# Games Parents and Adolescents Play: Risky Behaviors, Parental Reputation, and Strategic Transfers *

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**Abstract**

This paper examines reputation formation in intra-familial interactions. We consider parental reputation in a repeated two-stage game in which adolescents decide whether to give a teen birth or drop out of high school, and given adolescent decisions, the parent decides whether to house and support his children beyond age 18. Drawing on the work of Milgrom and Roberts (1982) and Kreps and Wilson (1982), we show that the parent has, under certain conditions, the incentive to penalize older children for their teenage risky behaviors in order to dissuade the younger children from the same risky behaviors.

This model generates two empirical implications: the likelihood of teen risky behaviors and parental transfers to a child who engaged in teen risky behaviors will decrease with the number of remaining children at risk. We test these two implications, using data from the National Longitudinal Survey of Youth, 1979 Cohort (NLSY79). Exploiting the availability of repeated observations on individual respondents and of observations on multiple siblings, we find evidence in favor of both predictions.

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# 1 Introduction

Teenage risky behaviors have raised substantial concerns in the U.S. For sexual behavior, the public strongly supports the statement that teenagers "should abstain from sex at least until they are out of high school." [1] For school dropping out, Cameron and Heckman (1993) demonstrated that dropping out of high school without a diploma could generate long-term negative consequences in later life. Similar disapproval has been expressed for youth smoking, marijuana use, and juvenile crime. Nevertheless, the 2001 Youth Risk Behavior Survey[2] still found a significant proportion of teenagers engaging in risky behaviors: 33.4% of high school students had had sexual intercourse in the previous three months,[3] 47.1% drank alcohol, 28.5% smoked cigarettes, and 23.9% used marijuana. NCES (2001) further reported that only 77% of adolescents aged 18-19 graduate from high school with a diploma, leaving almost a quarter of adolescents unprepared for a productive adult life.

What drives teenagers to engage in risky behaviors? What actions should parents and the society take to reduce these behaviors? These two questions have attracted enormous attention from several academic disciplines. In one strand of the literature, psychologists and behavioral economists analyzed adolescent decision-making process, linking risky behavior to teenagers' myopic view of the present and mis-prediction of the future (O'Donoghue and Robin 2001). In another two directions, economists, psychologists and sociologists associate teenage risky behaviors with external influences. Some emphasize extra-familial forces such as peer groups, mass media, school education, community organizations, and social policies. Others examine parental controls within the family, but are mainly limited to a static setting of one parent versus one child. Given the lack of consensus in both theoretical[4] and empirical[5] literature, the static view of parent-child interaction does not articulate the mechanism through which parents

[1] Annie E. Casey Foundation (1999).

[2] Conducted by the Center of Disease Control.

[3] 42% of which went unprotected

[4] The best-known economic theory about parent-child interaction is Becker's Rotten Kid Theorem (Becker 1974, 1991), which posits that a parent can fully discipline a child through economic incentives. Bergstrom (1989) challenges the transferable utility assumption of the Rotten Kid Theorem and questions parental controls in a world of non-transferable utility. Psychologists and sociologists emphasize the role of parents in a different way. Socialization theory stipulates that parents foster children's internalization of social values through modeling, reinforcing and punishing. The parental control thesis postulates that effective parenting capitalizes on social approval, social disapproval and inductive reasoning in parental supervision (Baumrind 1978; McLanahan 1985).

[5] Empirical findings are mixed. For example, some found that non-intact families and unstable families prevent parents from fulfilling their role and have negative consequences for children (Sampson and Laub 1993; Amato and Booth 1997) whereas others found little effect of non-intact families on children's outcomes (Wu and Martinson 1993; Harris 1998).

would have the ability to reduce risky behaviors of adolescents.

This paper introduces a new perspective by extending the static one-parent-one-child setting into a dynamic intra-familial model. Specifically, we consider one parent and multiple children engaging in a repeated game. In every round of the game, one teenage child decides whether to undertake a risky behavior. Conditional on the child's behavior, the parent decides whether to punish that child by withholding transfers. Each child plays the game once by birth order whereas the parent plays through all rounds. In this dynamic setting, younger children will learn parental reaction to teenage risky behavior from the experience of their older siblings. Drawing on the reputation model of Milgrom and Roberts (1982) and Kreps and Wilson (1982), we show that the parent has incentive to penalize older children for their risky behaviors in order to dissuade the younger ones from the same risky behavior.

This model, referred to as the "reputation model", yields two empirical implications – the likelihood of teenage engagement in a risky behavior, and parental transfers to a child with such a behavior will decrease with the number of children at risk. To test these two implications, we focus on two risky behaviors – teenage childbearing, and high school dropping out. Both behaviors of teenage children may have long-term negative consequences for their life course trajectories (Hoffman et al. 1993; Furstenberg et al. 1987; Cameron and Heckman 1993). Thus, parents are motivated to establish a reputation of disproving teenage childbearing and high school dropout. Robust findings about these two different risky behaviors will provide strong evidence to support the reputation model.

To test the reputation model, we exploit three unique features of the data from the National Longitudinal Survey of Youth, 1979 Cohort (NLSY79). First, the NLSY79 includes detailed information on children behaviors during teenage as well as parental transfers to children beyond age 18. This allows us to link parental transfers with teenage behaviors. Second, the NLSY79 provides a complete fertility history of the respondent's parent, from which we can calculate at each year for each respondent the number of siblings under age 18 at risk of a specific risky behavior. More importantly, the NLSY79 contains repeated observations of individual respondents and multiple siblings in the same family, which permits us to capture the unobserved individual and family characteristics that may affect teenage risky behavior.

Consistent with the reputation model, we find that adult respondents who committed a risky behavior (teenage childbearing or high school dropout) as teenagers receive less parental transfers when there are more siblings remaining at risk. Moreover, focusing on respondents from the same families, we find that older siblings are less likely to drop out of high school or

to have teenage childbearing. This supports the argument that older children foresee greater parental incentives to punish them for risky behaviors and therefore refrain from committing risky behaviors.

Before concluding in favor of the reputation model, we consider an alternative "income story." A parent may not have any concern for reputation, but face a financial constraint such that given a fixed permanent income the amount of resources he would like to transfer to each adult child declines with the number of children remaining under age 18. This may generate an effect similar to what the reputation model predicts.

This alternative explanation is rejected by two findings. First, the logic of the income story does not depend on children's teenage behaviors, so we expect similar birth-order effects regardless of risky behaviors. Inconsistent with this prediction, we find much stronger birth-order effects for ill-behaving children. Second, the income story assumes that the parent faces a budget constraint when there are remaining children under age 18 in need of parental support. Since the budget constraint is most likely binding for low-income families, it follows that the birth-order effect should exist for low-income families but not for high-income families. In contradiction, we find that the birth order effect is stronger for high-income families than for lower-income families. Both findings remain consistent with the reputation model.

The remainder of the paper is organized as follows. Section 2 characterizes the repeated two-stage game between one parent and multiple children and outlines a set of reduced form empirical implications from the game-theoretic model. To facilitate comparison, Section 2 also presents a formal discussion of the income story and derives testable implications from the income story. To test both models, Section 3 presents two econometric frameworks, one for children's choices of teenage risky behaviors and one for parents' transfer decisions conditional on children behaviors. We devote special attention to identification strategies and the distinction between the reputation model and the alternative income story. Applying econometric specifications to the NLSY79, Section 4 describes the data and Section 5 reports empirical estimates. In the final section, we offer concluding remarks.

## 2 Theory

Becker's Rotten Kid Theorem posits that a parent can fully discipline a child by specifying parental transfer as a function of the child's behavior (Becker 1974, 1991). As Bergstrom (1989) points out, this logic only holds under transferable utility. If utility is non-transferable, the

disutility that an ill-behaving child brings to the parent cannot be fully compensated through transfers. In that case, the parent fails to discipline the child. Section 2.1 delivers this intuition in a static model of one child and one parent. Section 2.2 extends the static model to a dynamic setting involving one parent and multiple children. The dynamic model describes the extent to which parents can discipline children even if the utility is non-transferable, and therefore is complement to both Becker (1974, 1991) and Bergstrom (1989). From the dynamic model we derive testable predictions in Section 2.3. At the end of this section, we discuss implications of the income story and compare them with those from the reputation model. Such comparison will guide our empirical analysis in later sections.

## 2.1 The Static Model

Consider an altruistic parent and a selfish teenage child playing a two-stage game. At stage 1, the child decides whether to avoid or engage in a risky behavior. Let "ill-behaving" ($b = 1$) be engagement in risky behavior and "behaving"($b = 0$) be no engagement in risky behavior. With action choice $b$ and consumption level $c_c$, the child earns utility $U_c = U_c(c_c, b)$.

At stage 2, the parent decides whether to extend or withhold transfers to the child. The parent is assumed to be altruistic and possess two personalities. On the one hand, as a consuming parent, he[6] derives utility $U_p = U_p(c_p, b)$ from his own consumption $c_p$ and the teenage child's action $b$ at stage 1. In general, the parent prefers the child not engaging in a risky behavior and therefore $U_p'(b) < 0$. On the other hand, the altruistic parent acts as a social planner for the family. He maximizes the family welfare function $W_p[U_p(c_p, b), U_c(c_c, b)]$ subject to an exogenously given family income $I_p$. Assuming the child has no income but parental transfer $t$, we summarize the game as:[7]

Stage 1: The child solves the problem

$$\max_{b} \qquad U_c = U_c(t, b);$$

Stage 2: Taking $b$ as given, the social-planning parent solves the problem

$$\max_{t} \qquad W_p[U_p(I_p - t, b), U_c(t, b)].$$

[6]We treat parents – be they a mother-father pair or a single parent – as one decision-maker. While calling the parent "he", we impose no gender assumption.

