to live in extended households. About 45% of women and 36% of men age 60 and older live with other family members (Wong and Parker 1999). Larger families and coresidence with older members allow for more opportunities for sharing elder care, for bargaining among family members, as well as more opportunities for parents to act strategically towards their children. Of course, these family exchanges might also be constrained by cultural norms about inheritance and property rights. This is particularly relevant in rural areas where inheritances are complicated by land rights (Hamilton 2002).

[3]Fafchamps and Quisumbing (2005) find that in Ethiopia, a much poorer developing country, asset transfers that occur around marriage are larger and more important than bequests, but this does not seem to be the case in Mexico.

4 Data

The analyses presented here use data from two waves of the Mexican Health and Aging Study (MHAS), a longitudinal survey conducted in 2001 and 2003. The sample includes 9,862 households containing at least one person age 50 or older, providing a nationally representative sample of individuals age 50 and older in Mexico. The study interviewed both age-eligible individuals and their partners or spouses if present, for a total sample size of 15,402 respondents.

Similar in design to the Health and Retirement Study in the United States, the survey contains detailed measures of health, assets, labor force participation, and family structure. In both waves, the survey includes information on all coresident and non-coresident children and financial transfers and other assistance exchanges between family members. These measures include the amount of monetary transfers between parents and children and which (if any) children may have assisted with any activities of daily living. In this paper we use the term ADL to mean an activity from the following list: Walking across a room, bathing or showering, eating, getting into or out of bed, and using the toilet. IADL (Instrumental Activity of Daily Living) refers to more complex activities including preparing hot meals, shopping for groceries, taking medications, and managing money.

In 2003, 92% of the original respondents were confirmed to be alive and reinterviewed if possible. An additional 4% (568) were confirmed deceased and 546 next-of-kin interviews were conducted. In these interviews, each next-of-kin was asked about the deceased individual's health in the three months before death and whether the individual received any assistance with ADL's or IADL's from their children during this time. The survey also collected information about financial transfers between the individual and his or her children from 2001 to the time of death.

Most critical to this paper, the next-of-kin reported whether the deceased had made arrangements for the division of his or her assets and which (if any) children received a more than equal share. Up to three different children could be listed. This way of asking about the distribution of the bequest suffers from far less measurement error than if next-of-kin were asked for a detailed accounting of how much each child received. One disadvantage of this approach is that it does not allow respondents to distinguish between a mildly unequal and a very unequal distribution. In addition, it is not possible to represent a a large family that explicitly dis-inherits a small number of children. The favored children are linked back to the appropriate lines in the household roster or the non-coresident child roster. All questions about division of the bequest were only asked when the deceased individual did not leave a surviving spouse.

Living respondents in both waves also reported whether they had plans for the future division of their estates. These plans need not have been written as formal wills. If they had such plans, individuals were asked which (if any) children would receive a more than equal share. If the individual was in a union, one of the partners answered these questions for the couple. This level of detail is unique to MHAS. Even the leading survey of older people in the United States, the Health and Retirement Study, asks respondents whether they have wills and which children appear in the will, but does not ask about less formal bequest plans or which children might be favored in the will.

5 Research Design

The theories of altruism discussed above and some formulations of the strategic bequest theory have strong predictions about the relationship between the characteristics and behavior of children on the one hand and the bequests and bequest plans of parents on the other. In the analyses that follow, we develop econometric models of bequest behavior using the MHAS data to test these predictions.

The analysis uses two samples. The first is a sample of individuals who die between the first and second survey wave and their children. This sample provides information about the observed bequest behavior of parents and their children's characteristics and behavior. The second sample includes individuals who survive the two survey waves and their children. This much larger sample provides information about parents' bequest plans and their children's characteristics and behavior. Both samples allow one to consider recent child behaviors (those in the period before death or in 2003) versus more distal ones (those in 2001).

Most research in this area to date analyzes behavior at the parent level, and often the dependent variable is an indicator for whether the estate was (or is intended to be) divided equally and the independent variables are characteristics of the parent or aggregate characteristics of the set of children. We estimate this type of model for comparison to the existing literature, but the primary contribution of this paper is to analyze bequests at the child-level where individual characteristics of children can be correlated with an indicator for whether a particular child gets a larger than equal share of the bequest. This approach allows much finer-grained hypotheses to be tested.

The theory of altruism predicts that children with higher needs get larger bequests. We measure needs using two variables, education and current financial situation, and test the hypothesis that those with lower education or in a worse financial situation relative to their siblings are actually given a larger than equal bequest (using the deceased sample) or that parents intend to leave these children such a bequest (using the surviving sample). McGarry's integrated theory of inter vivos transfers and bequests has the somewhat different prediction that lower education will predict a larger share but current financial situation will not.

The strategic bequest motive predicts that in the vast majority of families there will be a non-zero correlation of services provided by children and their bequest share. These services might include assistance with daily activities, more frequent contact, or financial transfers if the parent is liquidity constrained. We test these predictions by assessing whether helping with activities of daily living, having very frequent or very infrequent contact and providing financial transfers predict either an actual or planned larger (or smaller) than equal share of the bequest.

While a positive correlation of schooling or coresidence and bequest share could be explained by the most qualified heir theory (Baker and Miceli 2005), these gross relationships have several other potential explanations. A better test of the theory is to compare bequest patterns when the parent does and does not own a business. In particular, this theory predicts higher correlations of these variables when a business is part of the estate. The evolutionary theory posited by Cox (2003) has the strong prediction that step-children or adopted children are less likely to be favored in a bequest than full biological children.

One important concern in these analyses is that unobserved differences across families, for example generosity or vindictiveness, might confound the results. We address this concern by estimating within family fixed effects models that sweep out all observed and unobserved characteristics that are constant within families—an approach that is made possible by analyzing the behavior at the child level.

All of the analyses described to this point use bequest and bequest plan data gathered in 2003, but respondents were also asked about bequest plans in 2001. This enables two additional analyses. First, we estimate a "between" individual variation model using the two year means of all the variables. While this conflates the effects of contemporaneous and lagged characteristics, it provides a measure of the average correlation between child characteristics and how the child is treated in the planned bequest. Second, we net out each child's unobserved fixed attributes by estimating a "within" variation model. That is, we use the differences in variables between the two years in the regressions. Here the coefficient estimates can be interpreted as the effect of a change in behavior or characteristics on the likelihood of receiving a more favorable share of the bequest.

Most economic analyses address the problem of missing data using casewise deletion.

That is, observations that contain any missing variables are removed from the sample. While this method technically requires data to be missing completely at random (MCAR), in practice it is quite robust when data satisfies the weaker missing at random (MAR) assumption (Rubin 1976; Allison 2002). Because the number of MHAS respondents who died between 2001 and 2003 is relatively small (544), we use the method of multiple imputation to increase efficiency by exploiting the information in partial observations. Specifically, we use multiple imputation by chained equations (van Buuren et al. 1999) with ten imputation samples. Like casewise deletion, this method has been shown to perform well when data satisfies the MAR assumption (van Buuren et al. 2005). In addition, all analyses have been performed using casewise deletion and the results are qualitatively and quantitatively nearly identical with the expected slightly larger standard errors. These results are available upon request.

6 Results

6.1 Determinants of Bequests

Parent-level Analysis

Table 1 summarizes the characteristics of 2001 respondents who died before 2003 and had a next-of-kin interview. Multiply imputed descriptive statistics for all variables of interest are shown in the first column.[4] The main analysis sample, shown in the second column, is restricted to the 192 individuals who did not leave a surviving spouse, had at least two living children, and were reported to have left at least some assets when they died.

Because most men in Mexico marry younger women and have a lower life expectancy than their spouses, the analysis sample contains about twice as many women as men. Family sizes

[4]The variables for incidence of IADL's and assistance with them in 2001 are missing in 20% of cases because proxy respondants were not asked about IADL's in 2001. No other variables are missing for more than 10% of the sample.

for this cohort are large—on average about 5.5 children—and 85% of deceased respondents had at least two children. Coresidence of adult children with elderly parents is quite common and 60% of the analysis sample lived with at least one child in 2001. 6% of children are either step-children or adopted children.

MHAS did not collect the value of the deceased's estate in 2003, but the asset measures recorded in 2001 when the individual was alive are comprehensive and serve as a good proxy.[5] Mexico is not considered a rich country, but the estates at stake are sizable. 58% of the analysis sample owned a house, 12% owned a business, and 32% had at least 10,000 pesos of other assets as well. The mean level of total assets is over 250,000 pesos (about 26,000 USD in 2002) and even the median level is over 80,000 pesos (about 8,000 USD in 2002) These amounts would be considered low in the United States, but relative to median monthly earnings of prime age Mexican men in 2002 (about 3,000 pesos or 310 USD; McKee and Todd (2007)) or Mexican GNI in 2000 (about 4,300 2002 USD; World Bank (2008)), they are substantial.

Many of the deceased individuals were in poor health before they died. 44% of the analysis sample reported having difficulty with at least one ADL in 2001 and 57% had difficulty with an IADL. A third received help with an ADL from a child in 2001 and about half received help with an IADL. About two thirds (66%) of the sample received help with an ADL during the three months before they died and about the same fraction (64%) received help in this period with an IADL. Parents received significant financial assistance from children as well with 28% of the analysis sample receiving at least 5,000p from a child between 1999 and 2001. Financial transfers from parents to children are very rare with just one respondent giving 5,000p or more to a child during this period.

According to the next-of-kin, 39% of the deceased respondents in the analysis sample

[5] Hurd and Smith (2007) use HRS data to compare estate values with wealth measures from the wave preceding death and find they are very similar.

made arrangements ahead of time for the division of their estate, and 85% of these individuals left their entire estate their children. 21% (41) of the analysis sample chose to divide their estate unequally between their children.[6] It is possible that the next-of-kin may have been unaware of or misreported the actual division of bequests, but we find no evidence of bias in their reports. Children, who might be expected to have more information and represent two thirds of the next-of-kin, report that the deceased had bequest plans in 42% of cases while next-of-kin who were not children report plans in a not significantly different 33% of cases. Children might also under-report their own share of the bequest but this is not testable because the identity of the child who is next-of-kin is not revealed in the data. What is clear is that next-of-kin who were children and next-of-kin who were not children report similar fractions of unequal bequests (23% vs. 18%).

Table 2 presents the results of three regressions where the observations are deceased parents and the dependent variable is an indicator for whether the parent favored at least one child in the bequest. Some of the theories discussed above predict that families with higher variance in particular child characteristics are more likely to divide their bequest unequally. These tests are weaker than those that compare each child's individual characteristics to their bequest share, but we include them for comparison the the rest of the literature. The models we estimate are linear probability models with state-level fixed effects. The first model contains only characteristics of the parents and the second adds variables for the number, biology, coresidence, and schooling of the children. The third model adds variables describing health and assistance received from or given to children. The initial estimated coefficients are quite stable as the variables are progressively added to the model.

In the most complete model, only two coefficients are significant. Parents that own a business and parents with less than 10,000 pesos of non-housing or business assets are more likely to divide their estate unequally. The first result could be interpreted as evidence for the

[6] In three quarters of the unequal divisions, parents favored exactly one child.

most qualified heir theory, but the second has no obvious interpretation. While it is possible that the sample size is just too small to reveal true latent relationships, it is nonetheless interesting that children's biology, coresidence status and schooling do not significantly predict bequest behavior of parents and none of the health and assistance measures are significantly predictive.

Child-level Analysis

Column one of Table 3 describes the children of the deceased parents analyzed above. These children have substantially more schooling than their parents (7.5 years vs. 2.6 years) and are on average 43 years old. Most are married (83%) and their parents reported in 2001 that 34% of them were in a financial situation that was at least good.

It is common in Mexico for at least one child to live with a parent and 15% of our analysis sample were coresident in 2001. These coresident children are on average five years younger than non-coresident children (39 vs. 44), though only 34% of coresident children are the youngest child. Coresident children are also much less likely to be married (35% vs. 91%) and most (79%) have lived with their parents their whole lives.

