

Estimados organizadores del Congreso Economía Colombiana y 50 Años CEDE,

Soy PhD candidate en la Universidad de Cornell, donde estudio desarrollo económico con Kaushik Basu. El año pasado participé en la conferencia de LACEA en Los Andes y estaba feliz por volver a Bogotá, donde viví estudiando economía en con la Fulbright. Pero mi conexión con su organización y la economía colombiana tiene raíces aún más atrás: mi abuelo, John Hunter, era el primer director del CEDE. Antes que se murió en 2006, asistimos juntos la ceremonia en la cual la Universidad de Los Andes le otorgó la Medalla del Oro al Mérito Civil. El estaba muy agradecido y siempre consideraba que el CEDE fue su trabajo profesional más sobresaliente. El estaría muy contento con los éxitos del CEDE ahora y el congreso celebrándolos.

Por todo eso, me da muchas ganas de asistir el congreso en octubre. Aunque mi trabajo es teórico, tiene inspiración de mi estadía en Colombia, como he destacado en la obra. En octubre yo estaré en Salvador, haciendo una investigación, y espero que me consideren para ayuda financiera para poder llegar al congreso desde Brasil.

Aun si no puedo ir, espero que le pueden mandar el libro de la historia del CEDE a mi abuela quien todavía está viva y pasó esa época linda en Colombia también. Les felicito por el aniversario del CEDE y el tanto trabajo con que siguen para llevar al cabo este congreso.

Atentamente,

Sarah Reynolds

Complexities of Colombian Families:  
Intergenerational Intrahousehold Bargaining—  
A working paper

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**Abstract**

Economic literature on the family has widely ignored the reality of the extended family and the modeling challenges it brings. Intrahousehold literature focuses on bargaining power between husbands and wives, but does not consider the process between parents and children; this is particularly relevant for Colombia where many families are intergenerational. The bequest literature asks how parents pass on wealth to their children but generally ignores the possibility that later in life parents may be codependent with children. Drawing on elements of both arenas of family analysis, I present a model with two stages: each stage represents a different relationship between parent and child. In stage one the parent is the sole actor and makes deci-

sions for himself and the child regarding consumption, savings, and education. Stage two is a bargaining game after the child is grown and the parent no longer works; the child is now an actor negotiating with the parent to determine consumption. Education and savings decisions from the previous period affect the outcome of this second period. A comparison to the bequest model reveals the surprising result that parents may limit the education of children to maintain future power in the bargaining game. Finally some suggestions for empirical tests are presented. Future research includes merging these two models into a comprehensive model of family dynamics considering the child's threat point and the likelihood that the child moves away from home.

## 1 Introduction

The literature on household economics historically bases theory on nuclear families. Though this strategy helps keep models simple, in reality more complex household structures prevail. Colombia offers many examples. Sometimes families share dwellings with relatives to reduce costs or because they have strong family values. Frequently children live with their parents until married, or a family may welcome elderly grandparents who are unable to sustain themselves. A cousin from the rural area lives with an aunt in order to attend the university in the city. *Cien años de soledad* is an important reminder to the economist that Colombian families are anything but simple. These

complex family structures imply that standard bargaining models are insufficient for a comprehensive analysis of a Colombian family's allocative decisions, yet the bulk of intrahousehold bargaining literature only considers husband and wife. While this has been helpful to establish a framework for initial study, further theoretical advances are necessary. A more realistic model would allow for the plurality of actors as well as the different relationships between them.

Economics does offer tools to consider multiple actors in bargaining situations, and, as mentioned before, has analyzed in depth the relationship between husbands and wives. What is lacking in the literature is a model of bargaining between parents and children. The unique character of this relationship suggests that a simple application of existing bargaining models would be wanting because the child's transition from dependent to economic actor is one that the parent influences. Through a child's upbringing, the parent fosters abilities that affect the child's earning power and bargaining skills. When a child is young, the parent can be aware how parenting choices can affect the outcome of a future bargaining situation. In this paper I will focus on developing this aspect of theory. While also an oversimplification of reality, it is one that has not yet been considered. We will be one step closer to a comprehensive model of the family that synthesizes multiple actors and their complex relationships once the simplified parent-child relationship has been explored. The comprehensive model to be discussed at the end includes both the possibility

of the child remaining at home and leaving the nest.

