The Role of Parental Altruism in Parents Consumption, College Financial Support, and Outcomes in Higher Education*

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Abstract

This paper examines how parent-child interactions and altruism affect college financial support and outcomes. I analyze how parents adjust their consumption levels when their children's wealth changes and how children's consumption shocks affect parent consumption. I use a dynastic overlapped generations model to explore how future transfers from parents to children influence college graduation rates. I find that parent transfer reduces the cost of college but also lowers college returns. Altruism increases college graduation rates for low-ability children with wealthy parents but decreases rates for high-ability children with poor parents. Parental altruism explains most of the college graduation gap between low-ability children with wealthy and poor parents. Understanding parent-child interactions and altruism is crucial for comprehending college investment decisions and outcomes.

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1 Introduction

In the United States, parents play a fundamental role in financing their children's college education. Although in the year 2017, the government spent \$248 billion in college aids[1], the average household with two dependent children is expected to contribute \$6500 per child annually[2]. In this paper, I empirically study how parent consumption depends on children's position on the income distribution. Then, I look at transfers and bequests between parents and children, especially when attending college. Then, I build and estimate a dynastic overlapped generations model where parents are altruistic to their children to study if college transfers can be rationalized as my investment to avoid higher transfers and bequests to my children in the future. Finally, I study how parental transfer affects college graduation rates and whether it can account for the higher graduation rates between low-ability children with wealthy parents and low-ability children with poor parents. My empirical analysis sheds light on the crucial role of parents in financing their children's college education and the impact of my financial decisions on educational outcomes.

To investigate the impact of parent-child interactions on college financial support and outcomes, I analyze consumption data from the Panel Study of Income Dynamics (PSID). My findings show that parents adjust their consumption depending on their children's relative position in the income distribution. However, reported inter-vivos transfers and bequests between parents and children can only partially explain the change in consumption. To further explore this issue, I build and estimate an altruistic dynamic heterogeneous model with endogenous college decisions. In this model, parents have the option either to financially support their college attendance or save for later consumption, transfers, or bequests. Using the model, I analyze how parents' college financial support affects graduation outcomes, particularly for affluent low-skill children with higher graduation rates than poor low-skill children. Through this analysis, I aim to deepen our understanding of the impact of parental transfers on college graduation rates and shed light on the factors contributing to the graduation gap between low-skill children from affluent and low-income families.

Children with low cognitive skills are more likely to graduate from college if their parents

[1] https://research.collegeboard.org/pdf/trends-student-aid-2019-full-report.pdf

[2] https://www.forbes.com/sites/troyonink/2017/01/08/2017-guide-to-college-financial-aid-the-fafsa-and-css-profile/6ee3d28f4cd4

are wealthier. Table 1 shows the proportion of children who graduate from college, categorized by their cognitive ability quartile and parent's wealth, using data from the NLSY97. First, we observe that graduation rates increase with the child's ability. Second, holding ability constant, college graduation rates are higher for children with wealthier parents. For example, children in the lowest ability quartile with parents in the highest wealth quartile are 74% more likely to graduate from college than children with parents in the bottom wealth quartile. Although this advantage decreases to 39% for children in the top ability quartile, it remains substantial. These findings are consistent with Belley and Lochner (2007), which demonstrates that parental income and wealth are less relevant for high school completion but more significant for college graduation, particularly among low-ability children, which can be attributed to credit constraints. Brown et al. (2012) finds that children's college attendance depends on their parents' willingness to support their college education, and the heterogeneity in parents' altruism is a relevant factor in how college aid would affect college graduation. In contrast, Heckman and Mosso (2014) argues that the college enrollment of more affluent children may result from paternalism if education is a normal good and not necessarily due to borrowing constraints. In this paper, I explore an alternative hypothesis that wealthy parents influence graduation rates by reducing their children's college costs through higher monetary transfers, decreasing future transfers and bequests, and increasing their consumption later in life.

Table 1. Children College Attainment by Parent Wealth and Child Ability (NLSY97)

Parents' Wealth\Child's Ability	1	2	3	4
1	0.19	0.24	0.33	0.53
2	0.24	0.30	0.42	0.53
3	0.26	0.40	0.51	0.63
4	0.33	0.46	0.62	0.74
$\Delta\%(Q4 - Q1)$	74%	91%	87%	39%

Notes: The table shows the college graduation rate by parents' wealth quartiles and children's ability quartiles. We can observe that the difference in graduation rate between high and low ability children decreases with parents' wealth.

Parents have a significant impact on funding their children's education, and this relationship influences both parties throughout their lifetime. Therefore, the implications of college attainment should be examined not only from a student perspective but also from a household perspective. Analyzing the effects of changes in college costs and policies that alleviate financial constraints or enhance college attainment can provide a better understanding of the returns to education for both parents and children. This creates a connection between two crucial government programs, College Financial Aid and Social Security Retirement, which I plan to explore in future research. These programs have the potential to interact in ways that have significant implications for both students and parents, and understanding these interactions can affect policy benefits and costs.

The consumption of both older parents and adult children is closely linked. My analysis reveals that parents with high incomes and low-earning children consume about $3300 less per year than those with high-earning children. In contrast, parents with low incomes and high-earning children consume up to $5300 more per year than those with low-earning children. While inter-vivos transfers and bequests between children and parents partially account for these consumption changes, it can be challenging to capture them accurately in survey data. I also investigate whether parents insure their children's consumption against shocks and find evidence that they do so for consumption shocks but not for income shocks. Specifically, a 1% change in children's consumption results in a 0.09% change in their parents' consumption.

Finally, I extend the analysis by building and estimating a dynastic overlapped generation model that incorporates college decisions into a similar framework than Nishiyama (2002); Boar (2020). This approach addresses the endogeneity issue resulting from the fact that the children's position on the income distribution is endogenous to their parents' decisions and enables the quantification of the effect of parents' transfer on college attainment. The model accounts for 86% of the gap in college graduation rates between low-ability children by parent wealth, as parents find it optimal to reduce their children's college attendance costs by transferring money today rather than later in case of a negative shock. Additionally, the analysis shows that altruistic parents provide insurance that reduces the value of attending college, leading to a reduction in attendance among high-ability children. Specifically, parent altruism increases college graduation by 80% among low-ability children with wealthy parents, but it reduces college graduation by 18% among high-ability children with poor parents who are unable to provide incentives for their children to attend college today and who provide consumption insurance to their children later in life.

2 Literature

This paper contributes to various branches of literature. First, it connects with the research exploring the influence of parents' investment in their children's education and college attainment, as well as their impact on inter-generational persistence in income and wealth. Relevant studies include Ríos-Rull and Sanchez-Marcos (2002); Lee and Seshadri (2019); Abbott et al. (2019); Daruich and Kozlowski (2019).

Second, the paper is related to the literature on the disparity in college attainment based on cognitive ability and parental wealth. Belley and Lochner (2007); Bailey and Dynarski (2011); Lochner and Monge-Naranjo (2011); Brown et al. (2012) are among the studies that find liquidity constraints affecting college attendance, particularly for low-ability students.

Third, the paper relates to the literature on consumption insurance within families. While studies such as Altonji et al. (1992); Hayashi et al. (1996) reject perfect insurance within families, Attanasio et al. (2018) found significant potential insurance between parents and children. This paper contributes to this literature by studying the insurance parents provide to their children regarding college attendance. This paper also relates to the literature on inter-vivos transfers, bequests, and parents' consumption after retirement. Relevant studies include Nishiyama and Smetters (2002); Lockwood (2018); De Nardi et al. (2016); Kopczuk (2007); Barczyk and Kredler (2018); Barczyk et al. (2019); Haider and McGarry (2018)

Finally, on the quantitative side, this paper is related to the literature that studies family dynamics models without commitment in non-cooperative settings, such as Attanasio and Ríos-Rull (2000); Nishiyama (2002); Barczyk and Kredler (2014a,b); Boar (2020), among others.

3 Empirical Evidence

In this section, I present the empirical evidence of how parents' position in wealth distribution relative to their adult children impacts their consumption. Firstly, it is observed that parents who have children above them in the wealth distribution tend to increase their consumption. In contrast, those with children below them in the distribution tend to decrease it. This change in consumption can be attributed, at least in part, to the transfer of resources between parents and children and changes in bequests from parents to their children. Furthermore, I explore how parents financially support their children's college education and how this support is influenced by their children's wealth and ability levels. My findings suggest that parents' college transfers increase with their wealth but not with their children's cognitive ability.

3.1 Data

To investigate how adult children impact their parents' household consumption, I utilize data from the Panel Study of Income Dynamics (PSID) from the year 1999 onward, when consumption data was first collected. I restrict the sample to parents over 50 years old and children over 26 years old, as the focus is on the impact of adult children on parental consumption. Additionally, to ensure a sufficient sample size, I drop parents and children born in years with less than 100 individuals, and rank individuals by cohort based on their wealth and income. To link parents with their children in the survey, I utilize the FIMS file provided by PSID. This results in a sample size of 8944 observations representing 2338 parent-child pairs. Lastly, I deflate all nominal variables to 2016 prices for consistency.

Additionally, I employ The National Longitudinal Survey of Youth 1997 (NLSY97) to investigate college attainment among children, parents' financial support, and wages after college. The NLSY97 is a longitudinal survey that tracks Americans born between 1980-84, and provides comprehensive information on individuals during their college years. The final sample size for this analysis includes 5400 individuals with complete data on parents' wealth and children's cognitive ability, comprising a total of 97434 observations.

3.2 Parents' Consumption and Children's Position in the Income Distribution.

In this subsection, I examine the impact of adult children's income on their parents' household consumption. I begin by ranking parents by their wealth relative to individuals born in the same year. As many are retired, labor income is not reported, and wealth better predicts their well-being. For children, I rank them by both income and wealth but find that only the child's income position significantly affects their parent's consumption. Given that young adults are beginning to accumulate assets, income is a better welfare indicator. From now onward, I will refer to the difference between parents' position in wealth distribution and their children's position in income distribution as the wealth-income distribution difference.

Since children's position in the income distribution is influenced by their parent's decisions and their inherited characteristics, I focus on the effect of this difference on parents' consumption when their children are older than 26 years old. At this point, I assume that parents have completed investing in their children and cannot directly influence their children's relative position in the income distribution. Nonetheless, parents may still affect their children's welfare through financial support or bequests, which can impact their and their children's consumption.