There is a good deal of variation in the amount of service children provide to their parents. Few children helped their parent with an ADL or IADL in 2001 (6% and 10%) but these proportions increased to 19% and 16% during the three months before the parent died. One in ten children (11%) gave their parent at least 5,000 pesos in the two years before 2001. 20% of the children were not coresident and lived in a Mexican community different from that of their parent in 2001 and 10% lived outside the country. Extremes in frequency of contact were uncommon. Only 6% of children communicated with their parent once per year or less and 15% of children lived outside the parent's household and talked with their parent at least once per day.

The theories of bequest motives described above have strong predictions about how parents divide their estates between children. Table 4 presents the results of four regressions at the child level where the dependent variable is whether the child received a larger than equal share of the bequest. The first model includes basic characteristics of each child but does not include any characteristics of the parent or the estate itself as these are swept out by the family-level fixed effect. The second model adds measures of assistance provided to the parent in the three months before the 2001 interview, and the third adds assistance measures for the last three months of the parent's life as reported by the next-of-kin. The fourth model includes measures of the child's physical and social distance from the parent.

Becker's theory of altruism predicts that children who have the most need will be compensated in the bequest, but the data do not seem to bear this out. In particular, the financial situation of the child (relative to the other children in the family) is not predictive, while schooling, which can be interpreted as a proxy for permanent income, is positively correlated with receiving a larger bequest share. This result is also at odds with the negative relationship predicted by McGarry's integrated theory. The positive correlation can, however, be considered a sign that the heir best qualified to manage the estate is receiving a higher share.

Some formulations of the strategic bequest motive predict that children who provide services will receive a larger bequest than those who do not. These results provide some evidence for this in that children who helped with an IADL in the last three months of the parent's life are significantly more likely to have received a larger share, but none of the other measures of assistance has a significant effect. Similarly, children who are in contact with the parent once a year or less are significantly less likely to get a larger share. The effect of at least daily contact is positive, but not significant.

Coresidence predicts a 10-11% increase in the likelihood of getting a larger than equal share of the bequest, but this relationship is difficult to interpret. It is possible that those children who live with their parents are most in need of help and thus this positive association is a result of altruism. It is also possible that coresident children provide assistance in unmeasured ways and are reimbursed for this assistance through the bequest, consistent with the predictions of the strategic bequest motive. The significant positive effect for male children that emerges after controlling for assistance measures is difficult to interpret as well, but it may simply be a weak social norm in this society to favor sons.

The strongest prediction of Cox's evolutionary biology theory is that parents will favor children to whom they are genetically linked. These results show a reduction in the bequest share given to step-children or adopted children, but it is not significant.

6.2 Determinants of Bequest Plans

Parent-level Analysis

The results presented to this point are based on relatively small samples of 192 deceased parents and their 1,144 children. It is possible that some relationships predicted by theory are not found in the data due solely to lack of power. We now turn our attention to the much larger sample of surviving parents and their children and analyze their stated bequest plans as opposed to their actual bequests. This sample has the added advantage that the information is self-reported and thus does not suffer from potential next-of-kin reporting bias. Individuals over age 50 who were alive in 2003 and were interviewed in both waves are described in Table 5. The first column includes all respondents who reported bequest plans in 2001 and 2003 and the second restricts the sample to those with at least two children and a positive level of assets in 2003. Relative to the deceased individuals shown in Table 1, the survivors are younger, more educated, healthier, and have substantially more wealth. About one in ten report having bequest plans (11%) and of these, about a third (433 respondents or 4.4% of the total) plan to give at least one of their children a larger than equal share of the estate. More than 90% of those respondents with bequest plans intend to leave all their assets to their spouse (if alive) and/or children.

Table 6 presents results for four models that predict whether parents had unequal bequest plans in 2003. These models are very similar to those used to predict actual bequests in Table 2. The first column includes characteristics of the parent measured in 2001 and the second adds aggregate characteristics of their children. The third and fourth columns add variables for health and assistance in 2001 and 2003 respectively. Even with a much larger sample than that used to model actual bequests above (9,459 vs. 192), few significant relationships emerge. Individuals over age 77 are five percentage points more likely to bequeath unequally. This is not surprising since they are closer to the end of life and are more likely to have any bequest plans at all. Owning a business is no longer a significant predictor of unequal division, and it is difficult to interpret the now positive and significant coefficient on non-house non-business assets. If the parent received a large (over 5,000 peso) transfer from a child, he or she is more likely to plan to divide the estate unequally. This can interpreted as evidence for the strategic bequest motive if parents face binding liquidity constraints.

Child-level Analysis

Child-level analysis of the large sample of bequest plans provides our most powerful results. Characteristics of children of surviving parents are shown in the second column of Table 3. Not surprisingly, these children are younger and more educated than the children of deceased parents shown in the first column. They are also less likely to be married or have children and more likely to live with their parents (27% vs. 15%) than children of deceased parents. In part because their parents are healthier, children of surviving parents rarely help with an ADL or IADL (less than 1%) but they are almost as likely to give significant financial assistance (9% vs. 11%). Contact between parents and non-coresident children in 2001 is very similar between the two samples.

Table 7 shows how child characteristics and behavior predict whether parents plan in

2003 to favor particular children in their bequests. These models are designed to be as comparable as possible to those shown in Table 4 to predict actual bequests. The results show that the determinants of bequest plans are qualitatively similar to the determinants of actual bequests. In general, the magnitudes of effects are smaller, but because of the much larger sample size (53,124 vs. 1,144), the estimates are very precise.

We continue to find little evidence of altruism as a bequest motive. The financial situation of the child is not predictive and schooling has a positive point estimate though it is no longer significant. Being single or having children, which might be considered indicators of need, predict larger (not smaller) shares of the bequest.

In contrast, the evidence for the strategic bequest theory becomes stronger when we look at bequest plans. Four out of the six physical and financial assistance measures are positive and significant predictors of a larger share while just one, help with an ADL in 2001, is significant and negative. In all cases the point estimates are larger for more recent (2003) assistance although this difference is not significant for help with an IADL. This implies that parents may be updating their bequest plans on a regular basis to reward the children that are currently providing help. Measures of physical distance (besides coresidence) and social contact are not significant predictors.

The somewhat weak evidence for the best-qualified heir theory that we found for actual bequests (a significant positive correlation of schooling and bequest share) has disappeared, but this relationship may only hold when certain types of assets are at stake. The insignificant effect of being a step-child or an adopted child again violates the prediction of the Cox's evolutionary theory.

Table 8 presents the results of estimating the most complete model of bequest plans shown in Table 7 for four sub-samples. The first two columns compare the determinants of bequest plans in urban and rural areas and show just two significant differences. Males are more favored in rural areas, perhaps because of stronger social norms, while frequent contact is more likely to be rewarded by parents in urban areas. Urban parents reward children who help with ADL's and IADL's less than rural parents, but this difference is not significant. Urban areas have thicker markets for assistive services and urban parents have more wealth, so it is possible that the value of contact with children, relative to their provision of assistive services, is higher is these areas.

The second two columns divide estates into those that include a business and those that do not. These results weakly support the theory of the most qualified heir. The only significant difference between the samples is a stronger effect of coresidence when a business is at stake, which is predicted by the theory, but we find no difference in the effect of schooling or any other characteristic that could be a proxy for a child's ability to manage a business. In results not shown here, we find little difference in effects between rural and urban businesses.

Table 9 presents the results of estimating "between" and "within" models that exploit the bequest plans reported in 2001 and 2003. The dependent variable in the "between" models is the mean of the two indicators for whether the child would receive a larger than equal share of the bequest and the independent variables are means of the measures of child characteristics and behaviors. These models also include a parent-level fixed effect. The results continue to show a strong positive correlation between measures of assistance and bequest share. In addition, very infrequent contact between parents and children is penalized while frequent contact is rewarded lending further support to the strategic bequest motive. Child's schooling is positively related to bequest share, providing further evidence against theories of alruism, and coresidence, marriage, and presence of children have the same difficult-to-interpret effects as found above.

The "within" models regress the change in the bequest share indicator on the observed changes in child characteristics and behavior, netting out all observed and unobserved fixed characteristics of children. The effects of the first several variables (sex, age, schooling, and genetic relatedness) cannot be estimated as they are constant across the two waves. A zero coefficient estimate is expected if the characteristic or behavior has no causal effect but instead proxies for some unobserved fixed characteristic of the child. A zero is also expected if the parents value lagged characteristics or services as much as recent ones. The significant positive coefficient on financial assistance corroborates the higher effect of recent assistance found above and shown in Table 7. The results also suggest that children who move farther away from their parents between 2001 and 2003 are upgraded in their parents' bequest plans. It is possible that parents are rewarding these children for expected future financial assistance, since better job opportunities are the most common reason for migration. Finally, there is a weakly significant negative effect of becoming married. One possible interpretation of this result is that altruistic parents shift resources to more needy single children, although this is inconsistent with the positive correlation of marriage and bequest share found in most of the above results.

7 Conclusion

The results described above are consistent with the theory of a strategic bequest motive. They show that in Mexico, children who help care for their parents (both physically and financially) are more likely to receive a favorable share of the bequest and that living parents also plan to leave such children a more than equal share when they die. The results contradict the predictions of Becker's theory of altruism as well as McGarry's integrated theory of inter vivos transfers and bequests. More precisely, the evidence is inconsistent with the idea that parents try to equalize the well-being of their children using the bequest. Instead, parents are more likely to leave or plan to leave a larger than equal share to their male children, and to those with more schooling. This could signal a continuation of a family decision to invest unequally in some children (those who got more schooling in the first place) rather than others. This evidence does not imply that parents are not altruistic as the fact that children's utility directly enters the parental utility function is an important part of the strategic bequest motive. The key assumption of the altruistic model that seems to be rejected in the data is that parents and children only value items (like monetary income) that can be transferred losslessly between agents. We find intriguing, but somewhat weak evidence for the most-qualified heir theory posed by Baker and Miceli (2005) as parents are more likely to favor coresident children when their estate includes a business. Finally, we find no evidence that parents treat fully biological children differently than their step-children or adopted children.

Although the data and results described above are particularly well suited to exploring the reasons underlying bequest motives in Mexico they are not without limits. First, the regressions above describe correlations rather than explaining the dynamics of the bequest process. The fixed effect models control for all unobserved and observed characteristics that are constant within families, but do not describe the actual decision making of parents and how this changes over time. The data may also include reporting error by next-of-kin and individuals reported plans for their bequest may differ from what they would actually leave to their children.

In 80% of the bequests observed, parents equally divided their assets between their children and in the U.S., about two thirds of bequests are distributed equally across children (Menchik 1988; Wilhelm 1996). The theories considered above do not explain these facts well. The theory of altruism only predicts equal distribution when all children are in equal financial situations and the strategic theory has this prediction only in very special situations. McGarry's integrated theory predicts equal division when all children have the same expected permanent income. Cox's biological theory predicts equal division in most cases, but it does a poor job of predicting when division is not equal. Only recently have new economic theories been proposed to explain the predominance of equal bequests and none has yet been empirically tested (Lundholm and Ohlsson 2000; Bernheim and Severinov 2003).

Despite these limitations, this study brings to bear unique data that for the first time show how individual child characteristics and behavior influence the bequest plans and actual bequests of parents. Future theories of bequest motives must now explain the new finding that when distribution is unequal within families, children who provide more services tend to receive larger bequests. In addition, it teaches us about inheritance and bequest motives in a setting where the literature on how these decisions are made is quite limited. These issues are particularly salient in developing contexts like Mexico because formal programs for old age support are limited and family members often rely on each other for support throughout the life course.