[7]We further assume both the consumer-parent's and the child's utility are normal goods and that $W_p$ has nice concavity to guarantee a unique solution to this game.

Typically, the parent and teenage child have conflicting interests regarding risky behavior. As the behavior is likely to impose a permanent negative impact on the child's life, the parent would like the child to avoid it as much as possible. In contrast, the child may want to be more involved in such behavior either for peer respect or simply due to little consideration for the future. Parental disapproval may not be enough to prevent teenage engagement in the risky behavior. Once the child engages in the risky behavior, a typical altruistic parent cannot stand watching the child suffer from the consequences of the risky behavior, and therefore would like to offer help. Knowing the parent to be forgiving, the child would take advantage of parental altruism and engage in the risky behavior more than the parent desires. As a result, the parent fails to discipline the child.

Figure 1(a) illustrates this intuition in an example of teen birth. The equilibrium "teen birth, acquiesce" is away from the social optimum of "no teen birth" because (1) the selfish daughter does not take into account parental feelings toward teen birth; and (2) the altruistic parent cannot make a credible commitment to punish the daughter for a teen birth. As long as the daughter has complete information about parental altruism, the same problem exists in any finite repetition of the game.[8]

## 2.2 The Dynamic Model of Reputation

The static model implies that, in a world of non-transferable utility, parents do not have enough ability to control teenage behaviors and therefore teen birth and high school dropout are social problems. A dynamic model applying reputation theories in industrial organization argues that a parent, who would like to forgive children's wrong-doing *ex post*, may be able to establish a reputation of "being tough" by mimicking an unforgiving parent. In attempt to build up a reputation, an altruistic parent may punish his older child for risky behavior in hope of delivering a credible threat to the younger children at risk. However, for the reputation to be effective, the children must be uncertain about whether or not the parent is truly unforgiving.[9] The following dynamic model formalizes this intuition in a repeated game.

[8] Because the daughter will use backward deduction to derive the equilibrium solution.

[9] The original setting for reputation formation is a predatory problem in industrial organization. A monopolist faces a finite stream of potential entrants. Once an entry occurs, the monopolist has to decide whether to prey on or accommodate the entrant. Two classic papers, Kreps and Wilson (1982) and Milgrom and Roberts (1982), demonstrate that the monopolist will have strong incentives to build up a reputation of preying on early entrants, even if doing so results in an immediate loss of profit. For such commitment to be credible, potential entrants must have some doubts regarding whether the predatory behavior of the monopolist really leads to immediate loss for the monopolist.

To facilitate our analysis, we denote the degree of parental forgivingness by a continuous parental type $\pi$. At the beginning of the repeated game, children do not know $\pi$. Instead, they are endowed with a prior belief such that there is a positive probability ($\epsilon$) of encountering an unforgiving parent. If the parent is "unforgiving", he will cut off transfers to a child undertaking a risky behavior in stage 2. As shown in an example of Figure 1(b), such an "unforgiving" feature, once known to the child, would effectively deter teen birth. In the other $1-\epsilon$ probability, the chance of encountering a forgiving parent of type $\pi$ conforms to a known distribution on $[x, 1)$ where $x$ denotes initial reputation and 1 denotes the "unforgiving" type.[10]

If the children believe for a certainty that the parent is forgiving (i.e. $\epsilon = 0$), $x$ is set equal to $-\infty$ and there is no way to change this belief. In this case, all children will undertake risky behaviors and the parent will help in all events. On the other hand, if the children believe for a certainty that the parent is unforgiving (i.e. $\epsilon = 1$), there is no room to update the belief either. All children would behave as the parent desires and the parent commits to punish should any risky behavior occur. In all the other circumstances, the children believe the parent is *at least* as tough as one of real type $x$. The initial reputation would be updated as new information flows in.

In a family with $N$ children, the game has $N$ rounds. In each round, the parent plays the above two-stage game against one child. Game starts at the oldest child (referred to as the $N$th child), proceeds according to birth order and ends at the youngest child (referred to as the 1st child). Every child observes all the actions taken before its round and is able to use the history to update its belief about the parental type. $X_n$ denotes the $n$th's child's belief about the parental type right before the $n$th round starts. By this definition, the initial reputation is the same as $x_N$. Overall, the parent maximizes the sum of discounted welfare $\sum_{n=1}^{N} \delta^{N-n} \cdot W_p(t_n, b_n)$ using a publicly known discounting factor $\delta$.

Following Milgrom and Roberts (1982), the unique sequential equilibrium is characterized by a vector of punishment thresholds – $\bar{\pi}_1, \bar{\pi}_2, .., \bar{\pi}_N$. For any birth order $n$, $\bar{\pi}_n$ denotes the most lenient parent type who would punish risky behavior at the $n$th round. Any parent of type above $\bar{\pi}_n$ would prefer to punish the $n$th child for risky behavior, and any parent of type below $\bar{\pi}_n$ does not value the reputation enough to engage in punishment. The exact equilibrium goes on like this: at the beginning of the $n$th round, children believe the parent to be at least as tough as one of real type $x_n$. If the $n$th child does not engage in any risky behavior, the reputation remains at

[10]This setting follows Milgrom and Roberts (1982). Kreps and Wilson (1982) derived a similar equilibrium under the assumption of discrete parental types. We choose to follow Milgrom and Roberts (1982) only for illustrative purposes.

$x_n$. If the $n$th child undertakes a risky behavior, the parent will acquiesce if $\pi < \bar{\pi}_n$ and punish otherwise. In case of punishment, the belief is updated to $x_{n-1} = \max(x_n, \bar{\pi}_n)$. If the risky behavior goes unpunished, it immediately reveals the parent being "forgiving" and reputation degenerates to $x_{n-1} = -\infty$. In that case, "ill behave, acquiesce" arises in every round of the game that follows.

The above equilibrium [11] is illustrated in three graphs of Figure 2. Graph 2(a) depicts the real parental type $\pi$ and the punishment thresholds $\{\bar{\pi}_n\}$. On the one hand, if the parent is extremely altruistic and always places more value on the current child's suffering than on the future gains of reputation, he will forgive any wrongdoing child. This means that his real type $\pi$ is less than any punishment threshold. On the other hand, an unforgiving parent would punish every child for engaging in risky behavior, but for any forgiving parent, there is no reputation gain from punishing the last child. This implies that $\bar{\pi}_n = 1$. Between the oldest child and the youngest child, it is easy to show that any parent who would like to punish the $n$th child is also fully motivated to punish any wrongdoing child who enters the game before the $n$th child.

This suggests that $\bar{\pi}_n$ is a non-increasing function of $n$, which allows us to define a birth order threshold $\bar{n}$ such that $\bar{\pi}_{\bar{n}+1} < \pi < \bar{\pi}_{\bar{n}}$. Intuitively, $\bar{n}$ denotes a turning point for a forgiving parent to switch from "punish" to "acquiesce." Graph 2(b) illustrates the parent's decision in whether to withhold transfers to an ill-behaving child, and Graph 2(c) describes children's decision in whether to engage in the risky behavior as a teen. Cast along a birth-order horizon, both Graphs 2(b) and 2(c) are step functions turning at the birth-order threshold $\bar{n}$.

### 2.3 Testable Predictions from the Reputation Model

The reputation model generates three predictions for parental transfers:

1. Because the potential gain of reputation increases with the number of younger children at risk, parents should be more likely to punish older children for teenage risky behaviors.

[11] Technically, the above equilibrium is a unique sequential equilibrium for the finitely repeated dynamic game. The equilibrium is also robust to two-side uncertainty; that is, the child may have private information about a preference toward teenage risky behaviors. In that case, parental strategy is exactly the same as before, as long as every child's preference conforms to a publicly known distribution and every child's preference is independent from each other. (Otherwise, the parent may learn the child's preference throughout the game. This would substantially complicate the game structure.) Children's strategy would take into account his/her own preference, which may explain why not every youngest child engages in risky behaviors and not every older child in a big family avoid risky behaviors.

This prediction comes directly from the shape of the step function as depicted in Graph 2(b).

2. Suppose high family income signals "tougher" parental preferences either because having a troublesome teen child means more image damage for high-income parents or because high-income parents put more emphasis on good teenage performance as a crucial determinant of the child's adult life. Either way, high-income parents should have higher initial reputation ($x_N$) and hence greater incentives to maintain that reputation. Following this logic, high-income parents should be, on average, more likely to punish teen risky behaviors. It is clear to envision the logic in Graph 2(b): when the initial reputation goes up, the birth-order threshold $\bar{n}$ shifts to the right, implying greater likelihood of punishment on average.[12]

3. The more value parents place on the future gains of reputation, the more incentives parents would have to build up the reputation. Assuming parental discount rate decreases with the age gap between two adjacent children, the likelihood for a parent to punish an undesirable teenage behavior should decrease with the age gap between the child under study and its next younger sibling at risk. Graphically, this is because the birth-order threshold $\bar{n}$ shifts to right as the age gap narrows.

In equilibrium, children expect the reputation concerns of parents, and therefore take them into account when they choose whether to engage in risky behaviors. This suggests three predictions for teenage children:

1. Within a specific family, children of higher birth order (i.e. born earlier) should be less likely to engage in risky behaviors.

2. All else being equal, children from high-income families should be more self-disciplined about teenage risky behavior.

3. A narrower age gap between a child and its next younger sibling at risk should give the child more restraint to engage in risky behavior.

[12]The same reasoning applies to highly educated parents. Empirically, family income and parental education are highly correlated, so we only report results on family income. Results using parental education are very similar.

## 2.4 The Alternative Income Story

An alternative income story may produce an effect similar to that in the reputation model. To distinguish these two explanations, this subsection lays out a formal discussion of the income story and derives testable implications accordingly.