To measure the difference between parents and children in the wealth-income distribution, I construct a rank-rank variable that measures the relative distance between them in the following form:

1. I rank parents in quartiles by wealth relative to all individuals born in the same year.
2. I rank children in quartiles by income or wealth depending on the specification, relative to all individuals born the same year.
3. Then, I construct a variable $T^{Q_i^p - Q_j^c}$, which is the rank-rank difference between the parents and each of their children in a given year.

For example, for a parent in the fourth quartile who has a child in the first quartile, then $T^{(Q_4^p - Q_1^c)}$ is equal to three. So then, I estimate the following regression:

$$C_{i,t} = \beta_0 + \sum_{q=-3}^{3} \beta_q T_{i,t}^q + \beta_X \mathbf{X_{i,t}} + \varepsilon_t + \epsilon_{i,t}$$

where C is household consumption in dollars, i is the parent household, $T_{i,t}^q$ is the variable described before, $\mathbf{X_{it}}$ is a set of controls (parents' total wealth, parents' non-financial wealth, parents' household income, parents' quartile in the wealth distribution, parents household head in the labor force, number of people in the parents household, parents head born year, parents head education years, parents household US state, parents head age four order polynomial, rent or own house, parents' race and parents' religion), and ε_t is a year fixed effect.

The results of our study are presented in Table 2. The first column shows the ranking of children by wealth, where the relative position of parents with respect to their children does not affect their consumption. In contrast, the second column displays the ranking of children by income, revealing that the relative position of a child in the income distribution to their parents in the wealth distribution significantly affects parental consumption. For instance, a parent in the first quartile with a child in the fourth quartile consumes an average of \$5300 more per year than a parent in the first quartile with a child in the same quartile. Conversely, a parent in the fourth quartile with a child in the first quartile consumes an average of \$3300 less per year than a parent in the same quartile with a child in the same quartile. To support the robustness of my findings, I also estimate the same model using HRS data, as presented in Appendix A. Both surveys lead to the same conclusion: children's position in the income distribution above or below their parents affects parental consumption. However, the magnitude of the effects differs between the surveys. Specifically, the increase in consumption of poor parents with rich children is higher in PSID than in HRS, while the decrease in consumption of wealthy parents with poor children is higher in HRS than in PSID.

Table 2. Parent Consumption Given Kids Transition using PSID data

	(1) Ranking by Children's Wealth	(2) Ranking by Children's Income
	Parent Consumption	Parent Consumption
Child 3 Quartiles Below Parents	718	-1969
	(0.44)	(-0.86)
Child 2 Quartiles Below Parents	-380	-1387
	(-0.34)	(-1.23)
Child 1 Quartiles Below Parents	-246	-1446**
	(-0.30)	(-2.04)
Child Same Quartiles Below Parents	-170	91
	(-0.27)	(0.14)
Child 1 Quartile Above Parent	332	1371**
	(0.50)	(2.25)
Child 2 Quartile Above Parent	1492**	2414***
	(2.18)	(3.60)
Child 3 Quartile Above Parent	1145	3393***
	(1.08)	(2.93)
Constant	-16675	-18993
	(-0.54)	(-0.62)
Observations	7083	7083

Notes: The table shows the results of regressing parent household consumption in dollars to the relative position of their children in the income distribution T and demographic controls X using PSID data. t statistics in parentheses, standard error cluster by household. * $p < .10$, ** $p < .05$, *** $p < .01$.

In this section, I examine how the effect of having a child above or below parents in the wealth distribution varies with parent age. To conduct this analysis, I introduce a third-order polynomial of age and interact it with the relative position between parents and children. Specifically, I estimate the following linear model:

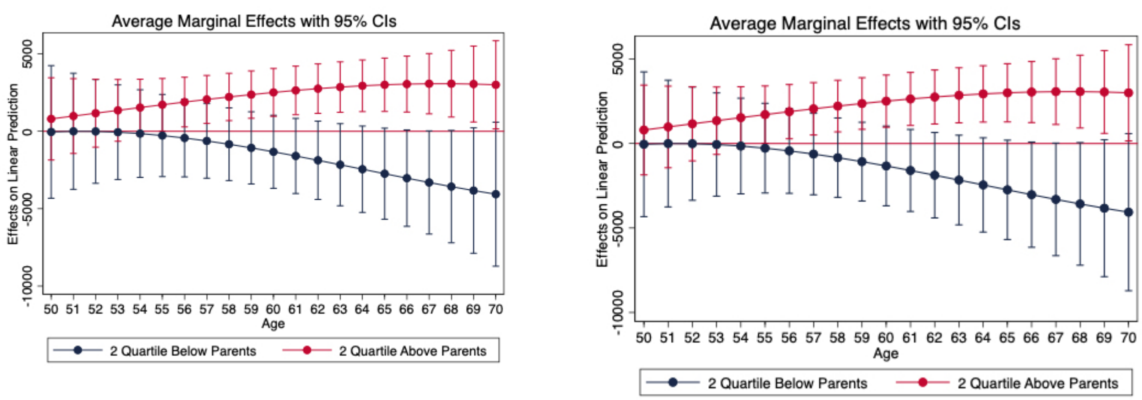
$$C_{i,t} = \beta_0 + \sum_{q=-3}^{3} \beta_q T^q_{i,t} f(Age_t) + \beta_X \mathbf{X_{i,t}} + \varepsilon_t + \epsilon_{i,t}$$

By including a polynomial of age in the model, I can capture potential non-linearities in the relationship between parent age and the effect of child position on parental consumption. The interaction term allows us to examine how the effect of child position on parental consumption changes with parent age.

Figure 1. Effect of children position in the income distribution across age

(a) Effect of children position in the income distribution across age (2 Quartiles Above or Below)

(b) Effect of children position in the income distribution across age (Above or Below)



Notes: The figures show the average marginal effect by age on parent household consumption in dollars of having a child in a different part of the wealth distribution than theirs. The left figure displays the difference between parents that are two quartiles above or below their children. The right figure displays the average consumption difference between parents with children above and below them on the income distribution.

I present the results in Figure 1, which displays the marginal effect of having a child above or below a parent's quartile, controlling for observables. Specifically, Figure 1a shows the effect of having a child two quartiles above or below the parent's quartile, while Figure 1b examines the same relationship without differentiating by the number of quartiles. My analysis reveals that the relative position of a child in parental consumption is not significant until age 60, after which a gap emerges between parents with poor and rich children. Wealthy parents with poor children significantly decrease their consumption compared to parents with children in the same quartile. Conversely, the difference in consumption between poor parents with rich children and those with children in the same quartile is stable across ages.

3.3 Inter-vivos Transfers, Bequests and Income Distribution.

This section aims to investigate the potential role of inter-vivos transfers and bequests in shaping the consumption behavior of parents and children, and whether they could explain why parents adjust their consumption depending on the relative position of their children in the income distribution. To conduct this analysis, I utilize data from the Health and Retirement Study (HRS), which provides more detailed information on transfers and has a larger sample of older parent-child pairs than the PSID.

To examine the relationship between transfers and the relative position of children in the income distribution, I estimate differences in transfers between siblings using the following specification:

$$IVT_{ijt} = \beta_0 + \sum_{q=-3}^{3} \beta_q T_{ij,t}^{q} + \beta_X \mathbf{X_j} + \varepsilon_i + \epsilon_{jt}$$

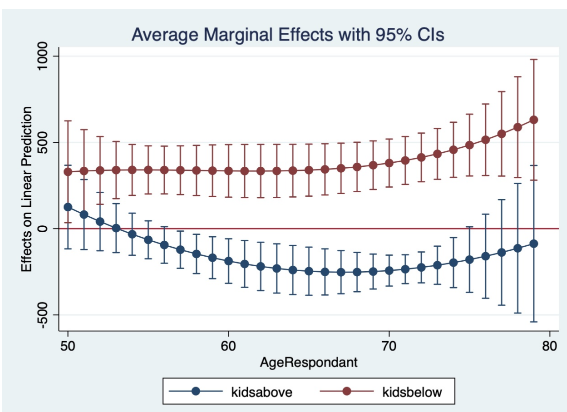
where IVT are intervivos transfers between parent and children, i is the parent household, j is the child, $T_{ij,t}^{q}$ is the relative position of the child i to his parents j, $\mathbf{X_j}$ is a set of controls (the year that child born and child blood relationship) and ε_i is a family fixed effect.

Table 3 presents the estimation results. In column 1, we observe that children with higher income than their parents transfer slightly more than those whose income is similar to their parents. However, these transfer differences are not statistically significant at conventional levels, and the magnitudes are economically small. For instance, the average transfer from a child in the fourth quartile to a parent in the first quartile is only \$100 more per year than a transfer from a child in the fourth quartile to a parent in the same quartile. In contrast, parents transfer more to children in a lower income-wealth position relative to them. Specifically, a parent in the fourth quartile transfers approximately \$500 more per year to a child in the first quartile compared to a child in the fourth quartile. Despite these differences, these transfer amounts are insufficient to explain the observed changes in parent consumption.

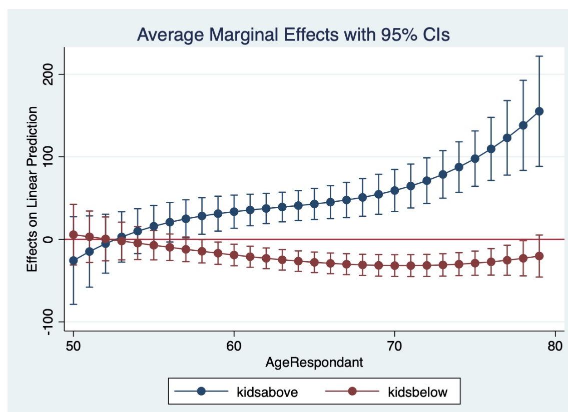
Next, I investigate how transfers change across parents' age by interacting a third-order polynomial with the parent-child relative position, as in subsection 3.2. The results are displayed in figure 2. Figure 2a shows transfers from parents to children, while figure 2b displays transfers from children to parents. The findings suggest that transfers from wealthy parents to poorer children remain flat between 50 and 70 but increase after 70. In contrast, transfers from poor parents to rich children decrease with. Moreover, the difference in transfers from rich children to poor parents increases after 70. In contrast, the difference in transfer from poor children to wealthy parents is not significantly different from zero and remains flat over time. These results support that parents with poor children consume less than parents with rich children. On the other hand, wealthy children support parents more in their later years, which are usually particularly expensive given health and care expenditures.

Figure 2. Effect of children position in the income distribution in transfers from parents to children and children to parents

(a) Parents to Children



(b) Children to Parents



Notes: The figures show the average marginal effect by age on intervivos transfer between parents and children of the relative position on wealth distribution. The left figure displays the effect of age on the transfer from parents to children. The correct figure displays the effect of age on transfers from children to parents.