This paper begins with a literature review that traces the trajectory of economic intrahousehold analysis mentioned above. Also reviewed is the bequest literature, where the parent-child relationship has been analyzed before, though the child is not an economic actor. This literature asks how parents pass on wealth to their children but assumes that parents are self sufficient until they die and will not be codependent with children. Drawing on elements of both arenas of family analysis, in part three I present a model with two stages: each stage represents a different relationship between parent and child. In stage one the parent is the sole actor and makes decisions for himself and the child regarding consumption, savings, and education. Stage two is a bargaining game after the child is grown and the parent no longer works; the child is now an actor negotiating with the parent on how to determine consumption. Education and savings decisions from the previous period affect the outcome of this second period. A comparison to the bequest model reveals the surprising result that parents may limit the education of children to maintain future power in the bargaining game. Finally some suggestions for empirical tests are presented.

## 2 Literature Review

### 2.1 The Intrahousehold Bargaining Literature

In the initial stages of family economics, intra-family decision making was dismissed. Samuelson's 1951 paper on social indifference curves is one of the first formal economic discussions of differing preferences within the family. Proving the impossibility of social indifference curves, he is conflicted with his understanding of family as a social unit, but he reconciles: "if within the family there can be assumed to take place an optimal reallocation of income so as to keep each member's dollar expenditure of equal ethical worth, then there can be derived for the whole family a set of well-behaved indifference contours relating the totals of what it consumes: the family can be said to act as if it maximizes such a group preference function." Most discussion, however, involves Gary Becker's seminal *Treatise on the Family* (1981). Almost every intrahousehold bargaining article begins by citing him, usually to disagree. Without his controversial statements regarding the family being run by an altruistic dictator, the field might not have grown so much.

The feminist reaction has focused on the bargaining power of wives: "While Becker broke ground by considering marriage to be 'economic' in a choice theoretic sense, the economics of marriage in a provisioning sense has always been a topic that few women can ignore. Marriage has often been a woman's bread and butter." (Nelson, 1994

pg 127) Bargaining models are believed to be more realistic than a single household head making all consumption decisions; they maintain individuality as well as allow for communication and altruism. Amartya Sen's work on cooperative conflicts helps establish that family relationships are not always harmonious, but neither are they full of cut-throat competition that economists often use to characterize agents (1989). A middle ground can also be theoretically sustainable: a family functions on its possibilities frontier, but the exact location on the frontier is up for negotiation.

The unitary model characterizes the situations of a household in complete harmony, or a dictator suppressing the preferences of the other members. A contrasting model is a non-cooperative game in which both individuals act independently. Similar to a Cournot equilibrium, they base their consumption and work decisions on the given or expected consumption and work decisions of the other player. As is typical of the Cournot situation, however, this equilibrium is Pareto inefficient with public goods being under-supplied and possibly an inefficient allocation of private goods (Carter and Katz, 1997). Udry empirically explores the supply and determines that household allocation of labor in Burkina Faso is not Pareto optimal. Land plots controlled by women yield significantly less than those of their husbands: there is empirical evidence for non-cooperative outcomes (1996).

Another popular model is the cooperative Nash Bargaining; this model predicts a Pareto optimal outcome for the household. The main

framework for the model comes from Manser and Brown (1980) and McElroy and Horney (1981). They show that demand for goods derived from this model, even though achieved cooperatively and Pareto efficiently, do not necessarily fit the neoclassical demand assumptions. This theoretical support allowed economists to break away from the concept of the family acting as a single consumer. Lundberg and Polak further modified the Nash model to consider the threat points to not be divorce, but a breakdown of cooperation; without cooperation equilibrium reverts to the Carter and Katz outcome characterized by traditional roles and separate spheres for husband and wife (1993).