Suppose children have perfect knowledge of parental type, so there is no reputation concern and the static equilibrium repeats in every round. In our previous example of teen birth, this means "teen birth, acquiesce" for any forgiving parent and "no teen birth" for any unforgiving parent. Further assume the parent is endowed with a fixed permanent income $I_p$. He allocates the income to himself and all his children. By law he has the responsibility to give housing and financial support to any child under age 18, but not necessarily to adult children. Therefore, at each time $t$, he has to meet the basic needs of living for himself and all minor children before transferring any amount to adult children. [13]

The parent's problem can be written as:

$$\max_{c_{ct}^1, c_{ct}^2, .., c_{ct}^N, c_{pt}} \sum_t \delta^{(N-t)} \cdot W_p[c_{pt}, c_{ct}^1, c_{ct}^2, .., c_{ct}^N, b^1, b^2, .., b^N]$$

subject to

$$\begin{aligned} c_{ct}^i &\geq c_c^{min} \qquad \forall i \text{ under age 18 at t} \\ c_{pt} &\geq c_p^{min} \\ \sum_{i=1}^{N} c_{ct}^i + c_{pt} &= I_p \end{aligned}$$

where subscript $i$ denotes a child's birth-order, $c_c^{min}$ and $c_p^{min}$ represent the minimum living expenses for a child and the parent respectively.

Because of legal responsibility for supporting minor children, an altruistic parent may or may not make transfers to his adult children depending on whether he can first meet the minimum needs of himself and all minor children. As children grow up over time, there are fewer and fewer children under age 18, implying fewer and fewer constraints for the parent to support children under age 18. As a result, the parent is more able to give transfers to his adult children when there are fewer minor children in the house. Figure 3(a) illustrates this intuition by depicting whether to transfer to an adult child as a function of the number of

[13] To keep the model simple, we ignore savings. Including or excluding this assumption does not affect the logic of the income story.

siblings remaining under age 18. It shows a step function similar to what we have depicted for the reputation model. This explains why identifying the birth-order effect alone does not separate the reputation model from the alternative income story.

The alternative income story also suggests two relationships distinguishable from the reputation model. First, the birth-order effects implied by the income story do not depend on the adult children's previous engagement in risky behavior. If the income story is the main explanation, we should observe birth-order effects for both ill-behaving and well-behaving children. In contrast, parental punishment out of reputation concerns should only apply to children with some wrongdoing during teen years.

Second, under the income story, the birth-order effect should only exist when the financial constraints are sometimes binding. In other words, if family income is sufficiently high such that those constraints are never binding, we should not observe any birth-order effect. This implies a flat line for high-income families in Figure 3(b). In contrast, under the reputation model, the punishment of risky behavior should be sensitive to birth order for all levels of family income. As illustrated in Figure 2(b), higher family income shifts the birth-order threshold $\bar{n}$ to the right, implying that higher-income families have even stronger incentives in reinforcing the reputation of punishing older children for their teenage risky behavior. Therefore, a comparison of high-income and low-income families should draw a clear distinction between the two competing explanations.

## 3 Econometric framework

We now proceed to test the implications from both the reputation model and the income story. The main econometric framework follows the reputation model, with special variables added to incorporate the income story. We present separate specifications for parents' transfer decisions and children's behavior decisions.

## 3.1 Parental transfers

### 3.1.1 Empirical Model

Consider the following specification for parental transfers to individual $i$ at time $t$:

$$\begin{aligned} T_{it} &= \alpha_i + \beta_1 \cdot B_i + \beta_2 \cdot NYG_{it} + \beta_3 \cdot AGAP_{it} + \beta_4 \cdot HIGHINC_{it} \\ &+ \beta_6 \cdot B_i \cdot NYG_{it} + \beta_7 \cdot B_i \cdot AGAP_{it} + \beta_8 \cdot B_i \cdot HIGHINC_{it} \\ &+ \beta_9 \cdot NYG_{it} \cdot HIGHINC_{it} + \beta_{10} \cdot B_i \cdot NYG_{it} \cdot HIGHINC_{it} \\ &+ f(z^c_{it}, z^p_{it}) + \epsilon_{it} \end{aligned}$$

where

$T =$ parental transfers in Stage 2 of the game, for example co-residence transfer and financial transfer to children older than age 18. Both types of transfers take binary value with 0 for no transfer and 1 for some transfer.[14] For the same individual i, $T$ may vary by time $t$.

$B =$ child behavior in Stage 1 of the game. $B$ is a binary choice, equal to 1 if the child engages in a specific risky behavior, and 0 otherwise. As detailed in Section 4, we study two risky behaviors – dropping out of high school or having a teen birth. For each behavior, we treat child action as a one-shot decision so $B$ is time invariant.

$NYG =$ birth order indicator. For the analysis of high school dropouts, NYG is set equal to the number of younger siblings under age 18. For the analysis of teen birth, NYG is equal to the number of younger sisters under age 18. NYG is time varying because more and more younger siblings grow out of age 18. For the youngest child, $NYG = 0$ all the time.

$AGAP =$ the number of years between the individual under study and his/her next younger sibling under age 18 who is at risk of the studied behavior.

$HIGHINC =$ a binary variable created from 1978 family income, indicating whether a family always has sufficient income per capita to support the basic needs of living for the maximum number of persons in the family. This time-invariant variable isolates high-income families from low-income families.

$z^c =$ observed child characteristics other than $B$ and $NYG$.

[14] See Section 4 for the exact definitions.

$z^p =$ observed parent characteristics other than $HIGHINC$.

$f(.) =$ flexible functional forms of $z^c$ and $z^p$.

$\alpha_i =$ individual fixed effect for individual $i$.

$\epsilon =$ error term.

### 3.1.2 Sign expectations

The main prediction from the reputation model is a birth-order effect specific to children who engaged in teenage risky behaviors. Namely, if parents are forgiving but children do not know parental type *ex ante*, the likelihood of parents withholding transfers from an ill-behaving child should increase with the number of younger siblings at risk of the same risky behavior. This implies a negative coefficient on $B \cdot NYG$ ($\beta_6 < 0$). [15] [16] As elaborated before, parents facing a smaller $AGAP$ or earning high income should be on average more likely to punish ill-behaving children. This implies a positive coefficient of $B \cdot AGAP$ ($\beta_7 > 0$) and a negative coefficient of $B \cdot HIGHINC$ ($\beta_8 < 0$).

To better envision these sign predictions, imagine we fit the step function of parental transfers illustrated in Figure 2(b) into a downward sloping line of $T$ with $NYG$ conditional on $B = 1$. Although the reputation theory predicts the effect of age gap and family income on the punishment threshold $\bar{n}$, it does not predict how the slope of the fitted line change with age gap and family income. When a smaller age gap or higher family income shifts $\bar{n}$ to the right, the fitted line may become steeper or flatter depending on the original position of $\bar{n}$. This explains why, by the reputation theory, we can test the coefficients of $B \cdot AGAP$ and $B \cdot HIGHINC$ but not the coefficients of three-way-interactions such as $B \cdot NYG \cdot HIGHINC$. As explained below, this implication will be useful in comparison with that from the alternative income story.

According to Section 2.4, the logic of the income story should only apply to those families that face binding constraints of supporting the basic needs of non-adult children, regardless of whether or not the adult children engaged in any risky behavior during teenage. This implies a

[15] Although the reputation equilibrium only applies to forgiving parents, this implication does not depend on what proportion of parents are indeed forgiving. Because unforgiving parents always treat all children equally, finding a negative coefficient on $B \cdot NYG$ is sufficient evidence for the reputation model.

[16] In a special case where the ill-behaving child is the youngest in the family (where $NYG = 0$), there is no reputation gain in the future and therefore forgiving parents won't withhold transfers. This translates into a positive coefficient on $B$, i.e. $\beta_1 \geq 0$. We are unable to test this hypothesis because individual fixed effects absorbs $B$.

negative coefficient on $NYG$ but a positive coefficient on $NYG \cdot HIGHINC$ ($\beta_2 < 0$, $\beta_9 > 0$). It is possible that those adult children who engaged in risky behaviors during teenage suffer from the consequences of risky behaviors and therefore have greater demand for parental transfers. If so, the birth-order effect may be more prominent for wrongdoing children ($\beta_6 < 0$), as we would observe under the reputation model. However, the income story should only apply to low-income families, and therefore high-income families should experience no incremental birth-order effects specific to teenage risky behaviors. This suggests a positive coefficient for the three way interaction $B \cdot NYG \cdot HIGHINC$ ($\beta_{10} > 0$). As discussed above, the reputation model does not give any clear prediction on this interaction term.

### 3.1.3 Identification Issues

A key identification challenge is that child $i$'s behavior choice, $B_i$, is endogenous in the transfer equation. For the dynamic reputation model to hold, children must update their belief about parental type whenever any new information comes in. In this sense, even if we observe multiple respondents from the same family, family fixed effects are not sufficient to control for different information sets each individual faced when he/she was up to make the teen behavior decision. Also, omitted individual characteristics, e.g. personality, are likely to affect both $B$ and $T$. Parents may even adopt differential definitions of punishing and helping for different children. Without adequate controls, these omitted characteristics will generate bias in estimates.

Two unique features of NLSY79 help circumvent this problem. First, NLSY79 contains repeated observations for each individual respondent after they reached age 18. These adulthood observations permit us to track variable residential and financial support from parents. Second, NLSY79 provides complete fertility history of each respondent's family, even though NLSY79 did not survey every child in the family. At each year for each respondent, this allows us to calculate the number of sisters under age 18 (at risk of teenage childbearing) and the number of siblings under age 18 (at risk of high school dropout).