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Table 1: Characteristics of 2001 respondents who died by 2003

	All		No Surv. Spouse ≥2 Children Had Assets at Death	
	Mean	Std Dev	Mean	Std Dev
Left a surviving spouse	0.46			
Male	0.51		0.35	
Urban	0.65		0.64	
Age (2001)	72.1	12.3	76.6	11.0
Schooling (yrs)	3.2	3.8	2.6	3.3
Interview by proxy (2001)	0.20		0.25	
Next-of-kin is child	0.47		0.68	
Assets (2001):				
Total value	201,893	634,236	255,600	752,084
(median)	(60,239)		(80,096)	
Owned house	0.53		0.58	
Owned business	0.16		0.12	
More than 10,000p other assets	0.34		0.32	
Number of children	5.52	3.35	5.96	2.59
Has $\geq$ 2 children	0.85		1.00	
One or more coresident children (2001)	0.57		0.60	
One or more non-biological children	0.13		0.06	
Max diff. in adult children's schooling	4.66	4.27	5.28	4.13
Health and Assistance (2001):				
Difficulty with ADL (past 3 mths)	0.39		0.44	
Difficulty with IADL (past 3 mths)	0.42		0.57	
Help with ADL (past 3 mths)	0.24		0.33	
Help with IADL (past 3 mths)	0.31		0.50	
Received $\geq$ 5,000p (past 2 yrs)	0.27		0.28	
Gave $\geq$ 5,000p (past 2 yrs)	0.04		0.01	
Assistance before death:				
Help with ADL (last 3 mths)	0.58		0.66	
Help with IADL (last 3 mths)	0.56		0.64	
Made bequest arrangements			0.39	
Favored a child in bequest			0.21	
Number of Observations	544		192	

Source: MHAS 2001, 2003

Missing values imputed using multiple imputation by chained equations.

All amounts are measured in Mexican pesos.

Table 2: Results from linear probability model predicting unequal bequests for sample of deceased parents in 2003

	(1)	(2)	(3)
Male	0.035	0.026	0.023
	(0.059)	(0.062)	(0.065)
Urban	0.061	0.063	0.075
	(0.068)	(0.066)	(0.071)
Age ≥ 77 (2001)	0.016	0.017	0.024
	(0.072)	(0.073)	(0.079)
Schooling 1-6 yrs	0.119†	0.125†	0.118
	(0.066)	(0.070)	(0.073)
Schooling 7+ yrs	0.023	0.016	-0.019
	(0.091)	(0.099)	(0.106)
Interview by proxy (2001)	-0.101	-0.092	-0.116
	(0.078)	(0.083)	(0.106)
Next-of-Kin is child	0.073	0.079	0.071
	(0.073)	(0.079)	(0.081)
Owned house (2001)	0.038	0.038	0.053
	(0.056)	(0.057)	(0.061)
Owned business (2001)	0.196*	0.191†	0.190†
	(0.098)	(0.099)	(0.108)
More than 10,000p other assets (2001)	-0.142†	-0.142†	-0.152†
	(0.082)	(0.084)	(0.081)
One or more non-biological children		0.057	0.071
		(0.126)	(0.136)
One or more coresident children (2001)		-0.012	-0.007
		(0.072)	(0.072)
Number of children		-0.000	-0.001
		(0.014)	(0.015)
Max diff. in adult children's schooling		-0.004	-0.003
		(0.009)	(0.009)
Difficulty with ADL (2001)			0.052
			(0.135)
Difficulty with IADL (2001)			-0.002
			(0.151)
Help with ADL (2001)			-0.200
			(0.133)
Help with IADL (2001)			0.104
			(0.171)
Received ≥ 5,000p (2001)			-0.042
			(0.086)
Gave ≥ 5,000p (2001)			-0.124
			(0.244)
Help with ADL (last 3 mths)			0.043
			(0.088)
Help with IADL (last 3 mths)			-0.042
			(0.071)
Constant	0.075	0.095	0.099
	(0.080)	(0.118)	(0.133)
N	192	192	192

†p<0.10, * p<0.05, ** p<0.01

Source: MHAS 2001, 2003

Standard errors are in parentheses.

Dependent variable is indicator for unequal bequest.

Missing values for independent variables imputed using multiple imputation by chained equations.

Regressions include state-level fixed effects.

Table 3: Characteristics of sample children

	Parent Deceased between 2001 and 2003		Parent Alive in 2003	
	Mean	Std Dev	Mean	Std Dev
Male	0.49		0.50	
Age (2001)	43.1	12.0	31.7	10.3
Schooling (yrs)	7.5	4.7	8.8	4.3
Married (2001)	0.83		0.67	
Has children (2001)	0.85		0.67	
Financial situation $\geq$ Good (2001)	0.34		0.28	
Non-biological child	0.03		0.08	
Coresides with parent (2001)	0.15		0.27	
Assistance (2001):				
Helped with any ADL (past 3 mths)	0.06		0.01	
Helped with any IADL (past 3 mths)	0.10		0.01	
Gave $\geq$ 5,000p (past 2 yrs)	0.11		0.09	
Assistance before death:				
Helped with any ADL (last 3 mths)	0.19			
Helped with any IADL (last 3 mths)	0.16			
Social distance measures (2001):				
In different Mexican community	0.20		0.15	
Outside Mexico	0.10		0.11	
Contact $\leq$ 1/yr	0.06		0.04	
Contact $\geq$ 1/day	0.15		0.18	
Assistance (2003):				
Helped with any ADL (past 3 mths)			0.01	
Helped with any IADL (past 3 mths)			0.01	
Gave $\geq$ 5,000p (past 2 yrs)			0.13	
Social distance measures (2003):				
In different Mexican community			0.16	
Outside Mexico			0.11	
Contact $\leq$ 1/yr			0.04	
Contact $\geq$ 1/day			0.19	
Number of Observations	1144		55124	

Source: MHAS 2001, 2003

Missing values imputed using multiple imputation by chained equations.

Table 4: Results from linear probability model predicting a better than equal share of bequest for sample of children of deceased parents

	(1)	(2)	(3)	(4)
Male	0.020	0.021	0.029†	0.027†
	(0.016)	(0.015)	(0.015)	(0.015)
Youngest	-0.011	-0.010	-0.012	-0.013
	(0.020)	(0.021)	(0.020)	(0.020)
Oldest	-0.005	-0.004	-0.003	-0.002
	(0.023)	(0.023)	(0.023)	(0.024)
Oldest Male	-0.034	-0.034	-0.032	-0.034
	(0.032)	(0.032)	(0.032)	(0.032)
Least Schooling	-0.013	-0.013	-0.012	-0.011
	(0.020)	(0.020)	(0.020)	(0.022)
Most Schooling	0.058**	0.058**	0.057**	0.057**
	(0.021)	(0.021)	(0.021)	(0.021)
Married (2001)	-0.003	-0.001	-0.002	0.001
	(0.027)	(0.028)	(0.028)	(0.028)
Has Children (2001)	0.000	-0.002	0.001	-0.001
	(0.033)	(0.033)	(0.033)	(0.033)
Best Financial Situation (2001)	0.053	0.055	0.049	0.064
	(0.042)	(0.043)	(0.043)	(0.045)
Worst Financial Situation (2001)	0.066	0.066	0.059	0.071
	(0.047)	(0.048)	(0.048)	(0.050)
Non-biological Child	-0.067	-0.068	-0.068	-0.073
	(0.053)	(0.054)	(0.053)	(0.054)
Coresides with Parent (2001)	0.110**	0.107**	0.101**	0.111**
	(0.034)	(0.039)	(0.038)	(0.037)
Helped with ADL (2001)		-0.031	-0.040	-0.040
		(0.053)	(0.053)	(0.053)
Helped with IADL (2001)		0.035	0.009	-0.002
		(0.052)	(0.055)	(0.057)
Gave $\geq$ 5,000p (2001)		0.007	0.004	-0.000
		(0.042)	(0.042)	(0.043)
Helped with ADL (last 3 mths)			-0.002	-0.003
			(0.028)	(0.028)
Helped with IADL (last 3 mths)			0.068†	0.066†
			(0.036)	(0.036)
In different Mexican community (2001)				0.003
				(0.029)
Outside Mexico (2001)				0.037
				(0.053)
Contact $\leq$ 1/yr (2001)				-0.072†
				(0.038)
Contact $\geq$ 1/day (2001)				0.040
				(0.029)
Constant	-0.011	-0.014	-0.023	-0.034
	(0.058)	(0.061)	(0.061)	(0.056)
N	1144	1144	1144	1144

†p<0.10, * p<0.05, ** p<0.01
Source: MHAS 2001, 2003
Standard errors are in parentheses.
Dependent variable is indicator for better-than-average bequest.
Missing values for independent variables imputed using multiple imputation by chained equations.
Regressions include family-level fixed effects.

Table 5: Characteristics of respondents interviewed in both 2001 and 2003

	All		≥2 Children Had Assets in 2003	
	Mean	Std Dev	Mean	Std Dev
Has a spouse (2003)	0.68		0.74	
Male	0.46		0.49	
Urban	0.65		0.65	
Age (2001)	62.4	9.4	61.6	8.8
Schooling (yrs)	4.4	4.4	4.6	4.4
Interview by proxy (2003)	0.09		0.05	
Assets (2003):				
Total value	282,341	612,872	316,301	653,604
(median)	(107,363)		(146,641)	
Owned house	0.59	0.49	0.67	0.47
Owned business	0.21	0.41	0.24	0.43
More than 10,000p other assets	0.46		0.52	
One or more coresident children (2003)	0.68		0.72	
One or more non-biological children	0.12		0.12	
Number of children	5.48	3.15	5.95	2.86
Max diff. in adult children's schooling	4.72	3.81	5.11	3.68
Health and Assistance (2001):				
Difficulty with ADL (past 3 mths)	0.08		0.07	
Difficulty with IADL (past 3 mths)	0.14		0.13	
Help with ADL (past 3 mths)	0.03		0.02	
Help with IADL (past 3 mths)	0.08		0.06	
Received $\geq$ 5,000p (past 2 yrs)	0.24		0.25	
Gave $\geq$ 5,000p (past 2 yrs)	0.10		0.11	
Health and Assistance (2003):				
Difficulty with ADL (past 3 mths)	0.09		0.08	
Help with ADL (past 3 mths)	0.05		0.04	
Difficulty with IADL (past 3 mths)	0.14		0.13	
Help with IADL (past 3 mths)	0.11		0.13	
Received $\geq$ 5,000p (past 2 yrs)	0.33		0.35	
Gave $\geq$ 5,000p (past 2 yrs)	0.11		0.12	
Made bequest plans (2003)	0.11		0.12	
Unequal bequest plans (2003)	0.06		0.04	
Number of Observations	12315		9459	

Source: MHAS 2001, 2003

Missing values imputed using multiple imputation by chained equations.

All amounts are measured in Mexican pesos.