The collective model also predicts a Pareto optimal household, but does not consider threat points (Chiappori, 1992, Bourguignon and Chiappori, 1992, and Browning, et. al. 1994). The collective model maximizes a weighted average of the participants' utility, with the weight being the sharing rule representing bargaining power. With empirical simplicity, all that is needed to determine into which bargaining regime the family fits is an assignable good and changes in exogenous income. For example, how does spending on womans clothing change when the wife wins the lottery as opposed to when the husband does. No difference indicates a unitary model; both share the same preferences or the family has a dictator. A constant sharing rule emerges under Nash bargaining. If the result is neither of these it suggests non-cooperative bargaining. Using this technique, Thomas rejects the unitary model in Brazil when considering childrens nutri-

tion (1994). Adam et. al also reject the unitary model in Canada, as does Attanasio (2002) in rural Mexico. Over and over the unitary model has been rejected such that Alderman et. al. suggest that this be reflected better in policy: transfers can be targeted to the appropriate household member (1995). In other words, policy makers should have a bargaining game as their fundamental understanding of marriage rather than the unitary model. Evidence against the unitary model is found in Colombia, as Greta Friedemann-Sánchez argues that women in the cut-flower industry gain bargaining power from a variety of methods, from assets to social support and kinship ties (2006).

Only a few authors have taken the bargaining games to an inter-temporal level. Kaushik Basu suggests that non Pareto optimal sub-game perfect equilibria can exist in the dynamic Nash Bargaining case (2006). Ethan Ligon also rejects Pareto optimality in unions with equilibria renegotiated over time (2002). Empirical studies of the dynamic models have not yet come forth en masse, but Lancaster, Maitra and Ray find support of this endogeneity in India (2006). Hans Haller achieves a similar non-Pareto optimal result (though for the economy as a whole) without the inter-temporal aspect by allowing for externalities among household members which cannot be completely internalized (2000).

Though intrahousehold bargaining is not limited to interactions between husbands and wives, (even Samuelson recognized that his children were making decisions about chocolate and peppermint) this

has been the main focus of the literature (1956). Children in the first world have a smaller economic role relative to their parents than in the developing world, which may be another reason these interactions have not yet been highlighted. “There is a significant cross-cultural and historical variation in the degree to which young children contribute to household income. In some societies they begin to work in the household at the age of 7 or 8, with little or no interruption for education. In others school attendance may begin at the age of 5 or 6 and absorb most of the children’s time until well into adulthood” (Folbre, 1984 pg 307). The trajectory of the intrahousehold literature is leading us to consider these relationships as well.

There are a few empirical studies within the bargaining literature that address intergenerational issues. Esther Duflo and Vladimir Ponczek examine the presence of an elderly person in the home on child welfare when there is an unexpected increase in pension payments. In South Africa, Duflo finds that the presence of an elderly woman, likely a grandmother improves granddaughter health (2003). Ponczek finds that an elderly man will have this affect on children’s education in Brazil (2008). Carolyn Moehling offers historical evidence of working children engaging in a bargaining relationship with their parents (2005). Though they often had to turn the money over to their parents, they could determine how a portion of it was spent. A cost of living survey in the early 20th century indicates that families with working daughters have a higher expenditure on daughter’s clothing

per dollar earned than others. Vegard Iversen finds that some teenage boys in India are making their own decisions regarding migration and work independent of their parents (2002). These recent empirical findings suggest that intergeneration bargaining is an important issue and a more defined theoretical framework could be helpful.

Yet models are never close enough to reality to avoid critiques. Bina Agarawal identifies some problematic issues for rural women: ownership and control of assets, access to employment and communal resources, support from NGOs and the State, and perceptions, norms, and access to traditional social support systems (1997). Furthermore there may be a meta-bargaining game taking place, with society itself bargaining over social norms, laws, and interpretation of these. Fortunately the critiques help push the field forward, and one successful response to these challenges is Kaushik Basu's work "Gender Say", which illustrates a repeated bargaining game may allow for a husband to strategically limit outcomes so a wife does not gain too much power in the future (2006). Hopefully similar progress can be made with regard to bargaining between parents and children.