In Appendix B, I investigate whether parents receive in-kind support from their children depending on the relative position of their children in the wealth-income distribution. The analysis reveals that children above their parents in the income distribution are slightly more likely to provide financial assistance for health-related expenses but less likely to help with daily life activities compared to children in the same position as their parents. Additionally, parents expect more help from children above them in the wealth-income distribution than those in the same position.

Table 3. Parent Transfers and bequest by Relative Position in the Income Distribution

	(1)	(2)	(3)
	Annual Transfer Kids to Parents US$	Annual Transfer Parents to Kids US$	Total Wealth Last Period US$
Child 3 Quartiles Below Parents	-32***	512***	-31175
	(-2.73)	(6.18)	(-0.97)
Child 2 Quartiles Below Parents	-21***	306***	19839
	(-5.28)	(7.77)	(1.20)
Child 1 Quartile Below Parents	-18***	90***	5838
	(-4.26)	(2.93)	(0.28)
Child Same Quartile Parents			5052
			(0.56)
Child 1 Quartile Above Parents	14***	-94***	-25682***
	(4.27)	(-6.56)	(-3.43)
Child 2 Quartile Above Parents	51***	-127***	-17497*
	(7.17)	(-7.78)	(-1.85)
Child 3 Quartile Above Parents	105***	-179***	-13380
	(6.40)	(-8.85)	(-1.61)
Observations	76374	79136	5197

Notes: The table shows the results of regressing intervivos transfer between parent and children on the relative position of their children in the income distribution T, controls X, and household fixes effect using PSID data. t statistics in parentheses, standard error cluster by household. * $p < .10$, ** $p < .05$, *** $p < .01$.

In the third column of table 3, I examine the effect of relative child position on parents' assets in the last survey before death, which serves as a proxy for bequests. The results show that parents with a child above them in the income distribution have fewer assets than parents with a child in the same quartile. However, as before, these results only partially explain the consumption differences between parents with children in different positions of the income distribution. For instance, a parent with a child one quartile above them has $25,000 less in assets in the last survey before dying.

Several possible explanations exist for why transfers and bequests cannot fully account for consumption differences. One possibility is measurement error, as transfers are self-reported by parents, and they may forget to report some transfers. Another explanation is that parents and children engage in transfers that they do not consider as transfers when reporting them in the survey, such as gifts. Another plausible explanation, which I develop later in the paper, is that part of the decrease in parent consumption is due to spending more on the college education of low-skill children, who are likely to have a lower position in the wealth-income distribution than their parents in the future reducing parents' savings and future consumption.

3.4 Transmission of Children Income Shocks to Parent Consumption

In this subsection, I examine whether parents' consumption is influenced by their children's income shocks, using the framework presented in Blundell et al. (2008). To accomplish this, I begin by conducting regression analysis on the log income and log consumption of both parents and children, controlling for individual components such as education, gender, household size, race, labor force status, states and parents, and interactions of year dummies with education, race, employment, labor force status, and parents fix effects. I also incorporate parents-year fix effects to account for any income shocks the family may share. I then utilize the residuals as a measure of the unpredictable portions of both consumption and income, represented as $\hat{c_{jt}}$ and $\hat{y_{jt}}$, respectively, as shown below:

$$\hat{c_{jt}} = \log c_{jt} - \beta_t \mathbf{Z_{jt}}$$
$$\hat{y_{jt}} = \log y_{jt} - \beta_t \mathbf{Z_{jt}}$$

where variable c refers to consumption, while y denotes income. The variable j indicates the individual under consideration, i.e., either a parent or a child. Finally, as explained in the previous paragraph, the variable $\mathbf{Z_{jt}}$ represents the predictable portion of income. Next, I estimate the first differences of the unpredictable consumption component with respect to the first differences of the unpredictable portion of parent and child incomes. This analysis provides insights into how parents' consumption responds to their and their children's income shocks, as shown below:

$$\Delta \hat{c_{pt}} = \delta_p \Delta \hat{y_{pt}} + \delta_k \Delta \hat{y_{kt}} + \epsilon_{it}$$

Here, we use the subscripts p and k to distinguish between parents and children, respectively. $\Delta \hat{c}$ represents the first difference in the consumption residual, while $\Delta \hat{y}$ denotes the first difference in the income residual. To address potential endogeneity, I follow the approach suggested by Kaplan et al. (2014) and use future differences in income residuals as instruments.

Table 4. Consumption Pass-Through of Children Income Shocks

	(1)	(2)	(3)
	Δ Consumption Parents	Δ Consumption Parents	Δ Consumption Parents
Δ Income Parents	0.11***	0.11***	0.10***
	(5.26)	(5.29)	(3.80)
Δ Income Children		-0.01	-0.03
		(-0.89)	(-1.44)
Δ Consumption Children			0.09***
			(6.55)
Constant	-0.00	-0.00	0.00
	(-0.39)	(-0.13)	(0.47)
Observations	7945	7945	5499

Notes: The table shows the results of regressing changes in parents' consumption on their and their children's income shocks. In the last column, I add the parent consumption response to changes in children's consumption. t statistics in parentheses, standard error cluster by household. * $p < .10$, ** $p < .05$, *** $p < .01$.

Table 4 presents the estimation results. It shows that children's income shocks do not significantly impact parent consumption. In contrast, parent income shocks affect their consumption, with an income-consumption pass-through rate of 0.11. This finding aligns with the results of Attanasio et al. (2018), who found that consumption does not respond equally to personal or family income shocks in the PSID dataset from 1999 to 2008. In column 3 of the table, I add unpredictable changes in children's consumption corrected by parent income shocks finding a positive correlation of 0.09 between changes in children's consumption and parent consumption, indicating that a 1% increase or decrease in child consumption leads to a corresponding 0.09% increase or decrease in parent consumption. The results suggest that parents do not offer insurance for children's income shocks but provide insurance for consumption shocks. This conclusion is consistent with the observation that most transfers between parents and children occur when they face significant shocks such as divorce or unemployment.

4 The Model

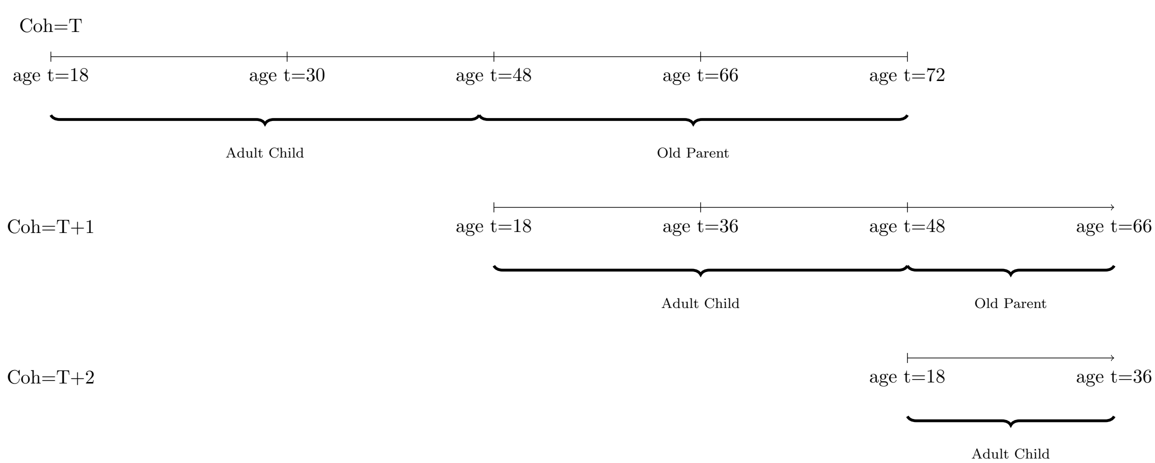
This section presents a non-cooperative and without-commitment model that captures the interactions between parents and adult children, quantifying how family transfers and bequests affect college financial support, graduation, and parent retirement consumption. The model is a heterogeneous dynastic overlapped generation model, similar to Nishiyama (2002); Boar (2020), but with the addition of a college education decision. The dynasties in the model are formed by one parent and one child, where parents are altruistic towards their children's current and future utility. The dynasty separately decides on consumption, savings, transfers, bequests, and college education. Parents can realize monetary transfers each period and leave a bequest in the last period, leading to strategic behavior by parents and children. The equilibrium properties of the model are derived in appendix C. It is shown that parents and children have incentives to over-consume, as children's savings reduce future transfers, and parent savings reduce children's savings. This phenomenon is known as the *dynamic Samaritan's dilemma*, as named by Barczyk and Kredler (2014a).

4.1 Model Demographics

In this model, the economy is divided into six-year periods, and each agent overlaps with their parents between the ages of 18 and 42, as illustrated in Figure 3. At 42, each child becomes a parent and has an 18-year-old child. The agent retires at 66, receiving social security transfers until their death at 72. During each period, parents can transfer money to their children, and to simplify the model, parents' income between the ages of 46 and 67 is determined only by their level of education. The population is evenly split between parents and children, and households face incomplete markets as they can only save in a non-contingent bond. Parents can transfer money to their children each period and decide on a bequest in the final period before their death, which their child receives in the subsequent period when they become a parent.

4.2 Model Decision Timing

Figure 3. Dynasty Time Line



Notes: The figure illustrates the overlap between different generations. In this model, each period consists of a dynasty composed of an older parent and their adult children.

The paper adopts a two-stage game, where the parent makes the first move, and children respond, conditional on the parent's decision, similar to the approach taken by Boar (2020). This is in contrast to a simultaneous game setup adopted by Nishiyama (2002); Barczyk and Kredler (2014a). This simplification is motivated by computational tractability. However, the fact that parents' and children's decisions depend on each other's choices is critical, as children's education, consumption, and savings decisions depend on the expected support they receive from their parents. At the same time, parents cannot force their children to attend college, nor can they commit not to support them in the future, making the game non-cooperative and without commitment.

The parent-child game is divided into periods and subperiods, where each decision is made. College attendance is decided in the first period, which is divided into three stages or subperiods. In the first stage, the child, who is born as a high school graduate, decides whether to enroll in college. The model assumes that children who attend college will become college graduates ($e_c = C$), while those who do not attend will continue as high school graduates ($e_c = HS$). In the second stage, the parent, knowing the child's college decision, decides on their consumption c_p, saving a_p, and the money transfer to the child t_p. Finally, in the third and last stage of the first period, the child decides on their consumption c_c and saving a_c, given their parent's previous decisions.