Because teen behavior is a time-invariant history for each adult child, we can use an individual fixed effect ($\alpha_i$) to control for any unobserved factor that had driven the respondent's behavior as a teen. This solves the potential endogeneity of teen behavior choices in the specification of parent transfer decisions. Although $B_i$ drops out of the individual fixed effects, the key variable of interest – $B_i \cdot NYG_{it}$ – remains valid. We can identify the coefficient of $B \cdot NYG$ by examining whether parents grant more transfers to the same wrongdoing adult child as more and more younger children grow beyond age 18.

While the use of individual-fixed-effects estimators deals with all sources of bias that could arise in the specifications of parental transfer decisions, they may not be robust to certain generalizations beyond the reputation model and the alternative income story. For example, both theories assume the tastes of parents to be fixed over time. In reality, it is possible that parental tastes with respect to the teenage behaviors of their children evolve over time, as parents learn the consequences of such risky behaviors from their experiences with their older children. Similarly, a number of studies suggest that a permanent-transitory error structure is inadequate for characterizing the labor market earnings processes of individuals. [17]

Under either generalization, our estimates of reputation effects derived for the individual-fixed-effect estimators might still be biased. In an attempt to minimize these potential sources of bias, we control for an extensive set of observable time-varying parental and child-specific characteristics when estimating parental transfers. For example, we include parental age, as of the time period when the parents are making a decision about transfers to a particular child, in order to proxy for the influence of time-varying factors determining parental income and/or the evolution of parental tastes. We also include offspring age and other time-varying child-specific characteristic in our specifications of parental transfers.

While failure to account for the above sorts of time-varying unobservables may bias our estimates of reputation effects, we note that such bias may be contrary to the implications of the reputation model. Consider the following potential source of such bias: Suppose that we fail to capture changes in parental or children's incomes over time due to unexpected changes of welfare policies, such as changes in AFDC benefits. If these policy changes provide greater benefits to high school dropouts or teen mothers, and/or the amount of such benefits increases with the number of children under age 18, our estimates of $\beta_2$ and $\beta_6$ in the parental transfer equation will capture both the effects of parental reputation and the impact of variation in welfare policies. To the extent that welfare programs like AFDC provide higher benefits for bigger families, we should observe more parental transfers to high school dropouts or teen mothers among families with more children under age 18. Note that the bias imparted due to the latter effect is in exactly the opposite direction as the predicted effect of the number remaining children implied by our theory of parental reputation. As a result, the failure to adequately account for the impact of time-varying changes in welfare policy should lead to an under-estimate of the parental reputation effect.

[17] See, for example, Lillard and Willis (1978) and Abowd and Card (1989), and Hirano (1998).

### 3.2 Teenage behavior

For each individual $i$ and each of the two risky behaviors considered in this paper, we examine a binary choice as to whether or not individual $i$ engages in a specific risky behavior. The unit of observation is individual rather than individual-year.

Consider child $i$'s risky behavior:

$$\begin{aligned} B_i &= \alpha_f + \gamma_1 \cdot NYG_{it} + \gamma_2 \cdot AGAP_{it} + \gamma_3 \cdot HIGHINC_f \\ &+ \gamma_4 \cdot NYG_{it} \cdot HIGHINC_{it} + g(z_{it}^c, z_{it}^p) + \epsilon_i \end{aligned}$$

All variables follow the same definitions as before, except that time-varying variables are measured at the specific time when the respondent engaged in the risky behavior and $\alpha_f$ stands for family fixed effects rather than individual fixed effects.

The reputation model expects better self-discipline for a child of higher birth order ($\gamma_1 < 0$), having smaller age gap to the next younger sibling at risk ($\gamma_2 > 0$), or living in a family with high income ($\gamma_3 < 0$). The alternative income story does not generate any direct prediction for child behavior, except that older children may expect forgiving parents to be more likely to struggle with binding financial constraints and therefore refrain from risky behaviors. This logic, even if it is true, should only apply to children from low-income families, implying a negative coefficient for $NYG$ ($\gamma_1 < 0$) but a positive coefficient for $NYG \cdot HIGHINC$ ($\gamma_4 > 0$). Since the reputation model does not give any prediction on $NYG \cdot HIGHINC$, finding a negative coefficient for $NYG$ coupled with a non-positive coefficient for $NYG \cdot HIGHINC$ would reject the income story.

One identification issue is worth noting. An ideal specification of teen behaviors should control for individual fixed effects, but for most respondents, we only observe the engagement in a risky behavior once. Because NLSY79 sample multiple siblings from the same family, we replace individual fixed effects by family fixed effects in an attempt to control for the unobserved family factors driving teenage behaviors.

Using family fixed effects, however, does not account for factors that differ across siblings in the same family. To allow siblings to differ in their own tastes towards teenage risky behaviors and to allow parent tastes and income to change over time, we control for an extensive set of parental and offspring-specific characteristics, including parental age, child's age, child's ability, and child's psychological states as of the time period when the child decides whether to engage in certain risky behavior. Another cost of using family fixed effects is lose identification for the

coefficient of $HIGHINC$. Since $HIGHINC$ is family-specific, we are unable to test whether children from high-income families are less likely to engage in risky behaviors.

# 4 Data

This study uses data from the 1979 to 1994 waves of the National Longitudinal Survey of Youth 1979 (NLSY79). The NLSY79 consists of a nationally representative sample of youth in the U.S. between the ages of 14 to 21 in 1979. [18] As noted above, our transfer analysis is able to take advantage of the full sample of NLSY79, while the behavior analysis has to be restricted to the subset of the respondents in the NLSY79 who have at least one sibling in the sample in order to specify the family fixed effects. Since teenage childbearing only applies to female respondents, the study of teenage childbearing is further limited to females only.

The NLSY79 sample design selected all respondents between the ages 14 and 21 (by January 1, 1979) who resided in surveyed households that were drawn in 1978. Of the 11,323 civilian respondents originally included in NLSY79 with non-missing transfer values, the multiple-sibling sample consists of 5,569 respondents for the analysis of high school dropout. For the analysis of teenage childbearing, the full sample contains 4,926 females, 1,524 of which have at least one sister interviewed in NLSY79. [19]

The NLSY79 Survey gathered an extensive set of data on its respondents in its 1979 baseline interview and in subsequent annual interviews through 1994. Included in this data are detailed education histories for all respondents, fertility histories for female respondents, as well as information about two forms of parental transfers beyond the age 18 to be described below. We also make use of a rich set of personal and family background characteristics gathered in the NLSY79 annual surveys.

The indicator of high school dropout is defined as not having a high school diploma before age 20. The teen birth indicator is defined to be equal to 1 if a female respondent had a live birth prior to age 18. Based on these definitions, we estimate the risky behavior specification using one observation per individual and measure the time-varying variables at the age of the occurrence of the risky behavior or at age 18 if no occurrence of risky behavior.

[18] For a complete description of this survey, see Bureau of Labor Statistics (1999).

[19] The NLSY79 also included a supplementary sample of civilians who were in the military at the time the sample was drawn. None of the respondents in this supplementary sample had information on siblings so they were not included in our samples.

We measure two alternative forms of parental transfers. The first form is financial transfer, a dichotomous variable, indicating whether a respondent's parents provided at least 50 percent of the annual expenses after age 18. The second form is co-residence transfer, a dichotomous variable, indicating whether the respondent was living in the parents' home.

The reputation model draws attention to three key variables. In section 3, we have defined $NYG$ to be the number of siblings (sisters) under age 18 at the risk of high school dropout (teenage childbearing). The second variable, $AGAP$, is defined as the age gap in years between the respondent and the next younger sibling (sister) at risk. To calculate the third variable, $HIGHINC$, we adopt two steps. First, from each household's 1978 income, we calculate income per capita counting in all children and parents. This calculation includes any new child born by 1993 when the detailed sibling information was collected, thus capturing the lowest income per capita that would possibly occur in the family. Second, we label a family "high income" (i.e. $HIGHINC = 1$) if its annual income per capita is over \$3,000. [20] By definition, $NYG$ and $AGAP$ are time varying but $HIGHINC$ is time-invariant.

Besides these three variables key to the reputation model and income story, we control for three sets of variables describing individual, family and community characteristics. The first set captures parent preferences or tastes, including parental age, parental education, family structure, and welfare receipt, some of which are constant within families. The second set measures offspring characteristics including age, race, ability, and psychological states, some of which are constant within individuals. The third set of variables describing the community conditions captures the economic and social environment within which children and parents make decisions. These include central city, proportion of county black population, proportion of county poor population, and AFDC guarantee levels and employment growth rates in the state of residence.

# 5 Results

This section begins with summarizing the distribution of the three key variables – parental transfers, risky behaviors, and the number of siblings at risk. To facilitate a comparison between the reputation model and the alternative income story, we report two sets of summary

[20] We choose \$3,000 per capita as the criteria for high income because the official poverty threshold for a family of 3 in 1980 is \$6,565 and about \$2,200 per capita. Taken inflation into account, an income of \$3,000 per capita could be considered rather well-off.

statistics, one for all families and the other for high-income families only. Sections 5.2 and 5.3 present multivariate analyses for parents' transfer decisions and children's behavior decisions, both allowing formal econometric tests for the two potential explanations.

## 5.1 Summary of Key Variables

### 5.1.1 Parental Transfers

Table 1 reports the proportion of offspring that receive co-residence or financial transfers from parents when over age 18. The proportions are grouped by whether the offspring have engaged in a certain risky behavior as teens, by family income level, and by the number of siblings remaining at risk when parents make transfer decisions. Panel A focuses on high school dropout status and Panel B focuses on teenage childbearing.