## 2.2 The Bequest Literature

Perhaps the most famous parent-child economic interaction is the Rotten-Kid Theorem. Gary Becker's model indicates that a selfish child will always act to maximize household income in order to maximize a later bequest by the parent. Theodore Bergstrom refines this

to say that this only happens under a certain set of transferable utility functions; incentive problems are not always solved simply by the presence of a benevolent household head (1989). Thus the bequest literature has grown much more complex and there are now competing models of parental decision making in this regard. Preferences now come to the forefront: do parents care about equality in wealth, bequests, or expected lifetime earnings of their children? A series of papers explore these nuances (Behrman, et. al., 1995). The wealth model indicates that the total wealth of the child is what matters to the parent; a parent invests in the child's education until marginal returns equal the returns to savings. The separable earnings-transfers model implies that child's income and bequests enter separately into the parent's utility function; there is more scope for parents preference for equality among children.

Empirical tests of the separable earnings-transfers model determine if parents compensate children with lower ability or reinforce higher ability children with extra education investments. Some parents, like my own, attempt a neutral strategy of equal resources to all children no matter their endowments. Findings from a US twin study indicate that parents may take a slightly reinforcing strategy, but “parental preference parameters are far from those that would lead parents to maximize the sum of their children’s earnings;” the wealth model is not sustained. As an example from the developing world, Agnes Quisumbing tests land bequests in the Philippines, where rural

families are very united. She models parents' credit constraints requiring intergenerational support for the children. She finds "grandparent proximity rather than wealth has a greater influence on both [male and female] children's educational attainment... This suggests that in many developing country settings, a model that features only the parents as decision makers may oversimplify family decision making processes" (1997, pg 41-42). Further empirical work suggests that older children are indeed economic agents in their own right.

My theoretical model draws from these two literatures, using education as an example of a factor that influences the child's bargaining power, but also one which the parent chooses for the child. The goal of the parent is not to pass along wealth to the child, but to maximize his own consumption. (Later we will add altruistic elements into the model.) However, in period 2 he will be partially dependent on the child for this so by increasing the child's education, he may be increasing his own welfare as well as that of the child's; on the other hand, by giving his child more power, parental consumption may be reduced.

### 3 The Model

The model, as mentioned before, is a simplification of the family into a mere parent-child relationship. Though unrealistic, such mental experiments on this theme have been undertaken before and likewise draw lessons to promote contemplation. I am thinking of Mary Shel-

ley's *Frankenstein*. Victor Frankenstein takes on the power of creation to build a man of unequaled physical perfection. Of course, his creation gets out of hand and results in a monster. When the two have a disagreement in preferences (the monster wants a wife and Victor does not want to make him one), Victor's choices in making the monster come back to influence the outcome of this "bargaining" process. We can only imagine that Victor would have rather preferred to endow his creature with less physical capabilities had he been able to foresee the course of events; this foresight effect is precisely what my model describes.

In my model, I assume that the parent, unlike Victor, does have an inkling of what may happen in the future bargaining process. The parent's objective is to maximize lifetime utility, the sum of his utility in periods one and two. In period one the parent is the sole actor and makes decisions for himself and the child regarding consumption, savings, and education. Period two is a bargaining game after the child is grown and the parent no longer works; the child is now an actor negotiating with the parent on how to determine consumption. Education and savings decisions from the previous period affect the outcome of this second period. If the child gains a great deal of power, the parent will not be able to achieve his own consumption decisions, even if total family income is high. Caldwell, Reddy, and Caldwell report that some illiterate parents in Kannada, India, "regarded the educated as arrogant. They could not be asked to do dirty but neces-

sary tasks like cleaning out the cow shed. Another criticism was that educated sons were likely to listen to their wives rather than their parents and to seek an undue share of independence prematurely” (1985).

Since this model is solved using backward induction, I begin by describing the outcome of period two, the bargaining period. I use a collective model, which is commonly used in the intrahousehold literature. With this outcome I return to period one, where the parent is making consumption, education, and savings choices which influence utility in both periods; the decisions taken in period one are those which maximize the parent’s lifetime utility.

If utility were maximized without taking the bargaining in the second period into account, the model would be like that of the wealth model in the bequest literature and *Frankenstein*. If the second period bargaining model were solved without taking the parental influence from the first period into account, it is similar to the existing intrahousehold literature. One surprising result will be the foresight effect, that under certain conditions, the parent’s sense of foreboding that the child could gain too much power will dampen the size of educational training that the parent bestows on the child relative to the other models.