After the first period, the game comprises two stages. In the first stage, the parent decides on their consumption c_p, saving a_p, and the money transfer to the child t_p. In the second stage, the child decides on their consumption c_c and savings a_c, given their parent's choices. In the last period, the parent's savings a_p become a bequest b_p that the child receives in the next period.

The sequential nature of the game is essential because children's decisions on education, consumption, and savings are based on how much support they expect from their parents in the future. Parents cannot force their children to attend college, nor can they commit to not supporting them in the future. Thus, both parents and children must make strategic decisions in each period, taking into account the other's expected behavior.

The economic model includes several endogenous state variables that determine the behavior of parents and children, including the dynasty assets a_c and a_p, which represent the savings of the child and parent, respectively, and the education level of each generation, denoted by e_p and e_c, which can take on two values: high school graduate (HS) or college graduate (C). The labor income of the child w is determined by four exogenous factors: their ability θ, education level e, an idiosyncratic income shock z, and age j. Parents receive a deterministic income $y(e)$ that depends only on their education level. Additionally, the ability is transmitted between generations through an AR(1) process with persistence parameter ρ_θ. Thus, the endogenous states of the model are determined by the interaction of family decisions with the exogenous shocks to labor income, while the exogenous states are the child's ability and the idiosyncratic income shock.

4.3 Parent-Child Decision Problem

4.3.1 Parent-Child Problem in Last Parent Period

The child's last period coincides with their parent's last period, as the child will become a parent themselves in the next period. We denote this period as $j = T_c$, representing the child being 18 years old and the parent being 72 years old. The parent and child engage in a two-stage game where the parent knows with certainty that they will pass away this period, and the child will receive all of the parent's remaining assets as a bequest in the next period.

In the second subperiod, the child faces the following Bellman equation:

$$V^c_{j=T_c}(a_c, e_c, e_p, \theta, z, t_p, a'_p) = \max_{c_c, a'_c} \{u(c_c) + \beta \int V^c_{j=T_c+1}(b_p + a'_c, 0, e'_c, e_c, \theta', 0) f(\theta'|\theta) d\theta\}$$

$$s.t:\ a'_c + c = w\epsilon_{j=T_c} + (1+r)a_c + t_p$$

$$\log \epsilon = \log(\alpha_e \theta^{\beta_e}) + A_{e_c, j=T_c} + z$$

$$\log \theta' = \rho_\theta \log \theta + \epsilon_\theta$$

$$\epsilon_\theta \sim N(0, \sigma_\theta), a'_c \geq 0$$

In the child's second sub-period, their consumption is denoted by c_c, their assets by a_c, and their education level by e_c. The parent's education level is denoted by e_p. The child's income is determined by their cognitive ability, denoted by θ, which affects income through the parameter α_e and β_e. A denotes the life cycle component of income, and the idiosyncratic labor productivity shock is denoted by z. Additionally, the child receives a bequest b_p that was decided by the parent in the first stage and will be received in the next period, and a transfer t_p that was decided by the parent in the previous sub-period and will be received by the child in this sub-period.

The cognitive ability of the next generation, denoted by θ', follows an AR(1) process with persistence ρ_θ and normally distributed idiosyncratic shocks with variance σ^2_θ. Finally, agents are only able to save on an asset that pays with certainty in the next period.

In the first stage, parents are aware of how their children will respond to their transfer and bequest decisions in the following stage. Consequently, parents must solve the following Bellman equation:

$$
\begin{gathered}
V^p_{j=T_c}(a_p, a_c, e_c, e_p, \theta, z) = \max_{c_p, b_p, t_p} \{u(c_p) + \eta u(c_c^*(a_p, a_c, e_c, e_p, \theta, z, t_p, b_p)) \\
+\eta_d \beta \int V^c_{T_c+1}(b_p + a_c^{'*}(a_p, a_c, e_c, e_p, z, \theta, t_p, b_p), a_c', e_c', e_c, \theta', z') f(\theta'|\theta) d\theta\} \\
s.t: \; c_p + b_p = w\mathrm{SS}(e_p) + (1+r)a_p - t_p \\
\log \theta' = \rho_\theta \log \theta + \epsilon_\theta \\
\epsilon_\theta \sim N(0, \sigma_\theta), b_p \geq 0 \\
a_c' = 0, z' = 0
\end{gathered}
$$

In this equation, c_p represents the parent consumption, a_p denotes the parent assets, η is the parent's altruism towards their child during the current period, and η_d represents their altruism towards the child after their death.

During this stage, parents are retired and receive a social security transfer that depends on their education level, denoted as $\mathrm{SS}(e_p)$. It is worth noting that the child's savings $a_c'^*$ is a function of the parents' choices, as the parents consider the child's behavior when deciding on consumption, savings, transfers, and bequests.

4.3.2 Parent-Child Problem After College and Before Parent Last Period

The dynasty plays a two-stage game when parents are between 48 to 72 years old and their children are between 18 to 48 years old. Parents decide on consumption, transfers, and saving in the first stage. In the second stage, the child decides on consumption and saving based on their parents' decisions. Unlike before, parents do not make decisions on bequests. The Bellman equation of the child in the second stage is:

$$V_j(a_c, e_c, e_p, \theta, z, t_p, a_p') = \max_{c_c, a_c'} \{u(c_c)$$

$$+\beta \int V_{j+1}(a_c', e_c, e_p, \theta, z', t_p^{'*}(a_p', a_c', e_c, e_p, \theta, z'), a_p^{*''}(a_p', a_c', e_c, e_p, \theta, z'))f(z'|z)dz'\}$$

$$s.t: \;\; a_c' + c_c = w\epsilon_j + (1+r)a_c + t_p$$

$$\log \epsilon_j = \log(\alpha_e \theta^{\beta_e}) + A_{e_c, j} + z$$

$$z' = \rho_z z + \epsilon_z, \epsilon_z \sim N(0, \sigma_{z,e_c}), a_c' \geq 0$$

where t_p and $a'p$ are the transfer and savings decisions made by the parents in the previous stage. However, the transfer decision of the parents for tomorrow, $t^{'*}p$, and their savings decision for tomorrow, $a_p^{''*}$, are determined by the children's current choices. As a result, the children consider the impact of their consumption and saving decisions today on their parents' transfer and saving decisions tomorrow when making their own decisions.

When parents decide at the beginning of the period, they consider how their decision will affect their children's tomorrow behaviors. Therefore, the parent Bellman equation in this stage is:

$$V_j(a_p, a_c, e_c, e_p, \theta, z) = \max_{c_p, a_p', t_p} \{u(c_p) + \eta u(c_c^*(a_c, e_c, e_p, \theta, z, t_p, a_p'))$$

$$+\beta \int V_{j+1}(a_p', a_c^{'*}(a_c, e_c, e_p, \theta, z, t_p, a_p'), e_c, e_p, \theta, z')f(z'|z)dz'\}$$

$$s.t: \;\; c_p + a_p' = wy(e_p, j) + (1+r)a_p - t_p$$

$$y(e_p, j) = \begin{cases} y(e_p, j) & j < j_{ret} \\ \text{SS}(e_p) & \text{o.w} \end{cases}$$

$$a_p' \geq 0, z' \sim N(0, \sigma_{z,e_c})$$

To simplify the model, parents are assumed to have a fixed income with no uncertainty. However, they take into account the income risk their children face, denoted by the variable z, when making decisions about transfers (t_p) and savings (a_p'). Before retirement, parents receive income ($y(e_p, j)$) that is a function of their education and age. Following retirement, their income consists of a fixed social security transfer determined solely by their level of education.

4.3.3 Parent-Child Problem at College Decision

The child is born as a high school graduate in the first period. The decision-making process unfolds in three stages. First, the child decides whether or not to attend college. Second, the parent determines their consumption, savings, and transfers, considering the child's decision regarding college attendance. Finally, the child decides on consumption and savings based on the parent's savings and transfers.

In the third subperiod, the children face the following Bellman equation:

$$V_{j=1}(a_c, e_c, e_p, \theta, z, t_p, a_p') = \max_{c_c, a_c'} \{u(c_c)$$

$$+\beta \int V_{j=2}(a_c', e_c, e_p, \theta, z', t_p'^*(a_p', a_c', e_c, e_p, \theta, z'), a_p^{*''}(a_p', a_c', e_c, e_p, \theta, z'))f(z'|z)dz'\}$$

$$s.t: \ a_c' + c_c = \tau(e_c)w\theta - \phi 1_{e_c=C} + t_p$$

$$\log\theta = \log(\alpha_e \theta^{\beta_e}) + \gamma_{e_c,1} + z$$

$$z' \sim N(0, \sigma_{z,e_c}), a_c' \geq 0, c_c \geq 0$$

$$a_c = 0, z = 0$$

where $t_p^{'}$ and $a_p^{''}$ represent the parent transfer and saving policies functions in the next period, respectively. The variable ϕ represents the monetary cost of college, while A captures life cycle effects on wages. Additionally, $\tau(e_c)$ denotes the percentage of hours that a college student can work relative to a high-school graduate, while α_e and β_e are parameters that shape the return on ability associated with attending college. Finally, each child starts with a mean productivity level ($z = 0$), and their income is subjected to idiosyncratic income shocks that depend on their education level.

In the second stage of the model, parents make decisions about how much to save and consume based on their children's education decisions, following the follow Bellman equation:

$$V_j(a_p, a_c, e_c, e_p, \theta, z) = \max_{c_p, a_p', t_p} \{u(c_p) + \eta u(c_c^*(a_c, e_c, e_p, \theta, z, t_p, a_p'))$$

$$+\beta \int V_{j+1}(a_p', a_c^{'*}(a_c, e_c, e_p, \theta, z, t_p, a_p'), e_c, e_p, \theta, z') f(z'|z) dz'\}$$

$$\text{s.t: } c_p + a_p' = wy(e_p, j) + (1+r)(a_p + b_p) - t_p$$

$$z = 0, a_p' \geq 0, z' \sim N(0, \sigma_{z,e_c})$$

where c_c^* and $a_p^{'*}$ are the child policy function determined in the third stage. Additionally, to their saving from the previous period a_p, the new parents have the bequest that their parents left to them. Finally, in the first stage, children decide whether attend college or not; then, their Bellman equation is:

$$\hat{V}_1^*(a_p, a_c, e_p, \theta, z) = \max_{i \in [HS,C]} \{V_1(a_c, i, e_p, \theta, z, t_p^*(a_p, a_c, i, e_p, \theta, z), a_p^{*'}(a_p, a_c, i, e_p, \theta, z)$$

$$+1_{e_c=C} \kappa(\theta) + \epsilon_i)\}$$

The psych cost of attending college, $\kappa(\theta)$, is a decreasing function of ability, and the child's decision to attend college is subject to a type I extreme value shock, ϵ, with a scale parameter σ_{cd}. Parents can influence their children's college, consumption, and saving decisions through their future financial support, as their optimal consumption and savings decisions depend on their children's college choices.