The first three rows of Panel A show that parents tend to withhold financial transfers from high school dropouts but are equally likely to make co-residence transfers to all children. In particular, for all families, 19% of high school dropouts receive financial transfers from parents at ages older than 19. The corresponding figure is 24% for offspring who did not drop out of high school. Thus, the average "punishment" for high school dropout is a 5% decline in the likelihood of getting financial help from parents.

The reputation model predicts that these punishments should *increase* with the number of siblings at risk. Towards the bottom of Panel A ( under "(1) Minus (2)" ), we display how punishments change with the number of siblings under the age of 18. As expected, for all families, going from 0 to 1 sibling at risk increases the dropout penalty in the form of co-residence transfers from 0% to 6%. Similarly, the penalty in the form of financial transfer increases from 4% to 9%.

Such effect is more apparent with high-income families. For high-income families only, the penalty in term of co-residence transfers increases from 0% for 0 sibling at risk to 6% for 1 sibling at risk, and the penalty in term of financial transfers increases from 2% to 7%. When we increase the number of siblings to 2 or 3+, high-income families indicate a clearly monotone increase in penalty, although all families as a whole do not show a clear pattern. This is opposite to the alternative income story, which predicts that the birth-order effect, if it exists, should only apply to low-income families.

Panel B of Table 1 reports corresponding statistics for teenage childbearing. The basic pattern remains similar except that parents appear to respond to teenage childbearing more strongly. Parents are less likely to make transfers (coresidence or financial) to a daughter who was a teen mother than otherwise in both low- and high-income families. Consistent with the reputation model, going from 0 to 1 sisters under 18 increases the penalty in the form of co-residence transfers from 5% to 15% for all families and from 7% to 13% for high-income families. When the numbers of sisters at risk increases from 1 to 2 or 3+, such birth-order effects become stronger for high-income families than for all families. Again, this statistic supports the reputation model but contradicts the alternative income story.

#### 5.1.2 Offspring Behaviors

Table 2 presents the proportions of offspring who dropped out of high school or gave birth as a teen by the number of siblings remaining at risk. Panel A report both behaviors conditional on the full sample while Panel B focuses on the subset of the respondents who have at least one sibling in the sample. Results are similar across the two panels.

Two phenomena stand out from Table 2. First, by our reputation model, we expect the proportion of offspring engaging in dropouts (teen childbearing) to decrease with the number of siblings (sisters) at risk. This pattern does not show up when we pool all families. For all families, the incidence of risky behaviors is substantially higher for offspring (daughters) with 3+ younger siblings (sister) than those with a small number of younger siblings (sisters), although the difference across having 0, 1, or 2 siblings (sisters) at risk is much smaller. As shown later, this counterintuitive phenomenon can be attributed to observable and unobservable differences across families.

More striking is the difference between all families and high-income families. For high-income families, the incidence of risky behaviors is moderately lower for offspring (daughters) with at least three younger siblings (sisters) than other categories, as we would predict from the reputation model. This phenomenon is inconsistent with the alternative income story.

### 5.2 Full Results

We now turn to the multivariate analysis. Table 3 reports individual-fixed-effects estimates for parents' transfer decisions conditional on offspring teenage risky behaviors. Table 4 reports

family-fixed-effects estimates for offspring decisions in whether to engage in high school dropout or teenage childbearing. In both tables, we control for observed individual, family and community characteristics in addition to individual or family fixed effects. Due to space limit, we present only those parameters that are the most relevant for the reputation model and the income story.

### 5.2.1 Parental Transfers

Using the sample of all offspring, Panel A of Table 3 estimates the parent transfer decision for each offspring in each year beyond age 19 as a function of the offspring's high school dropout status. In comparison, Panel B models the parent transfer decision for each daughter in each year beyond age 18 as a function of the daughter's teenage childbearing status, using the sample of all daughters. Both panels report the results for co-residence and financial transfers in parallel. As described below, each form of transfers involves three incremental models.

Model 1 tests the main reputation effect, which predicts that the greater the number of siblings (sisters) under the age of 18, the less likely is an offspring with a high school dropout status (a daughter with teenage childbearing) to receive co-residence and financial transfers from parents. We test the hypothesis by the interaction between high school dropout status (teenage childbearing) and the number of siblings (sisters) under 18 ($B \cdot NYG$). As predicted, the coefficient of this interaction is negative and significant for co-residence and financial transfers concerning both high school dropout and teenage childbearing. The robustness of the finding lends strong support for the reputation model. Moreover, the coefficient of $NYG$ is positive, suggesting that pooling families of all income levels, parents on average give more transfers to older adult children if these children did not engage in risky behaviors during teen years. This contradicts the income story which predicts that parents should face more financial constraint when they have more children under age 18 and therefore transfer less to older children.

Model 2 tests the reputation implication concerning the discount factor captured by the interaction between risky behavior and the age-gap between the offspring and its next younger sibling at risk ($B \cdot AGAP$). According to the reputation model, a larger age gap implies fewer reputation gains in the future and therefore less punitive reactions from parents. We find support for this prediction in the co-residence transfer analysis conditional on daughter teenage childbearing status (the column of co-residence transfers in Panel B). In particular, parents are less likely to withhold coresidence transfers to a daughter with teen birth if the daughter is far apart in age from the next sister at risk. In comparison, financial transfers to teen mothers do

not differ by age gap. For high school dropout, neither co-residence nor financial transfers are sensitive to age gap, indicating that age gap may not fully capture the way parents discount the future. It is worth emphasizing that the basic reputation effect, captured by $B \cdot NYG$, remains significant in Model 2 for both types of transfers and both types of behaviors. This uniform finding is the most basic and compelling evidence in favor of the reputation model.

Model 3 tests the alternative income story by introducing two new variables. One is the interaction of the number of siblings at risk and an indicator of high per capita family income ($NYG \cdot HIGHINC$), and the other is a three way interaction of $B \cdot NYG \cdot HIGHINC$. Because the income story should only applies to low-income families and does not necessarily depend on offspring teenage behaviors, we expect the birth-order effects to be reflected in a negative coefficient of $NYG$ and a positive coefficient of $NYG \cdot HIGHINC$. Results are consistent with this prediction, suggesting that budget constraints may indeed create some birth order effects in low-income families.

However, the coefficient of $B \cdot NYG$ in model 3 remains negative and significant, implying the birth order effects to be much stronger for ill-behaving offspring than for behaving offspring. For the alternative income story to explain this phenomenon, we must believe that engagement in teenage risky behaviors entails greater demand for parental transfers and parents are responding to such demand. In that case, the income story should still be restricted to low-income families, implying a positive coefficient on $B \cdot NYG \cdot HIGHINC$. In contrast to this prediction, we find negative and significant coefficient for $B \cdot NYG \cdot HIGHINC$, for both transfers and both risky behaviors. This implies that the behavior-specific birth order effect is even stronger for high-income families, which lead us to reject the income story. On the other hand, the persistent negative, significant coefficient for $B \cdot NYG$ throughout Models 1-3 provides strong evidence to support our reputation model.

### 5.2.2 Offspring Behavior

Table 4 reports results on offspring behavior in two panels – Panel A for high school dropout, and Panel B for teenage childbearing. All parameters are estimated with family fixed effects. As in Table 3, we present selected estimates from three incremental models.

Model 1 tests the reputation model, which predicts that the greater the number of siblings (sisters) under 18, the less likely for an offspring (daughter) to exhibit a risky behavior. For high school dropout status, the coefficient of the number of siblings under 18 ($NYG$) is negative

and significant, lending strong support for this prediction. For teenage childbearing status, the coefficient for the number of sisters younger than 18 is negative, but the size of standard errors is more than doubled. This may be because the analysis of teenage childbearing is limited to females and therefore we do not have enough observations for the sample of multiple sisters. Nevertheless, the consistent negative signs of $NYG$ in both panels support the reputation model.

Model 2 tests the reputation implication concerning the discounting factor. In particular, the model predicts that offspring facing wider age gap with the next younger sibling should be more likely to engage in risky behaviors. For both behaviors, the coefficients on $AGAP$ are insignificant from zero. Given the weak results on age gap in the transfer regressions, this suggests that our definition of age gap may not fully capture parents' value of the future. However, the main reputation effect remains robust even after we control for $AGAP$, which provides further support for the reputation model.

Finally, Model 3 tests the alternative income story by adding in an interaction of the number of siblings (sisters) under age 18 and the binary indicator of high-income families ($B \cdot HIGHINC$). A similar birth order effect may arise from the alternative income story if engagement in risky behaviors calls for more parental help and children of higher birth order rationally expect less parental transfers due to more binding financial constraints. In that case, we should only observe the birth order effect for low-income families, as the financial constraints are likely to bind in low-income families. Opposite to this prediction, Model 4 finds that offspring from high- and low-income families respond to the foreseen parental penalty in statistically the same manner. Based on this finding and the negative coefficients for $NYG$ throughout all three models, we believe the data is more supportive of the reputation model than of the income story.

# 6 Conclusion

This paper introduces a new perspective to understand intra-familial interaction and its impact on teenage risky behaviors. Drawing on a well-known literature from industrial organization, we lay out a reputation model and predict that parents have, under some conditions, the incentive to punish older children for their risky behaviors in order to dissuade younger children from the same risky behaviors.

The reputation model generates two empirical implications: the likelihood of teenage risky behaviors and parental transfers to children who engaged in risky behaviors during teen years will decrease with the number of siblings under 18. At least in the context of high school dropout

and teenage childbearing, we find support for both implications. We also consider an alternative income story in which parents may have more resources per capita to transfer when they have fewer children under 18. Empirical evidence suggests that the reputation model is far more powerful than the alternative income story in explaining the real data.

In a broader sense, our dynamic view of family is also coherent with the existing empirical literature about teenage risky behaviors. Not only can we provide one explanation as to why in a multi-children family some teenagers engage in risky behavior and some do not; we also detect the extent to which parents have the ability to reduce teenage risky behavior. This is a significant improvement from the traditional static model of one parent versus one child.