Table 6: Results from linear probability model predicting unequal bequest plans in 2003 for sample of surviving parents with positive assets in 2003

	(1)	(2)	(3)	(4)
Male	-0.004	-0.004	-0.003	-0.003
	(0.003)	(0.003)	(0.003)	(0.004)
Urban	-0.001	-0.001	-0.001	-0.001
	(0.006)	(0.006)	(0.006)	(0.006)
Age $\geq$ 77 (2001)	0.057**	0.057**	0.056**	0.054**
	(0.012)	(0.012)	(0.013)	(0.013)
Schooling 1-6 yrs	-0.002	-0.002	-0.002	-0.001
	(0.006)	(0.006)	(0.006)	(0.006)
Schooling 7+ yrs	-0.006	-0.005	-0.002	-0.001
	(0.008)	(0.008)	(0.008)	(0.008)
Interview by proxy (2003)	-0.014†	-0.015†	-0.015†	-0.006
	(0.008)	(0.008)	(0.008)	(0.014)
Owned house (2003)	0.001	0.001	0.001	0.000
	(0.004)	(0.004)	(0.004)	(0.004)
Owned business (2003)	-0.000	-0.000	0.000	0.001
	(0.005)	(0.005)	(0.005)	(0.005)
More than 10,000p other assets (2003)	0.010†	0.010†	0.011*	0.011*
	(0.005)	(0.005)	(0.005)	(0.005)
One or more nonbiological children		0.007	0.008	0.009
		(0.009)	(0.009)	(0.009)
One or more coresident children (2003)		0.003	0.003	0.003
		(0.006)	(0.006)	(0.006)
Number of children		0.000	0.000	0.000
		(0.001)	(0.001)	(0.001)
Max diff. in adult children's schooling		0.000	0.000	0.000
		(0.001)	(0.001)	(0.001)
Difficulty with ADL (2001)			0.003	0.000
			(0.012)	(0.012)
Difficulty with IADL (2001)			0.001	-0.000
			(0.009)	(0.009)
Help with ADL (2001)			0.005	0.006
			(0.021)	(0.021)
Help with IADL (2001)			0.001	-0.000
			(0.013)	(0.013)
Received $\geq$ 5,000p (2001)			0.006	0.004
			(0.006)	(0.007)
Gave $\geq$ 5,000p (2001)			-0.010	-0.010
			(0.008)	(0.008)
Difficulty with ADL (2003)				0.015
				(0.014)
Help with ADL (2003)				-0.020
				(0.018)
Difficulty with IADL (2003)				0.020
				(0.015)
Help with IADL (2003)				-0.012
				(0.016)
Received $\geq$ 5,000p (2003)				0.013*
				(0.006)
Gave $\geq$ 5,000p (2003)				0.004
				(0.008)
Constant	0.040**	0.032**	0.030**	0.024*
	(0.006)	(0.010)	(0.010)	(0.010)
R-squared	0.006	0.006	0.007	0.008
N	9459	9459	9459	9459

†p<0.10, * p<0.05, ** p<0.01
Source: MHAS 2001, 2003
Standard errors are in parentheses.
Dependent variable is indicator for unequal planned bequest.
Missing values for independent variables imputed using multiple imputation by chained equations.
Regressions include state-level fixed effects.

Table 7: Results from linear probability model predicting a planned better than equal share of bequest for sample of children of surviving parents with positive assets in 2003

	(1)	(2)	(3)	(4)
Male	0.004**	0.004**	0.004**	0.004**
	(0.001)	(0.001)	(0.001)	(0.001)
Youngest	0.006**	0.006**	0.007**	0.007**
	(0.002)	(0.002)	(0.002)	(0.002)
Oldest	0.001	0.001	0.001	0.001
	(0.002)	(0.002)	(0.002)	(0.002)
Oldest Male	-0.002	-0.002	-0.002	-0.002
	(0.003)	(0.003)	(0.003)	(0.003)
Least Schooling	-0.002†	-0.002	-0.002	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)
Most Schooling	0.002	0.002	0.002	0.002
	(0.001)	(0.001)	(0.001)	(0.001)
Married (2001)	0.004†	0.005*	0.005*	0.005*
	(0.002)	(0.002)	(0.002)	(0.002)
Has Children (2001)	-0.006**	-0.006**	-0.006**	-0.006**
	(0.002)	(0.002)	(0.002)	(0.002)
Best Financial Situation (2001)	-0.002	-0.003	-0.003	-0.002
	(0.003)	(0.003)	(0.003)	(0.003)
Worst Financial Situation (2001)	-0.002	-0.002	-0.002	-0.002
	(0.003)	(0.003)	(0.003)	(0.003)
Non-biological Child	-0.004	-0.004	-0.003	-0.003
	(0.004)	(0.004)	(0.004)	(0.004)
Coresides with Parent (2001)	0.015**	0.015**	0.014**	0.014**
	(0.003)	(0.003)	(0.003)	(0.003)
Helped with ADL (2001)		-0.017*	-0.019*	-0.019*
		(0.009)	(0.009)	(0.009)
Helped with IADL (2001)		0.020*	0.018*	0.018*
		(0.008)	(0.008)	(0.008)
Gave $\geq$ 5,000p (2001)		0.006*	0.005†	0.005†
		(0.003)	(0.003)	(0.003)
Helped with ADL (2003)			0.007	0.007
			(0.010)	(0.010)
Helped with IADL (2003)			0.020*	0.020*
			(0.008)	(0.008)
Gave $\geq$ 5,000p (2003)			0.009**	0.009**
			(0.003)	(0.003)
In different Mexican community (2003)				-0.002
				(0.002)
Outside Mexico (2003)				-0.002
				(0.002)
Contact $\leq$ 1/yr (2003)				-0.002
				(0.003)
Contact $\geq$ 1/day (2003)				0.000
				(0.002)
Constant	0.005†	0.004	0.003	0.004
	(0.003)	(0.003)	(0.003)	(0.003)
R-squared	0.008	0.010	0.011	0.011
N	55124	55124	55124	55124

†p<0.10, * p<0.05, ** p<0.01
Source: MHAS 2001, 2003
Standard errors are in parentheses.
Dependent variable is indicator for better-than-average planned bequest.
Missing values for independent variables imputed using multiple imputation by chained equations.
Regressions include family-level fixed effects.

Table 8: Results from linear probability model predicting a planned better than equal share of bequest for four sub-samples of children of surviving parents with positive assets in 2003

	Urban	Rural	Business	No Business
Male	0.000	0.009**	0.006**	0.003†
	(0.002)	(0.002)	(0.002)	(0.002)
Youngest	0.006**	0.007*	0.005	0.007**
	(0.002)	(0.003)	(0.003)	(0.002)
Oldest	0.000	0.001	-0.000	0.001
	(0.002)	(0.002)	(0.003)	(0.002)
Oldest Male	0.001	-0.006	-0.003	-0.002
	(0.003)	(0.004)	(0.004)	(0.003)
Least Schooling	-0.001	-0.004†	-0.003	-0.002
	(0.002)	(0.002)	(0.002)	(0.002)
Most Schooling	0.003†	-0.000	0.002	0.002
	(0.002)	(0.002)	(0.002)	(0.002)
Married (2001)	0.003	0.007†	0.009*	0.003
	(0.003)	(0.004)	(0.004)	(0.003)
Has Children (2001)	-0.009**	-0.002	-0.006†	-0.006*
	(0.003)	(0.003)	(0.003)	(0.003)
Best Financial Situation (2001)	-0.003	-0.001	-0.002	-0.003
	(0.004)	(0.004)	(0.004)	(0.003)
Worst Financial Situation (2001)	-0.001	-0.004	-0.003	-0.002
	(0.004)	(0.004)	(0.004)	(0.003)
Non-biological Child	-0.003	-0.001	0.006	-0.006
	(0.006)	(0.005)	(0.007)	(0.005)
Coresides with Parent (2001)	0.011**	0.016**	0.022**	0.011**
	(0.004)	(0.004)	(0.005)	(0.003)
Helped with ADL (2001)	-0.029**	-0.000	-0.014	-0.021*
	(0.009)	(0.020)	(0.015)	(0.011)
Helped with IADL (2001)	0.017	0.018	0.010	0.020*
	(0.011)	(0.013)	(0.019)	(0.009)
Gave $\geq$ 5,000p (2001)	0.005	0.004	0.001	0.006*
	(0.004)	(0.004)	(0.005)	(0.003)
Helped with ADL (2003)	-0.004	0.027	0.012	0.007
	(0.009)	(0.022)	(0.023)	(0.011)
Helped with IADL (2003)	0.012	0.031*	0.032	0.017*
	(0.010)	(0.013)	(0.024)	(0.008)
Gave $\geq$ 5,000p (2003)	0.010**	0.008*	0.007	0.010**
	(0.004)	(0.004)	(0.005)	(0.003)
In different Mexican community (2003)	-0.003	-0.002	-0.001	-0.003
	(0.003)	(0.003)	(0.003)	(0.002)
Outside Mexico (2003)	-0.001	-0.004	-0.002	-0.002
	(0.003)	(0.002)	(0.003)	(0.002)
Contact $\leq$ 1/yr (2003)	-0.005	0.000	-0.001	-0.002
	(0.004)	(0.004)	(0.004)	(0.004)
Contact $\geq$ 1/day (2003)	0.002	-0.003	-0.002	0.001
	(0.002)	(0.002)	(0.003)	(0.002)
Constant	0.008*	-0.001	-0.001	0.006†
	(0.004)	(0.004)	(0.005)	(0.003)
R-squared	0.011	0.014	0.014	0.011
N	33283	21841	13678	41446

†p<0.10, * p<0.05, ** p<0.01
Source: MHAS 2001, 2003
Standard errors are in parentheses.
Dependent variable is indicator for better-than-average bequest.
Missing values for independent variables imputed using multiple imputation by chained equations.
Regressions include family-level fixed effects.

Table 9: Results from "between" and "within" models predicting a planned better than equal share of bequest for sample of children of surviving parents with positive assets in 2003

	Between			Within		
	(1)	(2)	(3)	(4)	(5)	(6)
Male	0.004**	0.003**	0.003**			
	(0.001)	(0.001)	(0.001)			
Youngest	0.006**	0.006**	0.006**			
	(0.001)	(0.001)	(0.001)			
Oldest	0.002	0.002	0.002			
	(0.001)	(0.001)	(0.001)			
Oldest Male	-0.002	-0.002	-0.002			
	(0.002)	(0.002)	(0.002)			
Least Schooling	-0.002	-0.001	-0.001			
	(0.001)	(0.001)	(0.001)			
Most Schooling	0.003**	0.003*	0.003*			
	(0.001)	(0.001)	(0.001)			
Non-biological Child	-0.002	-0.001	0.000			
	(0.003)	(0.003)	(0.003)			
Married	0.003	0.004†	0.004†	-0.004†	-0.003†	-0.003†
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Has Children	-0.006**	-0.005**	-0.006**	0.001	0.001	0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Best Financial Situation	-0.005	-0.006†	-0.005†	-0.000	-0.000	-0.000
	(0.003)	(0.003)	(0.003)	(0.001)	(0.001)	(0.001)
Worst Financial Situation	-0.006†	-0.006†	-0.005	0.001	0.001	0.001
	(0.003)	(0.003)	(0.003)	(0.001)	(0.001)	(0.001)
Coresides with Parent	0.018**	0.017**	0.019**	0.001	0.001	0.004
	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)
Helped with ADL		0.004	0.004		0.010	0.010
		(0.011)	(0.011)		(0.007)	(0.007)
Helped with IADL		0.031**	0.030**		0.001	0.001
		(0.009)	(0.009)		(0.005)	(0.005)
Gave $\geq$ 5,000p		0.018**	0.017**		0.005**	0.005**
		(0.003)	(0.003)		(0.002)	(0.002)
In different Mexican community			-0.000			0.004*
			(0.002)			(0.002)
Outside Mexico			0.005*			0.005*
			(0.002)			(0.003)
Contact $\leq$ 1/yr			-0.010**			-0.003
			(0.004)			(0.003)
Contact $\geq$ 1/day			0.004*			0.002
			(0.002)			(0.001)
Constant	0.007**	0.004	0.003	-0.001*	-0.001*	-0.001*
	(0.003)	(0.003)	(0.003)	(0.001)	(0.001)	(0.001)
R-squared	0.016	0.020	0.021	0.000	0.000	0.001
N	52443	52443	52443	52443	52443	52443

†p<0.10, * p<0.05, ** p<0.01
Source: MHAS 2001, 2003
Standard errors are in parentheses.
Dependent variable in between regressions is average of 2001 and 2003 indicators for better-than-average bequest.
Dependent variable in within regressions is difference of 2001 and 2003 indicators for better-than-average bequest.
Independent variables are averages in the between regressions and differences in the within regressions.
Missing values for independent variables imputed using multiple imputation by chained equations.

Appendix A: Theoretical Results

Bernheim et al. (1985) define the strategic bequest motive model as having $N+1$ actors with the following utility functions:

Parent: $U(c, a_1, \ldots, a_N, U_1(a_1, c_1), \ldots, U_N(a_N, c_N))$

Child i **of** N : $U_i(a_i, c_i)$

These actors play the following three stage game:

Stage 1: Parent decides how much to consume and creates a rule mapping actions to bequests such that $c_p + \sum b_i$ equals total parental income y_p.