### 3.1 Development of the second stage

To begin I analyze the second period, when the child is grown and participating in the family's economic decision process.

Assume a cooperative bargaining framework for allocation between a parent (individual 1) and a child (individual 2). For simplicity we shall assume that there are no public goods, and each finds utility in his own consumption of private goods  $x_1$  and  $x_2$ . The utility functions are the same:  $U' > 0$ ,  $U'(0) = \infty$ , and  $U'' < 0$ . Consumption, however is individual; the parent and the child only care about their unique consumable. The two engage in a cooperative bargaining exercise bound by the budget constraint of household income  $Y$ . The strength of the child's bargaining power is represented by  $\theta$ , where  $\theta \in [0, 1]$ . Likewise the parent's bargaining strength is  $1 - \theta$ . Prices are assumed equal to one. In period two (the period analyzed here)  $Y$  and  $\theta$  are given. However decisions in period one can affect  $Y$  and  $\theta$  and thus will be influencing the outcome here.

$$\max_{x_1, x_2} (1 - \theta)U(x_1) + \theta U(x_2) \quad (1)$$

$$s.t. x_1 + x_2 \leq Y$$

$$FOC : \theta U'(Y - x_1) = (1 - \theta)U'(x_1) \quad (2)$$

The solution,  $x_1^* = x_1(\theta, Y)$  and  $x_2^* = x_2(\theta, Y)$ . The parent's consumption  $x_1^*$  is increasing in  $Y$ , decreasing in  $\theta$ . Note that when

$\theta = 1$ , we have the corner solution that all income is spent on  $x_2$ .

Likewise if  $\theta = 0$ , all is spent on  $x_1$ .

Proof: From the FOC the implicit function theorem gives us:

$$\frac{dx_1^*}{dY} = \frac{\theta U''(Y - x_1^*)}{(1 - \theta)U''(x_1^*) + U''(Y - x_1^*)} > 0 \quad (3)$$

$$\frac{dx_1^*}{d\theta} = \frac{U'(x_1^*) + U'(Y - x_1^*)}{(1 - \theta)U''(x_1^*) + \theta U''(Y - x_1^*)} < 0$$

## 3.2 Parental Influence

Now let us assume that income  $Y$  in this second period has two components. One portion comes from the parent's prior savings  $s$  which has grown proportionately to the interest rate  $r$ . The other portion of family income is earned by the child:  $w(e)$  is a return to educational attainment  $e$ .  $w' > 0$  and  $w'' < 0$ .  $Y(e, s, r) = s(1 + r) + w(e)$ . It is easy to see that  $\frac{dx_1^*}{ds} > 0$  and  $\frac{dx_1^*}{dr} > 0$  since  $x_1^*$  is increasing in  $Y$  and  $Y$  is increasing in both  $s$  and  $r$ .

Furthermore, we shall also assume that the more education the child has, the more bargaining power he will have.  $\theta$  is now a function of  $e$ . This will be partially due to confidence and self esteem that comes from higher earning capabilities and also to increased sense of superiority through academic snobbery. In some sense it captures the idea of a threat point contributing to bargaining power: the more educated the child, the easier for him to leave home to undertake life on his own.

Yet  $\theta$  will also be influenced by how much income the parent has at present. If the parent saved a lot or the interest rate is very high, he will have more power instead of the child. Thus  $\theta = \theta(e, s, r)$ . So if  $s = 0$ , the parent has no power:

$\theta(e, 0, r) = 1$ .  $\frac{d\theta}{ds} < 0$  and  $\frac{d\theta}{dr} < 0$ . Also assume  $\frac{d\theta}{de} > 0$  and  $\frac{d^2\theta}{de^2} < 0$ ;  $\theta(0, s, r) = 0$  and  $\theta(\infty, s, r) = 1$ . I allow for concavity of  $\theta$  in  $e$  since the parent has some innate power just from being the parent; a first loss of power is more easily relinquished than the last.