We recognize that community, school and public policies may have important impacts on teenage behaviors as well. The reputation model embeds these extra-familial influences in children's prior belief about parental type but does not model how they affect the prior belief. With better data on these extra-familial factors, the reputation model can be extended to allow more active interactions between intra- and extra-familial influences. Another path of future research is to explore the impacts of extra-familial factors through channels other than the reputation model. Given the success of a dynamic view for intra-familial interactions, we believe it is worthwhile to pursue dynamic models for extra-familial interactions as well.

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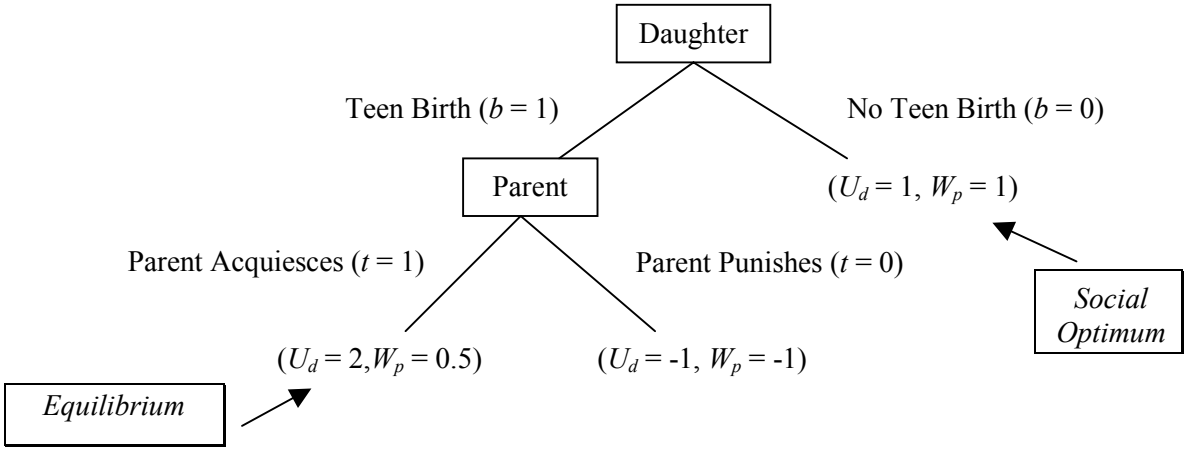
**Figure 1: Decision Tree for Parents' and Daughter's Decisions – an Example of Teen Birth**

***Case A: Forgiving Parents***




***Case B: Unforgiving Parents***

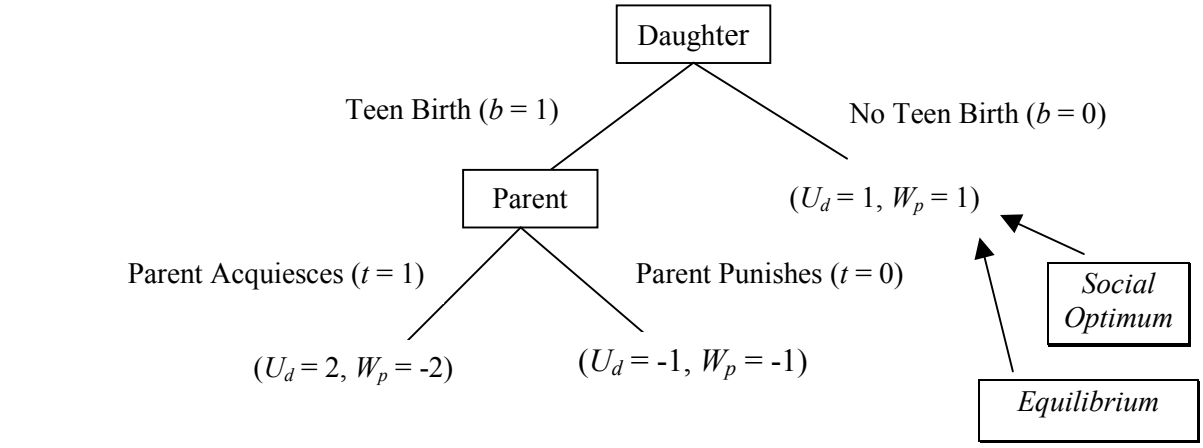
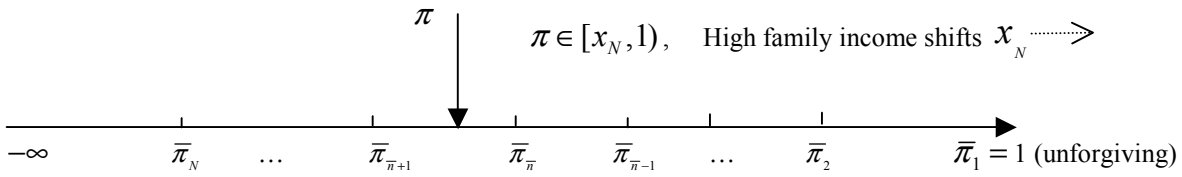
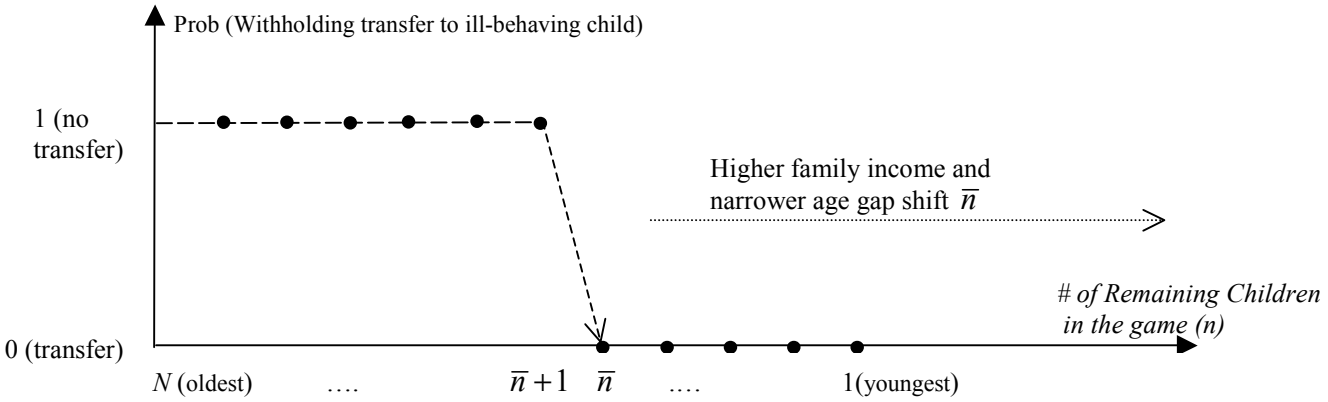


**Figure 2: Features of the Solution to the Dynamic Reputation Model**

***Graph A: Parental real type $\pi$, initial reputation of being at least as tough as type $x_N$ and the punishment thresholds $\{\overline{\pi}_1, \overline{\pi}_2, .., \overline{\pi}_N\}$***