Stage 2: Children simultaneously decide $a_1, \ldots, a_N$

Stage 3: Parent dies and assets are divided according to rule. Each child i gets $U_i(a_i, c_i + b_i)$

Children may have different utility functions and different amounts of initial income. Bernheim et al. (1985) show that the equilibrium allocation of this game is the same as the optimal outcome from an alternative model where the parent optimizes her utility by choosing an allocation that satisfies each child's IR constraint. The results shown here assume there are exactly two children, but can be easily generalized to N children.

In the simpler alternative model, parents solve the following optimization problem:

$$\begin{aligned} \max_{a_1,a_2,b_1,b_2} \quad & U(y_p - b_1 - b_2, a_1, a_2, U_1(a_1, \underline{c_1} + b_1), U_2(a_2, \underline{c_2} + b_2)) \\ \text{s.t.} \quad & U_1(a_1, \underline{c_1} + b_1) \geq U_1(\underline{a_1}, \underline{c_1}) \\ & U_2(a_2, \underline{c_2} + b_2) \geq U_2(\underline{a_2}, \underline{c_2}) \end{aligned}$$

The corresponding Lagrangian is:

$$\begin{aligned} L \;=\; & U(y_p - b_1 - b_2, a_1, a_2, U_1(a_1, \underline{c_1} + b_1), U_2(a_2, \underline{c_2} + b_2)) \\ & + \lambda_1(U_1(a_1, \underline{c_1} + b_1) - U_1(\underline{a_1}, \underline{c_1})) \\ & + \lambda_2(U_2(a_2, \underline{c_2} + b_2) - U_2(\underline{a_2}, \underline{c_2})) \end{aligned}$$

The first order conditions corresponding to bequest choices are:

$$\begin{aligned} (\frac{\partial U}{\partial U_1} + \lambda_1)\frac{\partial U_1}{\partial c_1} &= \frac{\partial U}{\partial c_p} \\ (\frac{\partial U}{\partial U_2} + \lambda_2)\frac{\partial U_2}{\partial c_2} &= \frac{\partial U}{\partial c_p} \end{aligned}$$

The first order conditions corresponding to child actions are:

$$\begin{aligned}\frac{\partial U}{\partial a_1}+(\frac{\partial U}{\partial U_1}+\lambda_1)\frac{\partial U_1}{\partial a_1} &= 0\\ \frac{\partial U}{\partial a_2}+(\frac{\partial U}{\partial U_2}+\lambda_2)\frac{\partial U_2}{\partial a_2} &= 0\end{aligned}$$

The remaining first order conditions are:

$$\begin{aligned}\lambda_1(U_1(a_1,\underline{c_1}+b_1)-U_1(\underline{a_1},\underline{c_1})) &= 0\\ \lambda_2(U_2(a_2,\underline{c_2}+b_2)-U_2(\underline{a_2},\underline{c_2})) &= 0\\ \lambda_1 &\geq 0\\ \lambda_2 &\geq 0\end{aligned}$$

Summary of Results:

If all children are identical, parents care about them equally, and parents do not care who provides services, then all children will provide the same amount of services and receive equal bequests (Proposition 1). I examine four types of variation in which the model can predict unequal equilibrium allocations.

Children have different endowments: If child one is wealthier, then either $a_1 = a_2$ and $b_1 < b_2$ OR $a_1 < a_2$ and $\underline{c_1} + b_1 > \underline{c_2} + b_2$. That is, there is no strong prediction for the correlation of bequest share and services provided among children in a household (Proposition 2).

Children face different costs of providing services: If child one has a lower marginal cost of performing the action but preferences are otherwise identical, then there is no strong prediction for the correlation of bequest share and services provided among children in a household (Proposition 3).

Parents prefer one child over another: If child one is preferred, then $a_1 = a_2$ and $b_1 = b_2$ OR $a_1 < a_2$ and $b_1 > b_2$. That is, action and bequest are negatively correlated (Proposition 4).

Parents prefer getting service from one child relative to another: If parents prefer getting service from child one, then $a_1 > a_2$ and $b_1 > b_2$. That is, action and bequest are positively correlated (Proposition 5).

Assumptions:

The assumptions defined here are used below in different combinations to show properties of the model.

Assumption A1 *Parental utility is increasing in consumption, actions, and child utility, and marginal utility is decreasing in all of these:*

$$\begin{array}{lll} \frac{\partial U}{\partial c_p} > 0, & \frac{\partial U}{\partial a_i} > 0, & \frac{\partial U}{\partial U_i} > 0, \\ \frac{\partial^2 U}{\partial c_p^2} < 0, & \frac{\partial^2 U}{\partial a_i^2} < 0, & \frac{\partial^2 U}{\partial U_i^2} < 0 \ \forall i \in \{1,2\} \end{array}$$

Assumption A2 *Children's utility is increasing in consumption and decreasing in the action. The marginal utility of consumption is decreasing and the marginal disutility of the action is increasing:*

$$\begin{array}{ll} \frac{\partial U_i}{\partial c} > 0, & \frac{\partial U_i}{\partial a} < 0, \\ \frac{\partial^2 U_i}{\partial c^2} < 0, & \frac{\partial^2 U_i}{\partial a^2} < 0 \ \forall i \in \{1,2\} \end{array}$$

Assumption A3 *Parental utility is separable in actions and altruism:*

$$\frac{\partial(\partial U/\partial a_i)}{\partial U_j} = 0, \frac{\partial(\partial U/\partial U_i)}{\partial a_j} = 0 \ \forall i \in \{1,2\} \text{ and } \forall j \in \{1,2\}$$

Assumption A4 *Child utility is separable in action and consumption:*

$$\frac{\partial(\partial U_i/\partial a)}{\partial c} = 0, \frac{\partial(\partial U_i/\partial c)}{\partial a} = 0 \ \forall i \in \{1,2\}$$

Assumption A5 *Parents value children's utility equally:*

$$U(c_p, a_1, a_2, U_1, U_2) = U(c_p, a_1, a_2, U_2, U_1) \ \forall c_p, a_1, a_2, U_1, U_2$$

Assumption A6 *Parents value services from each child equally:*

$$U(c_p, a_1, a_2, U_1, U_2) = U(c_p, a_2, a_1, U_2, U_1) \ \forall c_p, a_1, a_2, U_1, U_2$$

Assumption A7 *Children have identical utility functions:*

$$U_1(a,c) = U_2(a,c) \ \forall a, c$$

Assumption A8 *Children have identical endowments:*

$$\underline{c_1} = \underline{c_2}$$

Assumption A9 *Children have preferences that differ such that $U_1(a,c) = U_c(a,c) - ak_1$ and $U_2 = U_c(a,c) - ak_2$ and $k_1 < k_2$. k_1 and k_2 can be interpreted as different costs of providing service. U_c is concave and decreasing in a and is separable, concave, and increasing in c. In the absence of a bequest each child will choose $\underline{a_i}$ so that their marginal disutility of service equals the same exogenous constant.*

Propositions and Proofs:

All propositions take as given the basic assumptions about monotonicity, concavity, and separability of utility functions (A1–A4).

Proposition 1 *Suppose parents don't have favorites (A5,A6) and children have identical utility functions and endowments (A7, A8). In the equilibrium allocation,* $a_1 = a_2$ *and* $b_1 = b_2$.

Proof

Case 1: Suppose no constraints bind ($\lambda_1 = \lambda_2 = 0$).

The bequest FOC's can be arranged to give:

$$\frac{\partial U}{\partial U_1}\frac{\partial U_c}{\partial c}(a_1, \underline{c} + b_1) = \frac{\partial U}{\partial U_2}\frac{\partial U_c}{\partial c}(a_2, \underline{c} + b_2)$$

Similarly, the action FOC's can be arranged to give:

$$\frac{\frac{\partial U}{\partial a_1}}{\frac{\partial U}{\partial a_2}} = \frac{\frac{\partial U}{\partial U_1}(-\frac{\partial U_c}{\partial a}(a_1, \underline{c} + b_1))}{\frac{\partial U}{\partial U_2}(-\frac{\partial U_c}{\partial a}(a_2, \underline{c} + b_2))}$$

Case 1.1: Suppose $U_1 = U_2$.

By the bequest FOC's, $b_1 = b_2$, and by the action FOC's we have:

$$\frac{\frac{\partial U}{\partial a_1}}{\frac{\partial U}{\partial a_2}} = \frac{-\frac{\partial U_c}{\partial a}(a_1, \underline{c} + b_1)}{-\frac{\partial U_c}{\partial a}(a_2, \underline{c} + b_2)}$$

This can only hold when $a_1 = a_2$.

Case 1.2: Without loss of generality, suppose $U_1 > U_2$.

This implies $\frac{\partial U}{\partial U_1} < \frac{\partial U}{\partial U_2}$ which combined with the consumption FOC's yields:

$$\begin{aligned}\frac{\partial U_c}{\partial c}(a_1, \underline{c} + b_1) &> \frac{\partial U_c}{\partial c}(a_2, \underline{c} + b_2)\\ \underline{c} + b_1 &< \underline{c} + b_2\\ b_1 &< b_2\end{aligned}$$

If $a_1 \geq a_2$, then $U_1(a_1, \underline{c} + b_1) < U_2(a_2, \underline{c} + b_2)$. Contradiction.

Combining $\frac{\partial U}{\partial U_1} < \frac{\partial U}{\partial U_2}$ with the action FOC's yields:

$$\frac{\frac{\partial U}{\partial a_1}}{\frac{\partial U}{\partial a_2}} < \frac{-\frac{\partial U_c}{\partial a}(a_1, \underline{c} + b_1)}{-\frac{\partial U_c}{\partial a}(a_2, \underline{c} + b_2)}$$

This can only hold when $a_1 > a_2$, but this would imply $U_1 < U_2$. Contradiction.

Therefore, if no constraints bind (Case 1), $a_1 = a_2$ and $b_1 = b_2$.

Case 2: Suppose both constraints bind ($\lambda_1 > 0, \lambda_2 > 0$).

$$\begin{aligned} U_c(a_1, \underline{c} + b_1) &= U_c(\underline{a}, \underline{c}) \\ U_c(a_2, \underline{c} + b_2) &= U_c(\underline{a}, \underline{c}) \\ U_1 &= U_2 \end{aligned}$$

This implies EITHER $a_1 = a_2$ and $b_1 = b_2$ OR $a_1 > a_2$ and $b_1 > b_2$ OR $a_1 < a_2$ and $b_1 < b_2$.

From the bequest FOC's, we know:

$$(\frac{\partial U}{\partial U_1} + \lambda_1)\frac{\partial U_c}{\partial c}(a_1, \underline{c} + b_1) = (\frac{\partial U}{\partial U_2} + \lambda_2)\frac{\partial U_c}{\partial c}(a_2, \underline{c} + b_2)$$

Without loss of generality, suppose $b_1 > b_2$ and $a_1 > a_2$.