4.4 Equilibrium Definition

The recursive equilibrium is a set of value functions, denoted by $V_t(s)^T t = 1$, and policy functions, denoted by $c^t p(s), a'^t p(s), t^t p(s)^T t = 1$, $c^t c(s), a'^t c(s)^T t = 1$, and $e_c^1(a_p, a_k, e_p, \theta, z)$, where T represents the number of periods that a cohort lives and $s = (a_p, a_k, e_p, e_c, \theta, z)$ are the dynasty state variables. This equilibrium is also a Markov-Perfect equilibrium.

In each repetition of the parent-child stage game, the equilibrium is characterized by the following steps:

1. In period $t = 1$, when the children decide whether to attend college or not:
   (a) Solve the children's college attendance problem.
   (b) Solve the parents' problem given their children and their state variables.
   (c) Solve the children's problem, given their parents and their state variables, after seeing their parents' decisions and receiving the transfer.
2. In period $t = 2$ to $t = J - 1$, where there is no college decision:
   (a) Solve the parents' problem, given the children's state variables and their state variables.
   (b) Solve the children's problem, given their parent and their state variables, after seeing their parents' decisions and receiving the transfer.
3. In period $t = J$, the parents die with certainty:
   (a) Solve the parents' problem, given their children's and their state variables.
   (b) Solve children's problem, given their parents and their state variables, after seeing their parents' decision about bequests and receiving the transfer.

5 Estimation

To estimate the model parameters, I followed a three-stage approach. In the first stage, I use parameters from the literature. In the second stage, I estimated the income process independently using the available data. Finally, I estimate the remaining parameters using the indirect method of moments using 20 data moments to estimate 11 parameters. Table 5 lists the first two estimation stages parameters. The parameters estimated in the last stage are listed in Table 7.

5.1 Functional Forms and Preferences

Consumption: Parents and Children utility function is modeled using a Constant Relative Risk Aversion (CRRA) with a relative risk aversion equal to 1.5 following Abbott et al. (2019).

Table 5. Parameters from the data or estimated outside the model

Parameter	Description	Value	Source
	Preferences		
r	Interest Rate	0.03	Daruich and Kozlowski (2019)
γ	Risk Aversion	1.5	Abbott et al. (2019)
	College Cost		
ϕ_C	Annual College Cost	\$12200	NLSY97
$\tau(e_c)$	Fraction of Time Work In College	0.56	Census
	Income Process		
ρ_c	College Graduate Income Persistence	0.90	NLSY97
σ_c	College Graduate Income Variance	0.049	NLSY97
ρ_{HC}	High School Graduate Income Persistence	0.93	NLSY97
σ_{HC}	High School Graduate Income Variance	.032	NLSY97
$\overline{w}$	Average Income	\$70000	Census
	Retirement Income		
SS_C	Retirement Income College Graduate	\$25500	HRS
SS_{HC}	Retirement Income High-School Graduate	\$31200	HRS

Notes:

Psych Cost: Psychic costs are an important consideration in schooling decisions Cunha et al. (2005); Heckman et al. (2006). To model the psych cost of attending college, we use a cost function that decreases with cognitive ability: $\kappa(\theta) = \frac{\omega_{c1}}{\theta^{\omega_{c2}}}$. This means that the cost of attending college is lower for individuals with higher cognitive ability, reflecting that they may find cognitive tasks less effortful or have a higher taste for education.

The discount factor β is estimated using the average wealth to average income ratio set to 6.218 following Boar (2020).

5.2 College Cost

In the model, all nominal quantities are deflated to 2016 dollars using the Consumer Price Index (CPI) to adjust for inflation. The annual cost of attending college in the model is set at \$12,200, based on the average tuition cost reported by college students at the NLSY97 survey after grants and scholarships have been considered. We do not find a significant difference in the net cost of attending college for students from different income backgrounds, which is consistent with the findings of Abbott et al. (2019) based on data from the National Center for Education Statistics. This lack of difference may be due to high-income students receiving more merit-based financial aid, compensating for their higher tuition costs.

5.3 Retirement Income

I estimated retirement income using data from households where the respondent is retired and over 67 years old. Specifically, I computed the average sum of Retirement Social Security Income, Supplemental Security Income, Disability Income, and Employer Pension programs for each education group. This approach allows me to examine how retirement income varies by education level- The results are presented in Table 5, which shows each education group's estimated retirement income levels.

5.4 Income Process

In the model income process is given by $\log \epsilon_j = \log(\alpha_e \theta^{\beta_e}) + \gamma_{e,j} + z_j$, where ϵ_j represents an individual's labor earnings and α_e, θ, and β_e are parameters that vary by education level. To estimate this process, I use data from the National Longitudinal Survey of Youth 1997 (NLSY97) households, as described in Abbott et al. (2019). Since the NLSY97 sample consists primarily of young individuals, with the oldest being 37 years old in the last survey, I estimate the income-age profile using data from the Panel Study of Income Dynamics (PSID) for households where the head is between 18-67 for high school graduates and 23-67 for college graduates. I present the results of this estimation in Table 6. I then control for ability differences by regressing the part of household income not explained by the age profile on the Armed Forces Qualification Test (AFQT) score, allowing me to measure the impact of ability on household income. Income shocks are estimated using the residuals from this regression. Specifically, I assume that the process governing the log income residuals follows:

$$z^e_{iat} = \log y_{it} - \widehat{f^e(a_{it})} - \hat{\beta}_0 - \hat{\beta}_1 \text{AFQT}_i$$

$$z^e_{iat} = \rho_e z^e_{i,a-1,t-1} + \eta^e_{iat}$$

$$\eta^e_{iat} \sim N(0, \sigma^e_\eta), \;\; z^e_{i0t} \sim N(0, \sigma^e_{z_0})$$

where y_{it} denotes individual i's income at age t, $\widehat{f^e(a_{it})}$ is the age profile of income estimated previously from the Panel Study of Income Dynamics (PSID), z_{it} represents the initial income shock with a persistence of ρ_e and an initial dispersion of $\sigma^e_{z_0}$, and ηit is an innovation of the income shock with a standard deviation of σ^e_η. I estimate the parameters ρe, σ^e_η and $\sigma^e_{z_0}$ using the Minimum Distance Estimator for the covariance of wage residuals for all possible lags by age and education group. The estimated results are presented in Table 6, which displays the estimates for the persistence of income shocks, the standard deviation of the initial income shock, and the standard deviation of the innovation shock.

Table 6. Income Process and Age-Profile

Age Profile		
	High-School	College Graduate
β_A	0.067	0.115
$\beta_{A^2} * 1000$	-6.831	-11.97
Income Process		
	High-School	College Graduate
ρ_z	0.93	0.90
σ_{eta}	0.032	0.049
σ_{z_0}	0.14	0.16

Notes: The table shows the estimated income process from NLSY79 and PSID data. In the Age Profile, we observe the estimated parameters of regressing $\log y_{t,i} = \beta_0 + \beta_A Age_{t,i} + \beta_{A^2} Age^2_{t,i}$ by education groups. In the bottom, we observe the income process parameters ρ_e, σ^e_η and $\sigma^e_{z_0}$ using the Minimum Distance Estimator for the co-variance of wage residual for all possible lags by age and education group.

5.5 Return on Ability

To estimate the return to ability by education group, denoted as $\alpha_e \theta^{\beta_e}$, I first estimate the parameters $\gamma_{e,t}$ and the exogenous shock process z, as described in the previous subsection. Then, following Daruich and Kozlowski (2019), I estimate the parameters α_e and β_e using the college premium and income volatility for high school and college graduates aged between 36-42 years old, consistent with the NLSY97 participants who are currently between 36 and 40 years old. I assume NLSY97 participants have the same college premium and income variance as the PSID sample. The estimated parameters are presented in Table 7.

Table 7. Parameters Estimated Using the Indirect Method of Moments

Parameter	Description	Value
	Preferences	
β	Discount Factor	0.88
σ_{cd}	EV Scale Parameter	0.027
	Parent Altruism	
η	Parent Altruism Before Death	0.26
η_d	Parent Altruism After Death	η
	Return to Ability	
α_c	College Level	1.79
α_{HS}	High School Level	0.35
β_c	College Concavity	0.12
β_{HS}	High School Concavity	0.23
$\omega_{c_1}, \omega_{c_2}$	College Psych Cost	0.6, 4.6
	Intergenational Transmission of Ability	
ρ_H	Human Capital Persistence	0.06
σ_H	Human Capital Standard Deviation	0.46

Notes: Parameters that are estimated from the data using the indirect method of moments.

5.6 Ability, Parent Altruism, and Psych College Cost

The intergenerational ability process, represented by $\log \theta^c = \rho_\theta \log \theta^p + \epsilon_{h_0}$ and $\epsilon_{h_0} \sim N(0, \sigma_{h_0})$, is estimated using data on college attainment by children's ability and their parents' income group. We estimate the parameters, including ρ_θ, σ_{h_0}, parent altruism η, and college psych cost parameters ω_{c_1} and ω_{c_2}, and present the results in Table 7.

Table 8. Targeted Moments

College Attainment by HH Wealth and AFQT Quartile (NLSY97) v/s Model College Attainment				
Parents' Wealth Quartile \ Child's Ability Quartile	1	2	3	4
1	0.19	0.35	0.39	0.38
	(0.19)	(0.24)	(0.33)	(0.53)
2	0.15	0.28	0.38	0.45
	(0.24)	(0.30)	(0.42)	(0.53)
3	0.18	0.41	0.43	0.43
	(0.26)	(0.40)	(0.51)	(0.63)
4	0.31	0.38	0.45	0.44
	(0.33)	(0.46)	(0.62)	(0.74)
Transfer + Allowances Yearly, Model v/s Data (NLSY97)				

Income Moments		
	Model	Data
High-School/College mean Income Ratio	0.46	0.57
High-School HH Income S.D	134000	39600
College HH Income S.D	200000	60000
Income-Wealth Ratio	5.90	6.22

Notes: Used moments to estimate the unknown parameters using the Indirect Method of Moments. The first group of moments is college graduation rates by age and ability used to estimate parents' altruism and inter-generational ability persistence. The numbers without parenthesis are the model moments, and those with parenthesis are the data moments. In the bottom half of the table, we observe the moments used to estimate the income process and the discount factor.