Even when the child is small, the parent foresees the future relationship between himself and his own child. (Perhaps the parent understands only too well, having been a child once himself.) He is in a conundrum. Should he choose to educate the child more, the parent can consume more since total family income rises. On the other hand, the child may get too big for his britches and take over the bargaining power in the household. If this were an isolated decision with savings given, without another period to consider, the parent solves this problem by maximizing  $U(x_1^*(\theta(e, s, r), Y(e, s, r)))$  with respect to  $e$ . Since  $U' > 0$ , we can do the same by maximizing  $x_1^*(\theta(e, s, r), Y(e, s, r))$  with respect to  $e$ . Using the FOC from the bargaining problem, more use of the implicit function theorem can help us determine the shape of  $x_1^*(\theta(e, s, r), Y(e, s, r))$ , when  $s$  and  $r$  are given.

The implicit function theorem gives us

$$\frac{dx_1^*}{de} = \frac{\frac{d\theta}{de}U'(s(1+r) + w(e) - x_1^*) + w'(e)\theta(e, s, r)U''(s(1+r) + w(e) - x_1^*) + \frac{d\theta}{de}U'(x_1^*)}{(1 - \theta(e, s, r))U''(x_1^*) + \theta(e, s, r)U''(s(1+r) + w(e) - x_1^*)} \quad (5)$$

We do not know the functional form of  $x_1^*(e)$  so a little analysis is in order to determine if solving  $\frac{dx_1^*}{de} = 0$  for  $e$  would give a maximum or a minimum. Let us determine the sign of  $\frac{dx_1^*}{de}$  at  $\theta = 0$  (which also implies that  $e = 0$ ) and the sign at  $\theta = 1$  (meaning  $e$  is very large). First, when  $\theta = 0$  the middle term of the numerator disappears and we are left with only positive terms on top. The denominator is always negative, so  $\frac{dx_1^*}{de} < 0$  at  $e = 0$ . Now at  $\theta = 1$ ,  $\theta'(\infty, s, r) = 0$

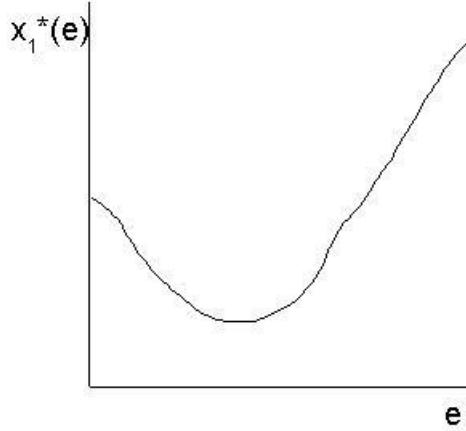


Figure 1: How child's education affects parental consumption in Period 2

(because we are asymptotically approaching  $\theta = 1$ ) so we are only left with the middle term in the numerator. This term is negative so we can conclude that when  $e$  is very large,  $\frac{dx_1^*}{de} > 0$ . If education were an isolated decision, the outcome would most likely be a corner solution:  $e=0$  or the maximum education that the budget constraint allows, as long as all the other variables are given.

### 3.3 Two Periods

The educational choice, however, is not actually so simple. Let us now consider the first period, when the parent must choose between private consumption  $x_o$ , personal savings  $s$ , as well as the amount of education  $e$  for the child. Furthermore there is a minimum amount  $c$  which must be spent on food for the child. Less than this and the child will die; the parent will be put in jail and have zero utility now and forever. Expenditure beyond  $c$  this will improve the child's welfare and

future wages; a healthier child makes for a more productive adult. To keep the model simple, though, we shall assume additional spending beyond  $c$  to be lumped into the variable  $e$ , since the effect in the second period is the same. Again for simplicity, we shall assume no benefit of education in the first period, it only accrues in the second period, which is the bargaining problem described above.

Limited by his period 1 income  $y$ , the parent will choose education  $e$  at price  $p$ , savings  $s$ , and first period consumption  $x_o$  to maximize lifetime utility, the sum of his utility from both periods.

$$\max_{e,s} U(x_o) + U(x_1^*(\theta(e, s, r), Y(e, s, r))) \quad (6)$$

$$s.t. x_o + pe + c + s \leq y$$

To simplify notation since  $c$  is a constant, the income can be normalized to  $y_o = y - c$ . It is also easy to see that  $x_o = y_o - s - pe$  which can be substituted into the objective function and now we can maximize over  $e$  and  $s$ .