This implies $\frac{\partial U_c}{\partial c}(a_1, \underline{c} + b_1) < \frac{\partial U_c}{\partial c}(a_2, \underline{c} + b_2)$, and combining this with the above yields:

$$\frac{\partial U}{\partial U_1} + \lambda_1 > \frac{\partial U}{\partial U_2} + \lambda_2$$

From the action FOC's, we know:

$$\frac{\partial U}{\partial a_1} + (\frac{\partial U}{\partial U_1} + \lambda_1)\frac{\partial U_c}{\partial a}(a_1, \underline{c} + b_1) = \frac{\partial U}{\partial a_2} + (\frac{\partial U}{\partial U_2} + \lambda_2)\frac{\partial U_c}{\partial a}(a_2, \underline{c} + b_2)$$

$a_1 > a_2$ implies $\frac{\partial U}{\partial a_1} < \frac{\partial U}{\partial a_2}$ and combining this with the above yields:

$$\begin{aligned} (\frac{\partial U}{\partial U_1} + \lambda_1)\frac{\partial U_c}{\partial a}(a_1, \underline{c} + b_1) &> (\frac{\partial U}{\partial U_2} + \lambda_2)\frac{\partial U_c}{\partial a}(a_2, \underline{c} + b_2) \\ (\frac{\partial U}{\partial U_1} + \lambda_1)(-\frac{\partial U_c}{\partial a}(a_1, \underline{c} + b_1)) &< (\frac{\partial U}{\partial U_2} + \lambda_2)(-\frac{\partial U_c}{\partial a}(a_2, \underline{c} + b_2)) \\ -\frac{\partial U_c}{\partial a}(a_1, \underline{c} + b_1) &< -\frac{\partial U_c}{\partial a}(a_2, \underline{c} + b_2) \\ a_1 &< a_2 \end{aligned}$$

This last step contradicts the above assumption that $a_1 > a_2$.

Under these assumptions it is not possible for just one constraint to bind and therefore, when the constraints bind (and when they do not bind), $a_1 = a_2$ and $b_1 = b_2$. ∎

Proposition 2 *Suppose parents don't have favorites (A5,A6) and children have identical utility functions (A7), but child one has a higher endowment than child two ($\underline{c_1} > \underline{c_2}$). In the equilibrium allocation, either $a_1 = a_2$ and $b_1 < b_2$ OR $a_1 < a_2$ and $\underline{c_1} + b_1 > \underline{c_2} + b_2$. That is, there is no strong prediction for the correlation of bequest share and services provided among children in a household.*

Proof

Case 1: Neither constraint binds ($\lambda_1 = \lambda_2 = 0$).

The bequest and action first order conditions tell us that:

$$\begin{aligned}
\frac{\partial U}{\partial U_1}\frac{\partial U_c}{\partial c}(a_1, \underline{c_1} + b_1) &= \frac{\partial U}{\partial U_2}\frac{\partial U_c}{\partial c}(a_2, \underline{c_2} + b_2) \\
\frac{\frac{\partial U}{\partial a_1}}{\frac{\partial U}{\partial a_2}} &= \frac{\frac{\partial U}{\partial U_1}(-\frac{\partial U_c}{\partial a}(a_1, \underline{c_1} + b_1))}{\frac{\partial U}{\partial U_2}(-\frac{\partial U_c}{\partial a}(a_2, \underline{c_2} + b_2))}
\end{aligned}$$

Case 1.1: Suppose $U_1 = U_2$.

By the bequest FOC's, $\underline{c_1} + b_1 = \underline{c_2} + b_2$ which implies $b_1 < b_2$. Combining with the action FOC's yields:

$$\frac{\frac{\partial U}{\partial a_1}}{\frac{\partial U}{\partial a_2}} = \frac{-\frac{\partial U_c}{\partial a}(a_1, \underline{c_1} + b_1)}{-\frac{\partial U_c}{\partial a}(a_2, \underline{c_2} + b_2))}$$

This can only hold if $a_1 = a_2$.

Case 1.2: Suppose $U_1 > U_2$.

This implies:

$$\frac{\partial U}{\partial U_1} < \frac{\partial U}{\partial U_2}$$

Combining with the bequest FOC's yields:

$$\begin{aligned}
\frac{\partial U_c}{\partial c}(a_1, \underline{c_1} + b_1) &> \frac{\partial U_c}{\partial c}(a_2, \underline{c_2} + b_2) \\
\underline{c_1} + b_1 &< \underline{c_2} + b_2
\end{aligned}$$

Combining with the action FOC's yields:

$$\frac{\frac{\partial U}{\partial a_1}}{\frac{\partial U}{\partial a_2}} < \frac{-\frac{\partial U_c}{\partial a}(a_1, \underline{c_1} + b_1)}{-\frac{\partial U_c}{\partial a}(a_2, \underline{c_2} + b_2)}$$

This can only hold when $a_1 \geq a_2$, but this implies $U_1 \leq U_2$. Contradiction.

Case 1.3: Suppose $U_1 < U_2$

This implies $\frac{\partial U}{\partial U_1} > \frac{\partial U}{\partial U_2}$ and combining this with the bequest FOC's yields:

$$\begin{aligned}
\frac{\partial U_c}{\partial c}(a_1, \underline{c_1} + b_1) &< \frac{\partial U_c}{\partial c}(a_2, \underline{c_2} + b_2) \\
\underline{c_1} + b_1 &> \underline{c_2} + b_2
\end{aligned}$$

Combinging with the action FOC's yields:

$$\frac{\frac{\partial U}{\partial a_1}}{\frac{\partial U}{\partial a_2}} > \frac{-\frac{\partial U_c}{\partial a}(a_1, \underline{c_1} + b_1)}{-\frac{\partial U_c}{\partial a}(a_2, \underline{c_2} + b_2)}$$

This can only hold when $a_1 \leq a_2$, but this implies $U_1 \geq U_2$. Contradiction.

Therefore, if neither constraint binds (Case 1), parents equalize child utility and $b_1 < b_2$ and $a_1 = a_2$.

Case 2: Both constraints bind ($\lambda_1 > 0, \lambda_2 > 0$)

The consumption and action first order conditions tell us that:

$$\begin{aligned}(\frac{\partial U}{\partial U_1} + \lambda_1)\frac{\partial U_c}{\partial c}(a_1, \underline{c_1} + b_1) &= (\frac{\partial U}{\partial U_2} + \lambda_2)\frac{\partial U_c}{\partial c}(a_2, \underline{c_2} + b_2) \\ \frac{\frac{\partial U}{\partial a_1}}{\frac{\partial U}{\partial a_2}} &= \frac{(\frac{\partial U}{\partial U_1} + \lambda_1)(-\frac{\partial U_c}{\partial a}(a_1, \underline{c_1} + b_1))}{(\frac{\partial U}{\partial U_2} + \lambda_2)(-\frac{\partial U_c}{\partial a}(a_2, \underline{c_2} + b_2))}\end{aligned}$$

Because both constraints bind and child one has a better outside option, this child will get higher utility in equilibrium:

$$U_c(a_1, \underline{c_1} + b_1) > U_c(a_2, \underline{c_2} + b_2)$$

This implies $a_1 < a_2$ or $\underline{c_1} + b_1 > \underline{c_2} + b_2$ or both. I now show that either condition implies the other so both must be true.

First suppose $a_1 < a_2$. This implies $\frac{\partial U}{\partial a_1} > \frac{\partial U}{\partial a_2}$ and $-\frac{\partial U_c}{\partial a}(a_1, \underline{c_1} + b_1) > -\frac{\partial U_c}{\partial a}(a_2, \underline{c_2} + b_2)$. Combining these two facts with the action FOC's yields:

$$\frac{\partial U}{\partial U_1} + \lambda_1 > \frac{\partial U}{\partial U_2} + \lambda_2$$

Combining this with the bequest FOC's yields:

$$\frac{\partial U_c}{\partial c}(a_1, \underline{c_1} + b_1) < \frac{\partial U_c}{\partial c}(a_2, \underline{c_2} + b_2)$$

which implies $\underline{c_1} + b_1 > \underline{c_2} + b_2$.

Now instead, suppose that $\underline{c_1} + b_1 > \underline{c_2} + b_2$. This implies:

$$\frac{\partial U_c}{\partial c}(a_1, \underline{c_1} + b_1) < \frac{\partial U_c}{\partial c}(a_2, \underline{c_2} + b_2)$$

Combining this with the bequest FOC's yields:

$$\frac{\partial U}{\partial U_1} + \lambda_1 > \frac{\partial U}{\partial U_2} + \lambda_2$$

Combining this with the action FOC's yields:

$$\frac{\frac{\partial U}{\partial a_1}}{\frac{\partial U}{\partial a_2}} > \frac{-\frac{\partial U_c}{\partial a}(a_1, \underline{c_1} + b_1)}{-\frac{\partial U_c}{\partial a}(a_2, \underline{c_2} + b_2)}$$

This can only hold when $a_1 < a_2$.

So, if both constraints bind (Case 2), then $a_1 < a_2$ and $\underline{c_1} + b_1 > \underline{c_2} + b_2$. Note that in this case there is no firm prediction about which child will get a larger share of the bequest.

Case 3: Constraint for child one binds and constraint for child two does not ($\lambda_1 > 0, \lambda_2 = 0$).

There is no immediate prediction for which child has higher utility, so I proceed case by case.

Case 3.1 Suppose $U_1 \leq U_2$.

This implies $\frac{\partial U}{\partial U_1} \geq \frac{\partial U}{\partial U_2}$ which in turn implies $\frac{\partial U}{\partial U_1} + \lambda_1 \geq \frac{\partial U}{\partial U_2}$.

Combining this with the bequest FOC's yields:

$$\begin{aligned} \frac{\partial U_c}{\partial c}(a_1, \underline{c_1} + b_1) &< \frac{\partial U_c}{\partial c}(a_1, \underline{c_1} + b_1) \\ \underline{c_1} + b_1 &> \underline{c_2} + b_2 \end{aligned}$$

Combining with the action FOC's yields:

$$\frac{\frac{\partial U}{\partial a_1}}{\frac{\partial U}{\partial a_2}} > \frac{-\frac{\partial U_c}{\partial a}(a_1, \underline{c_1} + b_1)}{-\frac{\partial U_c}{\partial a}(a_2, \underline{c_2} + b_2)}$$

This can only hold when $a_1 < a_2$, but combining this with $\underline{c_1} + b_1 > \underline{c_2} + b_2$ implies $U_1(a_1, \underline{c_1} + b_1) > U_2(a_2, \underline{c_2} + b_2)$. Contradiction.

Case 3.2: Suppose $U_1 > U_2$.

There is no immediate prediction for the relation of $\frac{\partial U}{\partial U_1} + \lambda_1$ and $\frac{\partial U}{\partial U_2}$ so again, I proceed case by case.

Case 3.2.1: Suppose $\frac{\partial U}{\partial U_1} + \lambda_1 \leq \frac{\partial U}{\partial U_2}$.

By the bequest FOC's, this implies:

$$\begin{aligned} \frac{\partial U_c}{\partial c}(a_1, \underline{c_1} + b_1) &\geq \frac{\partial U_c}{\partial c}(a_2, \underline{c_2} + b_2) \\ \underline{c_1} + b_1 &\leq \underline{c_2} + b_2 \end{aligned}$$

By the action FOC's, we have:

$$\frac{\frac{\partial U}{\partial a_1}}{\frac{\partial U}{\partial a_2}} \leq \frac{-\frac{\partial U_c}{\partial a}(a_1, \underline{c_1} + b_1)}{-\frac{\partial U_c}{\partial a}(a_2, \underline{c_2} + b_2)}$$

This can only be true if $a_1 \geq a_2$, but combining with $\underline{c_1} + b_1 \leq \underline{c_2} + b_2$ implies $U_c(a_1, \underline{c_1} + b_1) \leq U_c(a_2, \underline{c_2} + b_2)$ which contradicts the supposition of Case 3.2.

Case 3.2.2: Suppose $\frac{\partial U}{\partial U_1} + \lambda_1 > \frac{\partial U}{\partial U_2}$.

By the bequest FOC's, this implies:

$$\begin{aligned} \frac{\partial U_c}{\partial c}(a_1, \underline{c_1} + b_1) &< \frac{\partial U_c}{\partial c}(a_2, \underline{c_2} + b_2) \\ \underline{c_1} + b_1 &> \underline{c_2} + b_2 \end{aligned}$$

By the action FOC's, we have:

$$\frac{\frac{\partial U}{\partial a_1}}{\frac{\partial U}{\partial a_2}} > \frac{-\frac{\partial U_c}{\partial a}(a_1, \underline{c_1} + b_1)}{-\frac{\partial U_c}{\partial a}(a_2, \underline{c_2} + b_2)}$$

This can only be true if $a_1 < a_2$, and this is perfectly consistent with the supposition (Case 3.2) that the wealthier child achieves higher utility.