6 Model Results

Table 8 presents the results of the model fit on college attainment, parent college transfers, and income moments. The model captures the two main characteristics of the data, namely that college attainment is increasing in both ability and parent wealth. However, the model tends to underpredict the college attainment of high-ability children. In addition, the model closely matches the observed college premium and the income-wealth ratio. However, the model over-predicts the income volatility for both high school and college graduates.

Parent altruism is an important factor in explaining the higher college graduation rate observed among low-ability children with wealthy parents compared to their counterparts with poor parents. Specifically, children with parents in the highest wealth quartile have a 64% higher college graduation rate than low-ability children with parents in the first wealth quartile, which explains 86% of the gap in graduation by parent income. This finding suggests that through financial support, parental altruism plays a role in higher educational attainment among wealthy children by providing financial assistance, which offsets college costs.

Table 9 provides estimates of financial transfers from parents to their children based on the model. The model suggests that transfers tend to increase as parents' wealth increases, while as children's ability levels rise, transfers tend to decrease. These transfers reduce attendance costs for children with low ability and improve their college outcomes.

Table 9. Parents College Transfers

Transfer + Allowances Yearly, Model v/s Data (NLSY97)				
Parents' Wealth Quartile\Child's Ability Quartile	1	2	3	4
1	4110	770	0	0
2	7000	161	0	0
3	14592	2435	0	0
4	15645	4178	900	320

Notes: Model parents yearly transfer by ability and wealth quartiles during college age.

7 The role of Parent Transfers on Education Achievement

In this section, I examine the role of parent transfers in shaping children's college achievement. To do this, I set the parameter $\eta = 0$, which assumes that parents do not care about their children's education and do not condition transfers on educational outcomes. The model predicts that parent transfers can significantly impact college attendance and graduation rates, particularly for low-ability children. Transfer can increase college graduation rates by reducing the cost of attending college. However, the model also predicts that transfers may harm college attendance for high-ability children since the higher income provided by graduating from college reduces future parent transfers. These suggest that parent transfers play a complex role in shaping children's educational outcomes.

The exercise results are at the bottom of Table 10. College attendance does not depend on parents' wealth, and low-ability children with rich or poor parents attend at the same rate. The model also predicts that parent altruism can significantly impact college attendance, both by increasing attendance rates through transfers and by making college less attractive by providing consumption insurance to children. Specifically, the model suggests that without parents' altruism, college attendance would decrease for low-ability children but increase for high-ability children since college would be a more attractive option for high-ability students, given the lack of future parental insurance.

Table 10. College Attainment Model with Dynamic Altruistic Transfers vs without Dynamic Altruistic Transfers

College Attainment with Altruist Parents				
Parents' Wealth Quartile\ Child's Ability Quartile	1	2	3	4
1	0.19	0.35	0.39	0.38
2	0.15	0.28	0.38	0.45
3	0.18	0.41	0.43	0.43
4	0.31	0.38	0.45	0.44
College Attainment with Non Altruist Parents				
Parents' Wealth Quartile\ Child's Ability Quartile	1	2	3	4
1	0.17	0.33	0.40	0.46
2	0.17	0.33	0.40	0.46
3	0.17	0.33	0.40	0.46
4	0.17	0.33	0.40	0.46

Notes: The table compares college attendance when parents are altruistic with a model without altruism. At the top of the table is college graduation with altruist parents ($\eta = .26$). At the bottom, we observe when parents are not altruistic to their children ($\eta = 0$).

The model predicts that low-ability children with wealthy parents are likely to decrease their college attendance by 45%, while those with poor parents are predicted to decrease attendance by 10%. Meanwhile, high-ability children with poor parents are predicted to increase their college graduation rates by 21%, while high-ability children with wealthy parents are expected to increase graduation rates by just 5%. These suggest that parent altruism significantly impacts college attendance and graduation rates, particularly for low-ability students from wealthy families. In the model, poor parents cannot transfer funds to their children to financially support college, but they provide insurance through their social security income, making college attendance less attractive for high-ability children from poor families, as they do not receive financial support. However, their parent can still provide insurance for bad outcomes later in life. As a result, parent altruism reduces college attendance for high-ability children from low-income families.

8 Conclusion

In this paper, I have examined how interactions between parents and adult children can affect parents' financial college support and the role of parental altruism in shaping children's college outcomes.

In the first part of the paper, I empirically assessed the effect of having richer or poorer children on parents' consumption behavior. I found that parents with children above them in the wealth-income distribution tend to consume more than those in the same quartile. This effect can be partially explained by parents increasing inter-vivos transfers to poor children while decreasing them to wealthy children. Additionally, parents with rich children tend to reduce bequests and increase consumption, especially among poor parents. However, the inter-vivos transfers and bequests only partially explain the changes in parents' consumption given their children's position in the wealth-income distribution.

In the second part of the paper, I built and estimated a dynastic overlapped generation model with endogenous college decisions to explore how parental investment in college varies by their child's ability. I found that parental altruism can impact college attendance and graduation rates, particularly for low-ability children from low-income families. Parent transfer can increase college graduation rates among children from high-income parents, reducing the cost of attending college. However, the model also predicts that transfers may have a negative effect on college attendance for high-ability children since attending college reduces future parent transfers. These findings highlight the importance of parent transfers in shaping children's educational outcomes and the relevance of intra-family interaction in designing government policies that target parents or children.

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A HRS Consumption Data

As a robustness exercise, I realize the same estimation as in section 3.2 using the Health Retirement Survey (HRS) that collects information on consumption information through the Consumption and Activities Mail Survey (CAMS), which measures household expenditure over the previous 12 months.

First, I use the household consumption measures built by RAND, which comprise the sum of all household consumption, including durable consumption, housing consumption, transportation consumption, and non-durable spending. I also use household spending, which is defined as the sum of all household expenses, including durables, non-durables, transportation, and housing spending. The difference between spending and consumption is that the last incorporates durable goods and housing, bought in one period but consumed for an extended time. Next, I link the CAMS file with the HRS Longitudinal File, which has detailed information on individuals' demographics, income, wealth, and health. Finally, I merge this data to the RAND Family Data, which has information on respondent adult children's income, in-kind transfers, and inter-vivos transfers from 1992-2014. Like before, I only consider children above 26 years old and parents older than 50, dropping parents and children born in years when less than 100 individuals were born. After this, I have a sample size of 19179 parent-child pairs and 98861 observations.

Unlike PSID, in HRS, children's household income is reported by parents, which answers in which of eight brackets are their children. Unfortunately, parents do not report their children's income in every survey. For this reason, I take the average income of each child and rank them to the individuals born in the same year. To construct my variable of the relative position of children to their parents, I average parent total wealth during the observed sample period. Then I rank their respect to all parents born in the same year. As before I realize the following estimation:

$$C_{i,t} = \beta_0 + \sum_{q=-3}^{3} \beta_q T_{i,t}^q + \beta_X \mathbf{X_{i,t}} + \varepsilon_t + \epsilon_{i,t}$$

where C is household consumption in dollars, i is the parent household, $T_{i,t}^q$ is the variable described before, $\mathbf{X_{it}}$ is a set of controls (parents' total wealth, parents' non-financial wealth, parents' household income, parents' quartile in the wealth distribution, parents household head in the labor force, number of people in the parents household, parents head born year, parents head education years, parents household US state, parents head age four order polynomial, rent or own house, parents' race and parents' religion), and ε_t is a year fixed effect.

The results are displayed in table 11. Column 1 shows the results using RAND consumption measure, and column 2 uses household expenditure. PSID and HRS consumption measures differ because the first does not impute durable consumption. However, this is a small fraction of HRS's total consumption, and both measures give the same conclusion. Parents with a child three quartiles below them in the income distribution reduce consumption in \$5500 each year (vs. \$3300 in PSID) to a parent in the same quartile. Parents with a child three quartiles above them increase consumption in \$1100 (vs. \$5000 in PSID) to a parent with a child in the same quartile. As in PSID, the effect on parent consumption increases with the relative distance between parents and children in the wealth-income distribution. Even when both surveys give the same conclusions, the magnitude of the results differs. In PSID, the increase in consumption of poor parents with rich children is higher than in HRS. On the other hand, in HRS, the decrease in consumption of wealthy parents with poor children is higher than in PSID.

Table 11. Parent Consumption Given Kids Transition

	(1) Total HH Consumption	(2) Total HH Expenditure
Child 3 Quartiles Below Parents	-4636***	-2431*
	(-3.56)	(-1.84)
Child 2 Quartiles Below Parents	-1055*	-457
	(-1.85)	(-0.76)
Child 1 Quartile Below Parents	-44	83
	(-0.12)	(0.22)
Child Same Quartile Parents	914***	906***
	(3.09)	(3.10)
Child 1 Quartile Above Parent	1273***	1469***
	(4.01)	(4.22)
Child 2 Quartiles Above Parents	1325***	1764***
	(3.38)	(3.83)
Child 3 Quartiles Above Parents	2113***	2556***
	(3.49)	(3.98)
Observations	19033	19033

Notes: The table shows the results of regressing parent household consumption in dollars to the relative position of their children in the income distribution T and demographic controls X using HRS data. t statistics in parentheses, standard error cluster by household. * $p < .10$, ** $p < .05$, *** $p < .01$.

B In-Kind Transfer

This appendix examines the impact of children's relative position in the wealth-income distribution on in-kind transfers from children to parents. In order to measure this impact, I estimate the following model:

$$\mathrm{y}_{i,t} = \beta_0 + \sum_{q=-3}^{3} \beta_q T_{i,t}^q + \beta_X \mathbf{X_{i,t}} + \alpha_p + \varepsilon_t + \epsilon_{i,t}$$

where y representing a discrete variable indicating whether child i provides a particular type of assistance to their parent (with the exception of hours of help). The variable $T_{i,t}^q$ reflects the position of child i in the income wealth-distribution relative to their parent. Additionally, the model includes a set of controls denoted by $\mathbf{X_{it}}$, which contains factors such as the parent's total wealth, non-financial wealth, household income, and demographic information such as the number of people in the parent's household and their location. Other controls include the child's education degree, marital status, and gender, as well as the frequency of contact between the parent and child, and their blood relationship. Furthermore, the model incorporates a parent fixed effect, denoted by α_p, and a year fixed effect, represented by ε_t.