The FOCs:

$$pU'(y_o - s - pe) = U'(x_1^*(\theta(e, s, r), Y(e, s, r))) \frac{dx_1^*}{de} \quad (7)$$

$$U'(y_o - s - pe) = U'(x_1^*(\theta(e, s, r), Y(e, s, r))) \frac{dx_1^*}{ds} \quad (8)$$

The budget constraint holds with equality.

**Proposition 1:** At the optimum,  $s^* > 0$ ,  $x_o^* > 0$ , and  $e^* > 0$ .

**Proof:** We know that when  $s = 0$ ,  $\theta = 1$  and  $x_1 = 0$ , as we noted after equation 2. Since the parent could have an infinite increase in utility from consuming a little

instead of nothing, we know there is not a corner solution where  $s = 0$ . For the same reasoning,  $x_o^*$  must be positive. Could there be a corner solution where  $e = 0$ ? From our previous analysis of equation 5, we know that at  $e = 0$ ,  $\frac{dx_1^*}{de} < 0$ . This would contradict 9 which has all other elements positive.

**Proposition 2:** From equations 7 and 8, it is clear to see that the solution is characterized by the equation:

$$\frac{dx_1^*}{ds} = \frac{\frac{dx_1^*}{de}}{p} \quad (9)$$

This equation represents the condition that the marginal returns in period two consumption that accrue to the last dollar spent on education equal the returns of the last dollar saved.

## 4 Comparison to the Bequest Model

Here I will alter the model slightly as if it were a simple bequest model. This slightly different but parallel form will allow us to contrast the results with my model.

In the bequest literature, the child is not usually assumed a decision maker. The parent is very well off (or has a very short life-span) and dies without having to be co-dependent with the child. Yet the parent is altruistic and wants the child to have the largest wealth possible, which is a combination of his earnings and inheritance. The parent maximizes his utility function which consists of his own consumption and the child's future welfare. Since the parent is no longer alive in period two, bequest  $b(e, s, r)$  would consist of the entire period two income,  $s(1 + r) + w(e) = Y(e, s, r)$ . Since there is no second period bargaining exercise,

$b$  is not a function of  $\theta$ . For simplicity of comparison, we shall assume that the parent's utility  $U(b)$  is the same form as  $U(x_1)$  in my model; the budget constraint is also the same.

$$\max_{e,s} U(x_o) + U(b_1(Y(e, s, r))) \quad (10)$$

$$s.t. x_o + pe + s \leq y_o$$

The solutions will be  $\hat{e}$  and  $\hat{s}$  The FOCs:

$$pU'(y_o - s - pe) = U'(\hat{x}_1(Y(e, s, r))) \frac{d\hat{x}_1}{dY} \frac{dY}{de} \quad (11)$$

$$U'(y_o - s - pe) = U'(\hat{x}_1(Y(e, s, r))) \frac{d\hat{x}_1}{dY} \frac{dy}{ds} \quad (12)$$

These give

$$1 + r = \frac{w'(\hat{e})}{p} \quad (13)$$

since  $\frac{dY}{de} = w'(e)$  and  $\frac{dy}{ds} = 1 + r$ . This equation parallels Becker's wealth model and has exactly the same interpretation as equation 9, but we can determine that  $e^* < \hat{e}$ .

Proof: Equation 9 can be re written as

$$\frac{dx_1^*}{dY} \frac{dY}{ds} + \frac{dx_1^*}{d\theta} \frac{d\theta}{ds} = \frac{\frac{dx_1^*}{dY} \frac{dY}{de} + \frac{dx_1^*}{d\theta} \frac{d\theta}{de}}{p} \quad (14)$$

Since  $\frac{dY}{ds} = 1 + r$  using 13 we can substitute into 14. Also note  $\frac{dY}{de} = w'(e^*)$ .

$$\frac{dx_1^*}{dY} \frac{w'(\hat{e})}{p} + \frac{dx_1^*}{d\theta} \frac{d\theta}{ds} = \frac{\frac{dx_1^*}{dY} w'(e^*) + \frac{dx_1^*}{d\theta} \frac{d\theta}{de}}{p} \quad (15)$$