***Graph B: Forgiving Parent's Transfer Strategy, (t|b=1), by the Number of Remaining Children in the Game (n)***




***Graph C: Teenage behavior Strategy of Children, by the Number of Remaining Children in the Game (n)***

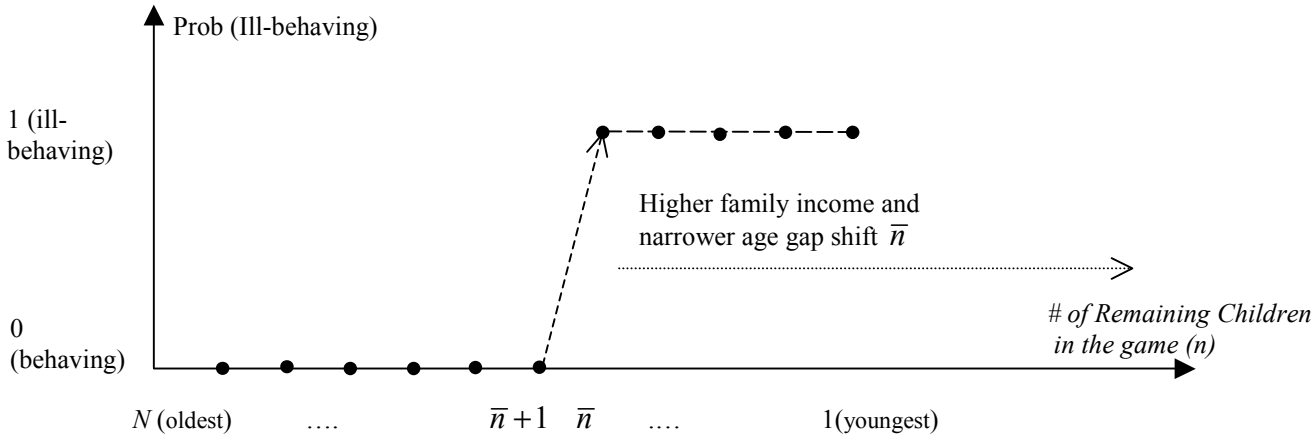
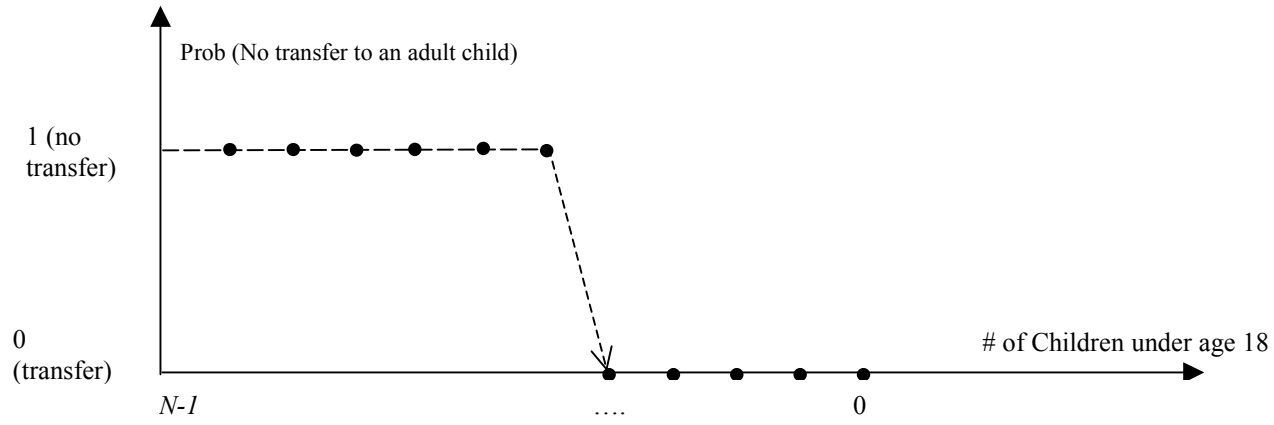
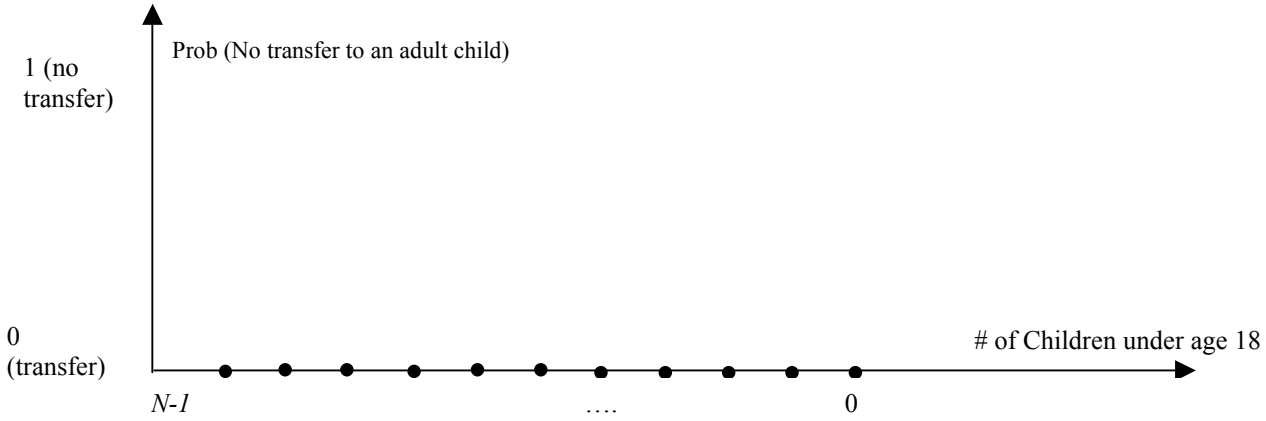


**Figure 3: Features of the "Income Story"**

***Graph A: Transfer Strategy of A <u>Low-income</u> Parent to An Adult Child by the Number of Children under age 18***




***Graph B: Transfer Strategy of A <u>High-income</u> Parent to An Adult Child by the Number of Children under age 18***



## Table 1. Parental Transfers by Offspring's Risky Behaviors, Number of Younger Sibling (Daughters) under Age 18, and per Capita Income in the Family

### Panel A. By Offspring's High School Dropout Behavior

| | Co-Residence Transfer | | | | Financial Transfer | | | |
|---|---|---|---|---|---|---|---|---|
| | All Families | | High per Capita Income Families | | All Families | | High per Capita Income Families | |
| | **Mean** | ***N*** | **Mean** | ***N*** | **Mean** | ***N*** | **Mean** | ***N*** |
| ***HS Dropout Status:*** | | | | | | | | |
| Not HS dropout | 0.22 | 101,985 | 0.23 | 29,235 | 0.24 | 51,760 | 0.27 | 13,917 |
| High school dropout | 0.22 | 42,773 | 0.22 | 5,493 | 0.19 | 21,482 | 0.24 | 2,578 |
| Average | 0.22 | 144,758 | 0.23 | 34,728 | 0.23 | 73,242 | 0.27 | 16,495 |
| ***(1) High School Dropouts*** | | | | | | | | |
| No. of siblings younger than 18 | | | | | | | | |
| 0 | 0.19 | 25,233 | 0.20 | 3,757 | 0.18 | 9,485 | 0.23 | 1,553 |
| 1 | 0.30 | 5,483 | 0.35 | 819 | 0.20 | 3,639 | 0.28 | 587 |
| 2 | 0.32 | 2,459 | 0.37 | 182 | 0.21 | 1,961 | 0.25 | 152 |
| 3+ | 0.33 | 1,812 | 0.37 | 52 | 0.20 | 1,581 | 0.14 | 42 |
| Missing | 0.25 | 7,786 | 0.16 | 683 | 0.20 | 4,816 | 0.17 | 244 |
| ***(2) Not High School Dropouts*** | | | | | | | | |
| No. of siblings younger than 18 | | | | | | | | |
| 0 | 0.19 | 63,711 | 0.20 | 20,439 | 0.22 | 25,703 | 0.25 | 8,633 |
| 1 | 0.36 | 12,190 | 0.41 | 3,466 | 0.29 | 9,159 | 0.35 | 2,780 |
| 2 | 0.37 | 4,012 | 0.46 | 755 | 0.27 | 3,367 | 0.35 | 658 |
| 3+ | 0.40 | 2,206 | 0.53 | 209 | 0.26 | 1,988 | 0.39 | 190 |
| Missing | 0.21 | 19,866 | 0.18 | 4,366 | 0.22 | 11,543 | 0.24 | 1,656 |
| ***(1) Minus (2)*** | | | | | | | | |
| No. of siblings younger than 18 | Mean | | Mean | | Mean | | Mean | |
| 0 | 0.00 | | 0.00 | | -0.04 | | -0.02 | |
| 1 | -0.06 | | -0.06 | | -0.09 | | -0.07 | |
| 2 | -0.05 | | -0.09 | | -0.06 | | -0.10 | |
| 3+ | -0.07 | | -0.16 | | -0.06 | | -0.25 | |

**Notes**: Sampling weights were used to reproduce the population distribution of means and standard deviations.
*Sample:* Sample of all offspring from the NLSY79 data set.

(Table 1 Continued)

## Panel B. By Daughter's Teenage Childbearing Behavior

| | Co-Residence Transfer | | | | Financial Transfer | | | |
|---|---|---|---|---|---|---|---|---|
| | All Families | | High per Capita Income Families | | All Families | | High per Capita Income Families | |
| | Mean | *N* | Mean | *N* | Mean | *N* | Mean | *N* |
| ***Teen Birth Status:*** | | | | | | | | |
| No Teen Birth | 0.19 | 59,328 | 0.20 | 16,714 | 0.24 | 28,545 | 0.28 | 7,885 |
| Teen Birth | 0.12 | 8,835 | 0.12 | 817 | 0.11 | 4,239 | 0.15 | 371 |
| Average | 0.18 | 68,163 | 0.20 | 17,531 | 0.23 | 32,784 | 0.28 | 8,256 |
| ***(1) Teen Birth*** | | | | | | | | |
| No. of sisters younger than 18 | | | | | | | | |
| 0 | 0.12 | 6,819 | 0.12 | 722 | 0.11 | 2,812 | 0.15 | 312 |
| 1 | 0.16 | 1,040 | 0.23 | 53 | 0.09 | 756 | 0.07 | 40 |
| 2 | 0.16 | 354 | 0.09 | 9 | 0.13 | 277 | 0.14 | 5 |
| 3+ | 0.19 | 171 | 0.00 | 2 | 0.13 | 156 | 0.00 | 2 |
| Missing | 0.08 | 451 | 0.00 | 31 | 0.17 | 238 | 0.28 | 12 |
| ***(2) No Teen Birth*** | | | | | | | | |
| No. of sisters younger than 18 | | | | | | | | |
| 0 | 0.17 | 47,381 | 0.19 | 14,248 | 0.24 | 20,381 | 0.27 | 6,425 |
| 1 | 0.31 | 5,605 | 0.36 | 1,179 | 0.26 | 4,310 | 0.34 | 891 |
| 2 | 0.35 | 1,210 | 0.42 | 201 | 0.26 | 1,065 | 0.34 | 176 |
| 3+ | 0.32 | 362 | 0.77 | 19 | 0.26 | 317 | 0.64 | 17 |
| Missing | 0.21 | 4,770 | 0.14 | 1,067 | 0.23 | 2,472 | 0.20 | 376 |
| ***(1) Minus (2)*** | | | | | | | | |
| No. of sisters younger than 18 | | | | | | | | |
| 0 | -0.05 | | -0.07 | | -0.13 | | -0.12 | |
| 1 | -0.15 | | -0.13 | | -0.17 | | -0.28 | |
| 2 | -0.19 | | -0.33 | | -0.13 | | -0.20 | |
| 3+ | -0.13 | | -0.77 | | -0.13 | | -0.64 | |

**Notes**: Sampling weights were used to reproduce the population distribution of means and standard deviations.
*Sample:* Sample of all daughters in NLSY79 data set.