The results of the estimation are presented in Table 12, with coefficients representing probabilities multiplied by 100. Consistent with previous findings, Column 1 indicates that children who rank higher than their parents in the wealth-income distribution are more likely to provide financial assistance than those in the same quartile. Column 2 reveals wealthier children are more likely to help cover their parents' healthcare costs. In Columns 3 and 4, no notable difference is observed in assistance with daily activities. Column 5 highlights the most significant discrepancy, the parental expectations of support, with wealthier children expected to provide more aid, potentially affecting their parents' insurance demand. Finally, Column 6 shows that less affluent children spent more time assisting their parents, with children one quartile below spending approximately 20 more hours per month. The previous result suggests that parents may transfer more resources to their lower-income children as compensation for their caregiving efforts.

Table 12. Transfer from Kids to Parents

	(1)	(2)	(3)	(4)	(5)	(6)
	Prob Transfer	Prob Help Health Cost	Prob Help ADL	Prob Help IADL	Prob Help in Future	Mothly Helped Hours
Child 3 Quartiles Below Parents	1.30***	0.37***	0.08	0.08	-1.95**	10.46
	(5.22)	(3.12)	(0.35)	(0.28)	(-2.01)	(0.81)
Child 2 Quartiles Below Parents	0.36**	0.07	0.12	-0.08	-1.16**	10.04
	(2.20)	(0.98)	(1.20)	(-0.67)	(-1.98)	(1.05)
Child 1 Quartile Below Parents	0.10	0.05	-0.05	0.07	-0.20	19.32**
	(0.86)	(0.80)	(-0.75)	(0.77)	(-0.52)	(2.45)
Child 1 Quartile Above Parents	0.82***	0.04	-0.15*	-0.21*	0.66*	-3.79
	(5.19)	(0.64)	(-1.69)	(-1.85)	(1.72)	(-0.54)
Child 2 Quartiles Above Parents	2.42***	0.40***	-0.24*	-0.41**	0.71	-12.90
	(8.00)	(2.63)	(-1.66)	(-2.17)	(1.22)	(-1.46)
Child 3 Quartiles Above Parents	5.45***	0.90***	-0.57	-0.82**	2.65**	-9.90
	(8.07)	(3.07)	(-1.53)	(-2.05)	(2.57)	(-0.64)
Professional Degree	0.92***	0.17**	-0.05	0.19	-0.85*	8.77
	(5.15)	(2.20)	(-0.50)	(1.52)	(-1.87)	(1.35)
Bachelor Degree	-0.13	0.05	0.09	-0.00	0.77*	-0.64
	(-0.78)	(0.80)	(1.16)	(-0.02)	(1.89)	(-0.13)
College DropOut	-0.68***	-0.10	0.11	0.25**	2.26***	0.61
	(-4.04)	(-1.35)	(1.40)	(2.26)	(5.16)	(0.10)
Married	-0.61***	-0.09	-0.27***	-0.20**	1.21***	-12.13*
	(-5.16)	(-1.62)	(-3.90)	(-2.21)	(3.94)	(-1.87)
Partnered	-0.19	-0.25**	-0.09	0.04	0.53	0.12
	(-1.07)	(-2.45)	(-0.81)	(0.28)	(1.07)	(0.01)
Parent Real Total Wealth	-0.00	0.00	-0.00	-0.00	-0.00	-0.00
	(-0.28)	(0.89)	(-0.50)	(-1.22)	(-0.88)	(-1.13)
Parent Real Total Household Income	-0.00***	-0.00	0.00	0.00	0.00	-0.00*
	(-3.29)	(-0.41)	(1.34)	(1.11)	(0.56)	(-1.77)
Parent Real Non Housing Fin. Wealth	-0.00	-0.00	-0.00	0.00	0.00	0.00
	(-1.34)	(-1.23)	(-0.33)	(0.39)	(0.14)	(0.96)
Child Work	-0.08	0.10	-0.04	0.04	0.91*	4.05
	(-0.50)	(1.06)	(-0.30)	(0.27)	(1.92)	(0.42)
Child Work Partime	0.09	0.16**	-0.13	-0.16	-1.00***	-5.95
	(0.76)	(2.54)	(-1.57)	(-1.48)	(-2.98)	(-1.25)
Contact Frequency	0.00***	0.00***	0.00***	0.00***	0.01***	0.01
	(5.24)	(3.37)	(5.52)	(7.45)	(10.00)	(1.30)
Female	0.19**	0.09**	0.61***	0.91***	9.92***	9.57*
	(2.13)	(2.10)	(10.79)	(12.55)	(37.27)	(1.87)
Step-kid	-0.79***	-0.21***	-0.39***	-0.53***	-16.34***	0.03
	(-5.93)	(-3.49)	(-5.06)	(-5.30)	(-31.83)	(0.00)
Constant	-286.65***	-26.55	113.27	36.43	-133.52	-930.19
	(-2.63)	(-0.26)	(1.31)	(0.40)	(-0.40)	(-0.22)
Observations	156979	128183	157216	157204	153013	2999

Notes: The table shows the results of regressing in-kind transfers from children to parents to the relative position of their children in the income distribution T and demographic controls X using HRS data. t statistics in parentheses, standard error cluster by household. * $p < .10$, ** $p < .05$, *** $p < .01$.

C Equilibrium Properties

This section aims to examine the equilibrium properties of the household problem in order to shed light on the decision-making processes of parents and children.

C.1 Parent-Child Problem when the Child Decides College

The model used in this analysis considers three distinct stages when children are deciding whether or not to attend college. In the first stage, the child must decide on college attendance, while taking into account the parent's transfers and savings. The second stage involves the parents, who must then decide on their consumption, savings, and transfers, based on their child's education decisions. Finally, in the third stage, given the previous decisions made by the parent and the child's own college decision, the child must decide on their savings and consumption. To facilitate the modeling of strategic interactions between parents and children, an interior solution is assumed, allowing for the use of first-order conditions. To simplify the analysis, the optimization problem is characterized in reverse order.

Child problem

At the beginning of the model, the child is born with zero assets and must make decisions about their consumption and assets in the third and final stage, based on both their parents' and their own previous decisions. To formalize this problem, the optimization problem can be defined as follows:

$$V_1(a_c, e_c, e_p, \theta, z, t_p, a_p') = \max_{c_c, a_c'} u(c_c)$$

$$+\beta E\left[V_2(a_c', e_c, e_p, \theta, z', t_p'^{*}(a_p', a_c', e_c, e_p, \theta, z'), a_p^{*''}(a_p', a_c', e_c, e_p, \theta, z'))|z\right]$$

$$\text{s.t: } a_c' + c_c = \tau_e y(1, 0, \theta) - \phi 1_{e_c = C} + t_p$$

$$z = 0, a_c = 0$$

$$a_c' \geq 0, c_c \geq 0$$

In this equation, the symbol $*$ is used to indicate the policies that serve as equilibrium objects, while E represents the expectation for future child income productivity, based on the child's current income productivity. The first-order conditions (F.O.C) for this problem can be expressed as follows:

$$c_c : u'(c_c) - \lambda = 0$$
$$a'_c : \beta E V^{t+1}_{a'_c} + \beta E V^{t+1}_{t'^*_p} \frac{\partial t'_p}{\partial a'_c} + \beta E V^{t+1}_{a''^*_p} \frac{\partial a''^*_p}{\partial a'_c} - \lambda = 0$$

The envelope theorem is used to derive the following result:

$$V^{t+1}_{a'_c} = (1+r)u'(c'_c)$$
$$V^{t+1}_{t'_p} = u'(c'_c)$$
$$V^{t+1}_{a''_p} = \beta E[V_{a''_p}{}^{t+2}] = 0$$

By rearranging these equations, we can derive the Generalized Euler Equation for the child:

$$u'(c_c) = \beta(1+r)E[u'(c'_c)] + \beta E[u'(c'_c)\frac{\partial t'_p}{\partial a'_c}] \tag{1}$$

The additional term in the Generalized Euler Equation captures the impact of savings on children, as it ultimately reduces the transfers they receive from their parents in the future. When the partial derivative of t'_p with respect to a'_c is negative, children's savings decrease future parental transfers, leading to a reduction in future consumption and creating what is referred to as the "Good Samaritan Problem". As a result of this phenomenon, children tend to under-save and overconsume each period, compared to the case where parents have full commitment. To avoid this distortion, parents seek to set $\frac{\partial a'^*_c}{\partial t_p} = 0$, thereby ensuring that their own savings do not have an adverse effect on their children's saving behavior.

Parent problem

During the period in which children must decide on college attendance, parents are faced with the following problem:

$$
\begin{gathered}
V_{1+j_k}(a_p, a_c, e_p, \theta, z) = \max_{c_p, a_p', t_p} u(c_p) + \eta u(c_c^*(a_c, e_c, e_p, \theta, z, t_p, a_p')) \\
+\beta E\left[V_{1+j_k+1}(a_p', a_c'^*(a_c, e_c, e_p, \theta, z, t_p, a_p'), e_c, e_p, \theta, z') | z'\right] \\
\text{s.t } a_p' + c_p = y(1 + j_k, e_p) - t_p + (1 + r)a_p \\
z = 0, a_c = 0 \\
a_p' \geq 0, c_p, t_p \geq 0
\end{gathered}
$$

Since parents make transfer decisions only after their children have decided whether or not to attend college, the child's education level is known to the parents. As a result, the first-order conditions for this problem can be expressed as follows:

$$
\begin{gathered}
c_p : u'(c_p) - \lambda = 0 \\
a_p' : \eta u'(c_c^*) \frac{\partial c_c^*}{\partial a_p'} + \beta E V_{a_p'}^{t+1} + \beta E V_{a_c'^*}^{t+1} \frac{\partial a_c'^*}{\partial a_p'} - \lambda = 0 \\
t_p : \eta u'(c_c^*) \frac{\partial c_c^*}{\partial t_p} + \eta \beta E V_{a_c'^*}^{t+1} \frac{\partial a_c'^*}{\partial t_p} - \lambda = 0
\end{gathered}
$$

Similar to the previous case, the Envelope Theorem is used to derive the following result:

$$V_{a_p'}^{t+1} = (1+r)\lambda' = u'(c_p')(1+r)$$
$$V_{a_c'^*}^{t+1} = \eta u'(c_c'^*)\frac{\partial c_c'^*}{\partial a_c'^*}$$