Therefore, when the constraint for child one binds and the one for child two does not (Case 3), we have $\underline{c_1} + b_1 > \underline{c_2} + b_2$ and $a_1 < a_2$.

Case 4: Constraint for child one does not bind and constraint for child two does ($\lambda_1 = 0, \lambda_2 > 0$).

These constraints imply that $U_1 > U_2$ which in turn implies that $\frac{\partial U}{\partial U_1} < \frac{\partial U}{\partial U_2}$ and thus $\frac{\partial U}{\partial U_1} < \frac{\partial U}{\partial U_2} + \lambda_2$

Combining with the bequest FOC's yields:

$$\begin{aligned} \frac{\partial U_c}{\partial c}(a_1, \underline{c_1} + b_1) &> \frac{\partial U_c}{\partial c}(a_1, \underline{c_1} + b_1) \\ \underline{c_1} + b_1 &< \underline{c_2} + b_2 \end{aligned}$$

Combining with the action FOC's yields:

$$\frac{\frac{\partial U}{\partial a_1}}{\frac{\partial U}{\partial a_2}} < \frac{-\frac{\partial U_c}{\partial a}(a_1, \underline{c_1} + b_1)}{-\frac{\partial U_c}{\partial a}(a_2, \underline{c_2} + b_2)}$$

This can only hold when $a_1 > a_2$, but combining this with $\underline{c_1} + b_1 < \underline{c_2} + b_2$ implies $U_1(a_1, \underline{c_1} + b_1) < U_2(a_2, \underline{c_2} + b_2)$. Contradiction.

Therefore, there is no strong prediction for the correlation of bequest share and services provided among children in a household. ∎

Lemma 1 *Suppose child one faces a lower cost of providing service (A9). In the absence of any bequest, the child who is better off is determined by the functional form of U_c, the difference in costs for the two children and the exogenous disutility of service.*

Proof Suppose $U_c(a, c) = -a^2$. Let the exogenous marginal disutility of action be m.

$$\begin{aligned} U_1(\underline{a_1}) &= -\underline{a_1}^2 - \underline{a_1}k_1 \\ -\frac{\partial U_1}{\partial a} &= 2\underline{a_1} + k_1 \\ 2\underline{a_1} + k_1 &= m \\ \underline{a_1} &= \frac{1}{2}(m - k_1) \end{aligned}$$

$\underline{a_2}$ can be written as a function of $\underline{a_1}$:

$$\begin{aligned} -\frac{\partial U_1}{\partial a} &= -\frac{\partial U_2}{\partial a} \\ 2\underline{a_1} + k_1 &= 2\underline{a_2} + k_2 \\ \underline{a_2} &= \underline{a_1} - \frac{1}{2}(k_2 - k_1) \end{aligned}$$

The utility that child 2 receives can thus also be written as a function of $\underline{a_1}$:

$$\begin{aligned} U_2(\underline{a_2}) &= -\underline{a_2}^2 - k_2 \\ &= -(\underline{a_1} - \frac{1}{2}(k_2 - k_1))^2 - k_2 \\ &= -(\underline{a_1}^2 - (k_2 - k_1)\underline{a_1} + \frac{1}{4}(k_2 - k_1)^2) - k_2 \\ &= -\underline{a_1}^2 + (k_2 - k_1)\underline{a_1} - \frac{1}{4}(k_2 - k_1)^2 - k_2 \end{aligned}$$

We can now write an expression for $U_2 - U_1$ in terms of exogenous variables:

$$\begin{aligned} U_2(\underline{a_2}) - U_1(\underline{a_1}) &= (k_2 - k_1)\underline{a_1} - \frac{1}{4}(k_2 - k_1)^2 - (k_2 - k_1) \\ &= (k_2 - k_1)(\underline{a_1} - \frac{1}{4}(k_2 - k_1) - 1) \\ &= (k_2 - k_1)(\frac{1}{2}(m - k_1) - \frac{1}{4}(k_2 - k_1) - 1) \end{aligned}$$

If the difference in costs is very small relative to $m - k_1$, then $U_2 > U_1$. If the difference in costs is large relative to the size of $m - k_1$, then the second term will be negative and $U_1 > U_2$. If the difference in costs is exactly equal to $2(m - k_1) - 4$ then $U_1 = U_2$. $\blacksquare$

Proposition 3 *Suppose parents don't have favorites (A5,A6) and children have identical endowments (A8), but child one faces a lower cost of performing the action (A9). The correlation of actions and bequests in the equilibrium allocation is determined by functional forms.*

Proof

First note that by Lemma 1 the child who is better off in equilibrium is determined by functional forms and thus we must consider all possibilities.

Case 1: Neither constraint binds ($\lambda_1 = \lambda_2 = 0$).

Case 1.1: Suppose $U_1 = U_2$.

By the bequest FOC's:

$$\begin{aligned}\frac{\partial U_1}{\partial c}(a_1, \underline{c} + b_1) &= \frac{\partial U_2}{\partial c}(a_2, \underline{c} + b_2) \\ \underline{c} + b_1 &= \underline{c} + b_2 \\ b_1 &= b_2\end{aligned}$$

By the action FOC's:

$$\frac{\frac{\partial U}{\partial a_1}}{\frac{\partial U}{\partial a_2}} = \frac{-\frac{\partial U_1}{\partial a}(a_1, \underline{c} + b_1)}{-\frac{\partial U_2}{\partial a}(a_2, \underline{c} + b_2)}$$

This can only hold when $a_1 > a_2$.

Case 1.2: Suppose $U_1 > U_2$.

This implies $\frac{\partial U}{\partial U_1} < \frac{\partial U}{\partial U_2}$ and combining this with the bequest FOC's yields:

$$\begin{aligned}\frac{\partial U_1}{\partial c}(a_1, \underline{c} + b_1) &> \frac{\partial U_2}{\partial c}(a_2, \underline{c} + b_2) \\ \underline{c} + b_1 &< \underline{c} + b_2 \\ b_1 &< b_2\end{aligned}$$

By the action FOC's:

$$\frac{\frac{\partial U}{\partial a_1}}{\frac{\partial U}{\partial a_2}} < \frac{-\frac{\partial U_1}{\partial a}(a_1, \underline{c} + b_1)}{-\frac{\partial U_2}{\partial a}(a_2, \underline{c} + b_2)}$$

This can only hold when $a_1 > a_2$.

Case 1.3: Suppose $U_1 < U_2$.

This implies $\frac{\partial U}{\partial U_1} > \frac{\partial U}{\partial U_2}$ and combining this with the bequest FOC's yields:

$$\begin{aligned}\frac{\partial U_1}{\partial c}(a_1, \underline{c} + b_1) &< \frac{\partial U_2}{\partial c}(a_2, \underline{c} + b_2) \\ \underline{c} + b_1 &> \underline{c} + b_2 \\ b_1 &> b_2\end{aligned}$$

Because $U_1 < U_2$, it must be true that $a_1 > a_2$. The action FOC's impose no further inequality restrictions on the equilibrium allocation.

So, when no constraints bind, $a_1 > a_2$ and there is no firm prediction about which child will receive a larger bequest.

Case 2: Suppose both constraints bind ($\lambda_1 > 0, \lambda_2 > 0$).

The bequest FOC's yield:

$$(\frac{\partial U}{\partial U_1} + \lambda_1)\frac{\partial U_1}{\partial c}(a_1, \underline{c} + b_1) = (\frac{\partial U}{\partial U_2} + \lambda_2)\frac{\partial U_2}{\partial c}(a_2, \underline{c} + b_2)$$

The action FOC's yield:

$$\frac{\frac{\partial U}{\partial a_1}}{\frac{\partial U}{\partial a_2}} = \frac{(\frac{\partial U}{\partial U_1} + \lambda_1)(-\frac{\partial U_1}{\partial a}(a_1, \underline{c} + b_1))}{(\frac{\partial U}{\partial U_2} + \lambda_2)(-\frac{\partial U_2}{\partial a}(a_2, \underline{c} + b_2))}$$

Case 2.1: Suppose $b_1 \leq b_2$.

This implies $\frac{\partial U_1}{\partial c}(a_1, \underline{c} + b_1) \geq \frac{\partial U_2}{\partial c}(a_2, \underline{c} + b_2)$ which when combined with the bequest FOC's yields:

$$\frac{\partial U}{\partial U_1} + \lambda_1 \leq \frac{\partial U}{\partial U_2} + \lambda_2$$

Combining this with the action FOC's yields:

$$\frac{\frac{\partial U}{\partial a_1}}{\frac{\partial U}{\partial a_2}} \leq \frac{-\frac{\partial U_1}{\partial a}(a_1, \underline{c} + b_1)}{-\frac{\partial U_2}{\partial a}(a_2, \underline{c} + b_2)}$$

This can only hold when $a_1 > a_2$.

Case 2.2: Suppose $b_1 > b_2$.

Combining with the bequest FOC's yields:

$$\frac{\partial U}{\partial U_1} + \lambda_1 > \frac{\partial U}{\partial U_2} + \lambda_2$$

Combining this with the action FOC's yields:

$$\frac{\frac{\partial U}{\partial a_1}}{\frac{\partial U}{\partial a_2}} > \frac{-\frac{\partial U_1}{\partial a}(a_1, \underline{c} + b_1)}{-\frac{\partial U_2}{\partial a}(a_2, \underline{c} + b_2)}$$

This inequality makes no strong prediction about the relationship between a_1 and a_2.

Case 3: Suppose child one's constraint binds and child two's does not ($\lambda_1 > 0, \lambda_2 = 0$)

Case 3.1: Suppose $b_1 \leq b_2$.

Combining with the bequest FOC's yields $\frac{\partial U}{\partial U_1} + \lambda_1 \leq \frac{\partial U}{\partial U_2}$ and combining this with the action FOC's yields:

$$\frac{\frac{\partial U}{\partial a_1}}{\frac{\partial U}{\partial a_2}} \leq \frac{-\frac{\partial U_1}{\partial a}(a_1, \underline{c} + b_1)}{-\frac{\partial U_2}{\partial a}(a_2, \underline{c} + b_2)}$$

This can only hold when $a_1 > a_2$.

Case 3.2: Suppose $b_1 > b_2$.

Combining with the bequest FOC's yields $\frac{\partial U}{\partial U_1} + \lambda_1 \leq \frac{\partial U}{\partial U_2}$, but combining this with the action FOC's yields no prediction about the relationshp between a_1 and a_2.

Case 4: Suppose child one's constraint does not bind and child two's does ($\lambda_1 = 0, \lambda_2 > 0$)

Case 4.1: Suppose $b_1 \leq b_2$ Combining with the bequest FOC's yields $\frac{\partial U}{\partial U_1} \leq \frac{\partial U}{\partial U_2} + \lambda_2$ and combining this with the action FOC's yields:

$$\frac{\frac{\partial U}{\partial a_1}}{\frac{\partial U}{\partial a_2}} \leq \frac{-\frac{\partial U_1}{\partial a}(a_1, \underline{c} + b_1)}{-\frac{\partial U_2}{\partial a}(a_2, \underline{c} + b_2)}$$

This can only hold when $a_1 > a_2$.

Case 4.2: Suppose $b_1 > b_2$ Combining with the bequest FOC's yields $\frac{\partial U}{\partial U_1} > \frac{\partial U}{\partial U_2} + \lambda_2$ which implies $\frac{\partial U}{\partial U_1} > \frac{\partial U}{\partial U_2}$ which implies $U_1 < U_2$. This can only hold when $a_1 > a_2$.