## Table 2. Offspring's Risky Behaviors by Number of Siblings (Daughters) under Age 18 and per Capita Income in the Family

### Panel A. All Offspring (Daughters) Sample

| No. of siblings (daughters) under 18 | High School Dropout | | | | Teen Birth | | | |
|---|---|---|---|---|---|---|---|---|
| | All Families | | High per Cap. Inc. Families | | All Families | | High per Cap. Inc. Families | |
| | Mean | *N* | Mean | N | Mean | N | Mean | *N* |
| 0 | 0.22 | 3,329 | 0.16 | 1,086 | 0.09 | 2,658 | 0.04 | 847 |
| 1 | 0.21 | 2,540 | 0.15 | 825 | 0.08 | 1,208 | 0.03 | 297 |
| 2 | 0.25 | 1,536 | 0.17 | 338 | 0.12 | 427 | 0.03 | 64 |
| 3+ | 0.34 | 1,397 | 0.15 | 128 | 0.18 | 193 | 0.00 | 10 |
| Missing | 0.23 | 2,526 | 0.14 | 89 | 0.05 | 440 | 0.00 | 12 |
| Total | 0.24 | 11,328 | 0.15 | 2,466 | 0.09 | 4,926 | 0.04 | 1,230 |

Notes:
*Sample for High School Dropout Behavior:* Sample of all offspring in NLSY79 data set.
*Sample for Teenage Childbearing Behavior:* Sample of all daughters in NLSY79 data set.

### Panel B. Multiple Offspring (Daughters) Sample

| No. of siblings (daughters) under 18 | High School Dropout | | | | Teen Birth | | | |
|---|---|---|---|---|---|---|---|---|
| | All Families | | High per Cap. Inc. Households | | All Families | | High per Cap. Inc. Families | |
| | Mean | *N* | Mean | N | Mean | N | Mean | *N* |
| 0 | 0.20 | 1,400 | 0.14 | 484 | 0.08 | 622 | 0.05 | 184 |
| 1 | 0.18 | 1,501 | 0.12 | 512 | 0.06 | 480 | 0.02 | 131 |
| 2 | 0.21 | 944 | 0.14 | 201 | 0.06 | 209 | 0.01 | 39 |
| 3+ | 0.30 | 849 | 0.13 | 89 | 0.15 | 72 | 0.00 | 6 |
| Missing | 0.23 | 875 | 0.16 | 63 | 0.02 | 141 | 0.00 | 8 |
| Total | 0.21 | 5,569 | 0.13 | 1,349 | 0.07 | 1,524 | 0.03 | 368 |

Notes:
*Sample for High School Dropout Behavior:* Families with 2-4 children (siblings) in NLSY79 data set.
*Sample for Teenage Childbearing Behavior:* Families with 2-4 daughters (sisters) in NLSY79 data set.

## Table 3. Determinants of Parental Transfers

### Panel A. As Function of Offspring's High School Dropout Status

| | Co-Residence Transfer | | | Financial Transfer | | |
|---|---|---|---|---|---|---|
| Variable | 1 | 2 | 3 | 1 | 2 | 3 |
| No. of Siblings Younger than 18 *(NYG)* | .0174*** | .0050 | .0001 | .0081** | -.0046 | -.0127** |
| | (.0023) | (.0035) | (.0035) | (.0040) | (.0058) | (.0059) |
| Missing Younger Sibs Data | -.0333*** | -.0249*** | -.0093 | -.0393*** | -.0223 | -.0065 |
| | (.0086) | (.0090) | (.0090) | (.0138) | (.0145) | (.0146) |
| HS Dropout ? No. of Younger Siblings *(B * NYG)* | -.0446*** | -.0433*** | -.0348*** | -.0556*** | -.0531*** | -.0400*** |
| | (.0033) | (.0036) | (.0037) | (.0058) | (.0059) | (.0062) |
| Age Gap with Next Oldest Sibling *(AGAP)* | | -.0037*** | -.0033*** | | -.0010 | -.0009 |
| | | (.0008) | (.0008) | | (.0014) | (.0014) |
| Missing Siblings' Age Gap Data | | -.0518*** | -.0358*** | | -.0375*** | -.0245* |
| | | (.0097) | (.0098) | | (.0141) | (.0143) |
| High School Dropout ? Age Gap of Siblings *(B * AGAP)* | | .0001 | .0008 | | .0002 | .0013 |
| | | (.0008) | (.0008) | | (.0015) | (.0015) |
| No. of Younger Sibs ? High per Cap. Income Family (> $3,000) | | | .0785*** | | | .0843*** |
| *(NYG * HIGHINC)* | | | (.0058) | | | (.0094) |
| HS Dropout ? No. of Younger Sibs ? High per Cap. | | | -.0589*** | | | -.0977*** |
| Income Family (> $3,000) *(B * NYG * HIGHINC)* | | | (.0132) | | | (.0223) |
| Number of Person-Years | 144,758 | 144,758 | 144,758 | 73,242 | 73,242 | 73,242 |
| Number of Individuals | 11,269 | 11,269 | 11,269 | 11,184 | 11,184 | 11,184 |
| R-squared | .23 | .23 | .23 | .11 | .11 | .11 |

Notes: the sample consists of all offspring in NLSY79 data set. Measurement of dependent Variables: Co-Residence Transfer = 1 if the respondent lives with parents, = 0 otherwise. Financial transfer = 1 if parents provide at least half of living expenses, = 0 otherwise.
* p < 0.10; ** p < 0.05; *** p < 0.01

**(Table 3 continued)**

## Panel B. As Function of Daughter's Teenage Childbearing Status

| | Co-Residence Transfer | | | Financial Transfer | | |
|---|---|---|---|---|---|---|
| Variale | 1 | 2 | 3 | 1 | 2 | 3 |
| No. of Sisters Younger Than 18 *(NYG)* | .0268*** | .0283*** | .0231*** | .0215*** | .0291** | .0201 |
| | (.0040) | (.0072) | (.0072) | (.0071) | (.0126) | (.0127) |
| Missing Younger Sisters Data | -.0057 | -.0091 | .0308* | -.0060 | -.0031 | .0250 |
| | (.0153) | (.0155) | (.0159) | (.0262) | (.0267) | (.0272) |
| Teen Birth ? No. of Younger Sisters *(B * NYG)* | -.0961*** | -.1085*** | -.0955*** | -.1031*** | -.1028*** | -.0881*** |
| | (.0079) | (.0091) | (.0092) | (.0147) | (.0152) | (.0156) |
| Age Gap with Next Oldest Sister *(AGAP)* | | -.0044*** | -.0032*** | | .0039* | .0040* |
| | | (.0012) | (.0012) | | (.0023) | (.0023) |
| Missing Sisters' Age Gap Data | | -.0234 | -.0017 | | .0261 | .0344 |
| | | (.0153) | (.0154) | | (.0242) | (.0243) |
| Teen Birth ? Age Gap of Sisters *(B * AGAP)* | | .0045*** | .0047*** | | -.0004 | .0005 |
| | | (.0017) | (.0017) | | (.0031) | (.0031) |
| No. of Younger Sisters ? High per Cap. Income Family (> $3,000) | | | .1200*** | | | .0911*** |
| *(NYG * HIGHINC)* | | | (.0105) | | | (.0172) |
| Teen Birth ? No. of Younger Sisters ? High per Cap. | | | -.1058** | | | -.1541* |
| Income Family (> $3,000) *(B * NYG * HIGHINC)* | | | (.0493) | | | (.0795) |
| Number of Person-Years | 71,332 | 71,332 | 71,332 | 35,902 | 35,902 | 35,902 |
| Number of Individuals | 4,908 | 4,908 | 4,908 | 4,878 | 4,878 | 4,878 |
| R-squared | .28 | .28 | .28 | .14 | .14 | .14 |

Notes: the sample consists of all daughters in NLSY79 data set. Measurement of dependent Variables: Co-Residence Transfer = 1 if the respondent lives with parents, = 0 otherwise. Financial transfer = 1 if parents provide at least half of living expenses, = 0 otherwise.
* p < 0.10; ** p < 0.05; *** p < 0.01

## Table 4. Determinants of Risky Behaviors of Offspring (Daughters)

### Panel A. Offspring's High School Dropout Decision

| Variable | 1 | 2 | 3 |
|---|---|---|---|
| No. of Siblings Younger than 18 *(NYG)* | -.0251*** | -.0292*** | -.0290*** |
| | (.0094) | (.0108) | (.0109) |
| Missing Younger Sibs Data | .0060 | .0089 | .0088 |
| | (.0255) | (.0269) | (.0269) |
| Age Gap with Next Oldest Sibling *(AGAP)* | | -.0032 | -.0032 |
| | | (.0045) | (.0045) |
| Missing Siblings' Age Gap Data | | -.0255 | -.0265 |
| | | (.0297) | (.0302) |
| No. of Younger Siblings ? High per Capita Income Family (> $3,000) | | | -.0037 |
| *(NYG * HIGHINC)* | | | (.0205) |

Notes: The sample consists of offspring in families with 2-4 offspring in NLSY79 data set.

### Panel B. Daughter's Teenage Childbearing Decision

| Variable | 1 | 2 | 3 |
|---|---|---|---|
| No. of Sisters Younger Than 18 *(NYG)* | -.0147 | -.0102 | -.0081 |
| | (.0216) | (.0271) | (.0272) |
| Missing Younger Sisters Data | -.0846** | -.0938** | -.0933** |
| | (.0426) | (.0433) | (.0433) |
| Age Gap with Next Oldest Sister *(AGAP)* | | -.0086 | -.0089 |
| | | (.0068) | (.0068) |
| Missing Sisters' Age Gap Data | | -.0115 | -.0209 |
| | | (.0485) | (.0494) |
| No. of Younger Sisters ? High per Capita Income Family (> $3,000) | | | -.0395 |
| *(NYG * HIGHINC)* | | | (.0386) |

Notes: The sample includes daughters in families with 2-4 daughters in NLSY79 data set