The equation system can be rewritten as follows:

$$u'(c_p) = \eta u'(c_c^*)\frac{\partial c_c^*}{\partial a_p'} + \beta E[u'(c_p')(1+r)] + \beta E[\eta u'(c_c'^*)\frac{\partial c_c'^*}{\partial a_c'^*}]\frac{\partial a_c'^*}{\partial a_p'} \tag{2}$$
$$u'(c_p) = \eta u'(c_c^*)\frac{\partial c_c^*}{\partial t_p} + \eta\beta E[\eta u'(c_c'^*)\frac{\partial c_c'^*}{\partial a_c'^*}]\frac{\partial a_c'^*}{\partial t_p} \tag{3}$$

Equation 2 represents the parent Generalized Euler Equation, reflecting the impact of parental saving behavior on both their own and their children's utility. It is worth noting that the derivative of the child budget constraint can be expressed as $\frac{\partial c_c}{\partial a_p'} = -\frac{\partial a_c'^*}{\partial a_p'}$, while the derivative of the child consumption in the next period is given by $\frac{\partial c_c'^*}{\partial a_c'} = (1+r) - \frac{\partial a_c''}{\partial a_c'^*}$. With these equations, we can rewrite the parent Generalized Euler Equation as follows:

$$u'(c_p) = \beta E[u'(c_p')(1+r)] - \eta\frac{\partial c_c^*}{\partial a_p'}\left(u'(c_c^*) - \beta E\left[\left(1+r-\frac{\partial a_c''^*}{\partial a_c'^*}\right)u'(c_c'^*)\right]\right)$$

The first term on the right side of the equation represents the standard trade-off between parent consumption today and in the future, as reflected in the parent Euler Equation. The second term represents the trade-off that parents face when deciding whether to increase their savings. When parents increase their savings, they receive an additional utility today as their child increases their own consumption through a decrease in savings. However, this comes at the expense of reducing the child's consumption in the future, which can ultimately lead to a reduction in both the child's and parent's utility. Therefore, the second term captures the tension that arises between the benefits of saving for the parent's own consumption and the potential negative impact on their child's consumption in the future.

Equation 3 represents the trade-off that parents face when deciding how much to transfer to their children. By using the child budget constraint, we can derive the expression $\frac{\partial c_c^*}{\partial t_p} = 1 - \frac{\partial a_c^{'}}{\partial t_p}$. This relationship enables us to rewrite the transfer equation as follows:

$$u'(c_p) = \eta u'(c_c^*) - \eta \frac{\partial a_c^{'*}}{\partial t_p} \left(u'(c_c^*) - \beta E \left[\left(1 + r - \frac{\partial a_c^{''*}}{\partial a_c^{'*}} \right) u'(c_c^{'*}) \right] \right)$$

The first term in the equation represents the marginal benefit that a parent receives from an additional unit of child consumption. It reflects the positive impact that a transfer can have on the parent's own utility, as their child's increased consumption can lead to greater satisfaction for the parent. The second term captures the trade-off that parents face between lower child consumption today and higher consumption in the future, given an increase in their child's savings. This occurs because a higher transfer to the child would decrease their current consumption, but the child's increased savings would lead to higher consumption in the future. Therefore, parents must weigh the benefits of a higher transfer against the potential cost of lower current child savings.

Child College Decision

The first stage of the model involves the college attendance decision, in which children are faced with the following problem:

$$\hat{V}_1^*(a_p, a_c, e_p, \theta, z) = \max_{i \in [HS, C]} \{ V_1(a_c, i, e_p, \theta, z, t_p^*(a_p, a_c, i, e_p, \theta, z), a_p^{*'}(a_p, a_c, i, e_p, \theta, z)$$
$$+ 1_{e_c = C} \kappa(\theta) + \epsilon_i) \}$$

The optimization problem faced by the child during the college attendance decision considers not only the impact of attending college on their consumption but also the potential effects on their parents' transfer and wealth. As a result, altruist parents can influence their children's decision to attend college by adjusting their transfer and savings behavior. By doing so, they can increase their child's likelihood of attending college, thereby improving their prospects and opportunities.

C.2 Parent-Child Problem After College and Before Parent Last Period

During these periods, parents always make their decisions first, in terms of their consumption, savings, and transfers. Then, based on these decisions, children must decide on their own savings and consumption. The optimization problem faced by parents and children during this period is identical to the problem that arises in the second and third stages, which occur when the college attendance decision is made. As a result, the trade-offs between consumption, saving, and transfers are the same across these different periods.

C.3 Parent-Child Problem During Parent Last Period

In this subsection, I focus on the last period of the parent's life, during which they are aware of their imminent death and must decide how to allocate their savings as a bequest to their children in the following period.

Child Problem

This period represents the final stage for the children before they become parents themselves, and they must solve the following problem:

$$V_{j_k}^{coh}(a_c, \theta^{coh}, e_c, e_p, z, t_p, a_p') = \max_{c_c, a_c'} u(c_c) + \beta E\left[\hat{V}_{j_k}^{coh}(b_p^* + a_c', 0, \theta^{coh+1}, e_c, z_0)|\theta^{coh}\right]$$
$$\text{s.t. } a_c' + c_c = y(j_k, e_c, z) + t_p + (1+r)a_c$$
$$a_c' \geq 0, c_p \geq 0$$

In this equation, coh represents a specific cohort, while $coh + 1$ refers to the variables associated with the next generation. The child's decisions do not affect future transfers since they occur after the parent's death. As a result, the first-order conditions for this problem can be expressed as follows:

$$c_c : u'(c_c) - \lambda = 0$$
$$a'_c : \beta E[V^{j_k}_{a'_c}] - \lambda = 0$$

By applying the Envelope Theorem, we obtain the expression $V^{j_k}_{a'c} : (1+r)\lambda' = u'(c'_c)(1+r)$. Using this result, we can derive the standard Euler Equation for the children, which is given by $u'(c_c) = \beta(1+r)E[u'(c'_c)]$. This equation indicates that the children's saving behavior is not influenced by future parent decisions.

Parent Problem:

During the last period, parents must decide how much to transfer to their children during this period and how much to leave as a bequest. To do so, they must solve the following optimization problem:

$$V^{coh}_J(a_p, a_c, e_c, e_p, \theta, z) = \max_{c_p, b_p, t_p} u(c_p) + \eta u(c^*_c(a_p, a_c, e_c, e_p, \theta, z, t_p, b_p))$$
$$+\eta_d \beta E\left[V^{coh+1}_{j_k+1}(b_p + a'^*_c(a_p, a_c, e_c, e_p, \theta, z, t_p, b_p), 0, e^{coh+1}_c, e_c, \theta^{coh+1}, 0)|\theta^j\right]$$
$$\text{s.t: } c_p + b_p = \text{S.S.}(e_c) - t_p + (1+r)a_p$$
$$t_p, b_p, c_p \geq 0$$

The first-order conditions for this problem can be expressed as follows:

$$c_p : u'(c_p) - \lambda = 0$$

$$b_p : \eta u'(c_c)\frac{\partial c_c^*}{\partial b_p} + \eta_d \beta E[V_{b_p}^{coh,j_k+1}(1 + \frac{\partial a_c^{'*}}{\partial b_p})] - \lambda = 0$$

$$t_p : \eta u'(c_c^*)\frac{\partial c_c^*}{\partial t_p} + \eta_d \beta E[V_{b_p}^{coh,j_k+1}\frac{\partial a_c^{*'}}{\partial t_p}] - \lambda = 0$$

By applying the Envelope Theorem, we can derive the following expression: V_{bp}^{coh,j_k+1} : $(1+r)\lambda' = u'(c_c^{'})(1+r)$. Based on this result, we can establish the following system of equations:

$$u'(c_p) = \eta u'(c_c^*)\frac{\partial c_c^*}{\partial b_p} + \eta_d \beta E[u'(c_c^{'})(1+r)(1 + \frac{\partial a_c'}{\partial b_p})] \tag{4}$$

$$u'(c_p) = \eta u'(c_p)\frac{\partial c_c^*}{\partial t_p} + \eta_d \beta (1+r) E[u'(c_c')\frac{\partial a_c^{'*}}{\partial t_p}] \tag{5}$$

Equation 4 provides insight into the trade-off faced by parents when deciding how much of their assets to leave as a bequest. The first term on the right side of the equation reflects the increase in utility that parents derive from higher child consumption today, as a result of leaving a larger bequest. The second term represents the trade-off between higher consumption in the future, given the bequest received, and lower consumption in the future due to reduced savings on the part of the child.

Similarly, equation 5 characterizes the trade-off faced by parents when making their final transfer decisions. Once again, the first term on the right side of the equation reflects the increase in utility derived from higher child consumption today. The second term represents the decreased utility associated with lower consumption in the future, which arises due to the reduction in child savings that results from the transfer.

D Model Solution Algorithm

To address the computational challenges associated with this problem, I adopt the solution algorithm developed by Boar (2020):

1. To begin, I set up a grid on assets (a), ability (θ), education (e), and income (z). As a result, the size of the state space is determined by the product of T, A^2, H, E^2, and Y. To discretize the ability and income processes, I employ the Tauchen method.

2. Solve the problem for generation J which is not altruistic: $V^T(a_p, a_c, e_c, e_p, \theta, z)_{t=1}^T$.

3. To obtain $V^{J-1}(a_p, a_c, e_c, e_p, \theta, z)_{t=1}^T$, I work backward through the parent-child pairs, beginning with the previous generation solved in the previous step. Specifically, I solve the problem for each cohort from T to 1, using the previous solution as the continuation value for the next cohort in T.

   (a) Solve the child optimization problem $c_c^{'**}(t, a_c, e_c, e_p, \theta, z, a_p')$, $a_c^{'**}(t, a_c, e_c, e_p, \theta, z, a_p')$ without parent transfers.

   (b) Solve the parent optimization problem in two steps to get the policy functions $c_p^*(t, a_p, a_c, e_c, e_p, \theta, z)$, $a'^*_p(t, a_p, a_c, e_c, e_p, \theta, z)$ and $t_p^*(t, a_p, a_c, e_c, e_p, \theta, z)$:
   First, solve the optimal transfer t_p conditional on a_p. Second, solve the optimal parental policy saving a_p' given the optimal transfer $t_p^{**}(t, a_p, a_c, e_c, e_p, \theta, z, a_p')$. Then using linear interpolation recover $t_p^*(t, a_p, a_c, e_c, e_p, \theta, z)$ and child policies $c_c^*(t, a_p, a_c, e_c, e_p, \theta, z)$, $a_c^{'*}(t, a_p, a_c, e_c, e_p, \theta, z)$.

4. Solve the problem backward until the difference between V^{T-j} and V^{T-j-1} is small enough.