Thus, the only prediction we have is that when the constraint for the child one (who experiences a lower cost of service) does not bind, child one will perform more service. There is no prediction for the correlation of bequests and service in the household in any case. ∎

Proposition 4 *Suppose children are identical (A7,A8) and parents don't care who provides service (A6), but parents care more about the utility of child one than child two:*

$$\frac{\partial U}{\partial U_1}(c, a_1, a_2, U_c, U_c) > \frac{\partial U}{\partial U_2}(c, a_1, a_2, U_c, U_c) \; \forall c, a_1, a_2, U_c$$

In the equilibrium allocation, $a_1 = a_2$ and $b_1 = b_2$ OR $a_1 < a_2$ and $b_1 > b_2$. That is, action and bequest are negatively correlated.

Proof

Case 1: Neither constraint binds ($\lambda_1 = \lambda_2 = 0$).

Suppose $U_1 \leq U_2$. This implies $\frac{\partial U}{\partial U_1} > \frac{\partial U}{\partial U_2}$ and substituting into the bequest FOC's yields:

$$\begin{aligned} \frac{\partial U_c}{\partial c}(a_1, \underline{c} + b_1) &< \frac{\partial U_c}{\partial c}(a_2, \underline{c} + b_2) \\ \underline{c} + b_1 &> \underline{c} + b_2 \\ b_1 &> b_2 \end{aligned}$$

Because $U_1 \leq U_2$, we have $a_1 > a_2$.

Combining $\frac{\partial U}{\partial U_1} > \frac{\partial U}{\partial U_2}$ with the action FOC's yields:

$$\frac{\frac{\partial U}{\partial a_1}}{\frac{\partial U}{\partial a_2}} > \frac{-\frac{\partial U_c}{\partial a}(a_1, \underline{c} + b_1)}{-\frac{\partial U_c}{\partial a}(a_2, \underline{c} + b_2)}$$

This can only hold when $a_1 < a_2$, so we have a contradiction and it must be true that $U_1 > U_2$. This implies $a_1 < a_2$ or $b_1 > b_2$ or both.

Suppose $a_1 < a_2$. This implies the following two inequalities:

$$\begin{aligned} \frac{\partial U}{\partial a_1} &> \frac{\partial U}{\partial a_2} \\ -\frac{\partial U_c}{\partial a}(a_1, \underline{c} + b_1) &< -\frac{\partial U_c}{\partial a}(a_2, \underline{c} + b_2) \end{aligned}$$

Combining these with the action FOC's implies $\frac{\partial U}{\partial U_1} > \frac{\partial U}{\partial U_2}$.
Combining this with the bequest FOC's yields:

$$\begin{aligned} \frac{\partial U_c}{\partial c}(a_1, \underline{c} + b_1) &< \frac{\partial U_c}{\partial c}(a_2, \underline{c} + b_2) \\ \underline{c} + b_1 &> \underline{c} + b_2 \\ b_1 &> b_2 \end{aligned}$$

This logic works in reverse as well, so when the constraints don't bind, $a_1 < a_2$ and $b_1 > b_2$.

Case 2: Both constraints bind ($\lambda_1 > 0, \lambda_2 > 0$).
In this case, $U_1 = U_2$ so $\frac{\partial U}{\partial U_1} > \frac{\partial U}{\partial U_2}$.

Case 2.1: Suppose $a_1 < a_2$ and $b_1 < b_2$.
This implies $\frac{\partial U_c}{\partial c}(a_1, \underline{c} + b_1) > \frac{\partial U_c}{\partial c}(a_2, \underline{c} + b_2)$.
Substituting into the bequest FOC's implies $\frac{\partial U}{\partial U_1} + \lambda_1 < \frac{\partial U}{\partial U_2} + \lambda_2$, but substituting into the action FOC's implies $\frac{\partial U}{\partial U_1} + \lambda_1 > \frac{\partial U}{\partial U_2} + \lambda_2$, so we have a contradiction.

Case 2.2: Suppose $a_1 > a_2$ and $b_1 > b_2$.
Exactly the logic used in Case 2.1 can be applied here also leading to a contradiction.

Thus, when both constraints bind, $a_1 = a_2$ and $b_1 = b_2$.

Case 3: Suppose the constraint on the favored child does not bind but the other constraint does ($\lambda_1 = 0, \lambda_2 > 0$).
This implies $U_1 > U_2$ which implies $a_1 < a_2$ or $b_1 > b_2$ or both.
Suppose $a_1 < a_2$. This implies the following two inequalities:

$$\begin{aligned} \frac{\partial U}{\partial a_1} &> \frac{\partial U}{\partial a_2} \\ -\frac{\partial U_c}{\partial a}(a_1, \underline{c} + b_1) &< -\frac{\partial U_c}{\partial a}(a_2, \underline{c} + b_2) \end{aligned}$$

Combining these with the action FOC's implies $\frac{\partial U}{\partial U_1} > \frac{\partial U}{\partial U_2} + \lambda_2$.

Combining this with the bequest FOC's yields:

$$\begin{aligned} \frac{\partial U_c}{\partial c}(a_1, \underline{c} + b_1) &< \frac{\partial U_c}{\partial c}(a_2, \underline{c} + b_2) \\ \underline{c} + b_1 &> \underline{c} + b_2 \\ b_1 &> b_2 \end{aligned}$$

This logic works in reverse as well, so when only the constraint on child two binds, we have $a_1 < a_2$ and $b_1 > b_2$.

Case 4: Suppose the constraint on the favored child binds but the other constraint does not ($\lambda_1 > 0, \lambda_2 = 0$).

This implies $U_1 < U_2$ and thus $\frac{\partial U}{\partial U_1} + \lambda_1 > \frac{\partial U}{\partial U_2}$.

Combining with the bequest FOC's yields:

$$\begin{aligned} \frac{\partial U_c}{\partial c}(a_1, \underline{c} + b_1) &< \frac{\partial U_c}{\partial c}(a_2, \underline{c} + b_2) \\ b_1 &< b_2 \end{aligned}$$

Combining with the action FOC's yields:

$$\frac{\frac{\partial U}{\partial a_1}}{\frac{\partial U}{\partial a_2}} > \frac{-\frac{\partial U_c}{\partial a}(a_1, \underline{c} + b_1)}{-\frac{\partial U_c}{\partial a}(a_2, \underline{c} + b_2)}$$

This implies $a_1 < a_2$, but combining this with $b_1 > b_2$ implies $U_1 > U_2$. Contradiction.

Therefore, in the equilibrium allocation, $a_1 = a_2$ and $b_1 = b_2$ OR $a_1 < a_2$ and $b_1 > b_2$.
∎

Proposition 5 *Suppose children are identical (A7,A8) and parents care equally about the utility of each child, but parents get more utility from the action of child one than child two. That is,*

$$\frac{\partial U}{\partial a_1}(c, a, a, U_1, U_2) > \frac{\partial U}{\partial a_2}(c, a, a, U_1, U_2) \ \forall c, a, U_1, U_2$$

In the equilibrium allocation, $a_1 > a_2$ *and* $b_1 > b_2$*. That is, action and bequest are positively correlated.*

Proof

Case 1: Neither constraint binds ($\lambda_1 = \lambda_2 = 0$).

Suppose $U_1 \geq U_2$. This implies $\frac{\partial U}{\partial U_1} \leq \frac{\partial U}{\partial U_2}$ and substituting into the bequest FOC's yields:

$$\begin{aligned} \frac{\partial U_c}{\partial c}(a_1, \underline{c} + b_1) &\geq \frac{\partial U_c}{\partial c}(a_2, \underline{c} + b_2) \\ \underline{c} + b_1 &\leq \underline{c} + b_2 \\ b_1 &\leq b_2 \end{aligned}$$

Because $U_1 \geq U_2$, we have $a_1 \leq a_2$.

Combining $\frac{\partial U}{\partial U_1} \leq \frac{\partial U}{\partial U_2}$ with the action FOC's yields:

$$\frac{\frac{\partial U}{\partial a_1}}{\frac{\partial U}{\partial a_2}} \leq \frac{-\frac{\partial U_c}{\partial a}(a_1, \underline{c} + b_1)}{-\frac{\partial U_c}{\partial a}(a_2, \underline{c} + b_2)}$$

This can only hold when $a_1 > a_2$, so we have a contradiction and it must be true that $U_1 < U_2$. This means $\frac{\partial U}{\partial U_1} > \frac{\partial U}{\partial U_2}$.

Combining with the bequest FOC's yields:

$$\begin{aligned} \frac{\partial U_c}{\partial c}(a_1, \underline{c} + b_1) &< \frac{\partial U_c}{\partial c}(a_2, \underline{c} + b_2) \\ b_1 &> b_2 \end{aligned}$$

And because $U_1 < U_2$, we have $a_1 > a_2$ when neither constraint binds.

Case 2: Suppose both constraints bind ($\lambda_1 > 0, \lambda_2 > 0$).

This implies $U_1 = U_2$ and thus $\frac{\partial U}{\partial U_1} = \frac{\partial U}{\partial U_2}$.

Suppose $a_1 \leq a_2$. This implies the following two inequalities:

$$\begin{aligned} \frac{\partial U}{\partial a_1} &> \frac{\partial U}{\partial a_2} \\ -\frac{\partial U_c}{\partial a}(a_1, \underline{c} + b_1) &\leq -\frac{\partial U_c}{\partial a}(a_2, \underline{c} + b_2) \end{aligned}$$

Combining these with the action FOC's implies $\frac{\partial U}{\partial U_1} + \lambda_1 > \frac{\partial U}{\partial U_2} + \lambda_2$.

Combining this with the bequest FOC's yields:

$$\begin{aligned} \frac{\partial U_c}{\partial c}(a_1, \underline{c} + b_1) &< \frac{\partial U_c}{\partial c}(a_2, \underline{c} + b_2) \\ \underline{c} + b_1 &> \underline{c} + b_2 \\ b_1 &> b_2 \end{aligned}$$

This implies $U_1 > U_2$. Contradiction.

So, it must be true that $a_1 > a_2$, and because $U_1 = U_2$, we also have $b_1 > b_2$ when both constraints bind.

Case 3: Suppose the constraint for child one binds but the constraint for child two does not ($\lambda_1 > 0, \lambda_2 = 0$).

This implies $U_1 < U_2$ and thuse $\frac{\partial U}{\partial U_1} + \lambda_1 > \frac{\partial U}{\partial U_2}$.

Combining with the bequest FOC's yields:

$$\begin{aligned} \frac{\partial U_c}{\partial c}(a_1, \underline{c} + b_1) &< \frac{\partial U_c}{\partial c}(a_2, \underline{c} + b_2) \\ \underline{c} + b_1 &> \underline{c} + b_2 \\ b_1 &> b_2 \end{aligned}$$

And because $U_1 < U_2$, we have $a_1 > a_2$.

Case 4: Suppose the constraint for child one does not bind but the constraint for child two does ($\lambda_1 = 0, \lambda_2 > 0$).

This implies $U_1 > U_2$ and thus $\frac{\partial U}{\partial U_1} < \frac{\partial U}{\partial U_2} + \lambda_2$.

Combining with the bequest FOC's yields:

$$\begin{aligned} \frac{\partial U_c}{\partial c}(a_1, \underline{c} + b_1) &> \frac{\partial U_c}{\partial c}(a_2, \underline{c} + b_2) \\ \underline{c} + b_1 &> \underline{c} + b_2 \\ b_1 &< b_2 \end{aligned}$$

And because $U_1 > U_2$, we have $a_1 < a_2$.

Combining $\frac{\partial U}{\partial U_1} < \frac{\partial U}{\partial U_2} + \lambda_2$ with the action FOC's yields:

$$\frac{\frac{\partial U}{\partial a_1}}{\frac{\partial U}{\partial a_2}} < \frac{-\frac{\partial U_c}{\partial a}(a_1, \underline{c} + b_1)}{-\frac{\partial U_c}{\partial a}(a_2, \underline{c} + b_2)}$$

This can only hold when $a_1 > a_2$. Contradiction.

Therefore, in all equilibrium allocations $a_1 > a_2$ and $b_1 > b_2$.

■