This simplifies to

$$p \frac{dx_1^*}{d\theta} \frac{d\theta}{ds} - \frac{dx_1^*}{d\theta} \frac{d\theta}{de} = \frac{dx_1^*}{dY} [w'(e^*) - w'(\hat{e})] \quad (16)$$

With the left side positive, and  $\frac{dx_1^*}{dY} > 0$  this implies that  $w'(e^*) > w'(\hat{e})$ . Since  $w'' < 0$ , we conclude that

$$e^* < \hat{e} \quad (17)$$

This result implies that education levels when a parent is expecting a bargaining exercise are lower than when a parent is not expecting one. The parent's foresight to the possibility of losing power to the child dampens the desire to have more household income through earnings brought in by the child. Of course, these parents do not share exactly the same characteristics since one is totally altruistic (and dead in period two) while the other is apprehensive about his future welfare. Yet it is not hard to imagine that this second kind of parent exists and my model better approximates this reality than existing models. It's surprising result needs to be considered for intrahousehold allocation.

## 4.1 Empirically Testable Implications

From the previous analysis, an empirical test can be developed to determine if the standard bequest model holds or this foresight model with the expectation of a bargaining problem.

Corollary 1: From 17 and 13

$$\frac{w'(e^*)}{p} > (1 + r) \quad (18)$$

This testable condition determines if marginal returns to the child's education are greater than the parent's returns to savings. The additional income gained from the last increment of schooling divided by its price is greater than the 1 plus the savings rate. Since the model is intertemporal, though, there are some econometric challenges that arise from forward thinking. First, parent's expectations may not align with future outcomes. Returns to education may change over time, as well as the interest rate. If parents are aware of this, expectations must be reflected in the empirical regression, since reality will not reflect a true decision process. This will require some econometric agility, since these decisions were in the past and past expectations may not have aligned with present reality. The further challenge is that although parents may express some expectations and plans, even if the actual returns to education and savings rate do not change, the parents' choices may differ from what they previously expressed. These actual results are what we want to analyze, as well as the parents earlier expectations. The time discrepancy suggests that a panel may be appropriate, if such one exists with the appropriate data.

It will also be important to determine under what other circumstances equation 18 can be accepted or rejected. Credit constraints imply that a parent may "over-invest" in education. Even though a parent is forward thinking, it may not appear so if there are credit constraints. Thus these families should not be included in the sample. Yet these poorer parents may be precisely the ones who are most concerned about their future. It could be advantageous to develop another sort of analysis for this circumstance.

Even if Corollary 1 proves too difficult to test due to lack of appropriate data, the standard test of the collective model can give further support to the idea that

parents and children bargain, though on its own it would not imply anything about a parent's foresight. This empirical test is prevalent in the literature, but has not been done between parents and children. It asks if expenditure on a private good changes relative to the party's private, exogenous income. An example of a private good might be entertainment tickets, for one ticket to a movie cannot be shared with another. If, when a child receives an exogenous transfer, a larger percent of household income is spent on movie tickets for the child than before, then the collective bargaining process is confirmed. Likewise if the same were to happen with a parent and his private good. If such a relationship can be confirmed, there is more likelihood that a parent understands it and anticipates it.

## 5 The Comprehensive Model

This section brings together the two possibilities of child bargaining with the parent and child leaving the home. The probability of the child leaving increases with education and therefore higher potential earnings. The child's threat point will also be introduced into the bargaining problem. I leave the formalization as my work over the summer, but conclusions will remain similar to those above, that a child's educational attainment may be tempered if the parent considers the possibility of the child staying home and usurping power.

## 6 Conclusion

This two stage model of family bargaining takes into account that the parent is allowed to choose the child's level of education and in essence has some determinism

over the bargaining power in the second period. While I am not suggesting that all Colombian parents act in this manner, the endogeneity of this aspect of family life not often considered in economics, and its inclusion into the literature will allow for a more realistic understanding of family, especially in countries like Colombia, where intergenerational family strucutre is prevalent. The model offers results that can be in conflict with the wealth model from the bequest literature and that can be tested empirically, though a careful analysis is necessary before taking it to the data. The future should allow for a syntheses of this model with existing family models that better represents the parent's economic decision making process.

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