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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. The 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.

1. Introduction

A significant percentage of adolescents engage in risky behaviors. For example, among U.S. students enrolled in grades 9-12 in 2001, 47.1% drank alcohol, 23.9% used marijuana, and 45.6% had had sexual intercourse at least once in their lives.[1] Some of these behaviors represent experimentation during the transition from youth to adulthood, but authorities are concerned that some behaviors are excessive and may have harmful long-run consequences. Take unprotected sex as an example: it results in about 3 million new cases of sexually transmitted diseases (STDs) each year,[2] implying substantial medical and public health costs.[3] Unprotected sex and/or use of ineffective contraceptive methods also led to 453,725 births to women under the age of 20 in 2001[4], of which 79% were out-of-wedlock. Numerous studies suggest that early childbearing is associated with adverse consequences for both teen mothers and her children.[5] Aware of these long run consequences, the public strongly supports the statement that teenagers "should abstain from sex at least until they are out of high school."[6]

Why do adolescents engage in risk-taking behaviors even if the society as a whole disapproves these behaviors? Answer to this question is important for understanding the causes of adolescent risky behaviors hence identifying effective methods to curb these behaviors. To address this question, most researchers focus on either the adolescents' decision-making process[7], or external forces such as peer groups, mass media, school education, community

[1] Tabulations from the 2001 Youth Risk Behavior Survey (YRBS). Centers for Disease Control and Prevention.
[2] Eng and Butler (1997).
[3] Chesson, et al. (2004) estimate that the direct medical costs of the 9 million new cases of STDs that occurred among adolescents and young adults in the U.S. in 2001 cost $6.5 billion.
[4] Child Trends (2003).
[5] For example, women who bear children as teenagers are subsequently less likely to complete high school, less likely to participate in the labor force, more likely to have low earnings, and less likely to marry than are women who do not have children as teenagers. As a result, adolescent mothers and their children are likely to spend a substantial fraction of their lifetimes in poverty (see Upchurch and McCarthy 1990).
[6] Annie E. Casey Foundation (1999).
[7] O'Donoghue and Robin (2001).

organizations, and social policies. In comparison, the role of parents receives much less attention, though parents "have the legal authority to control their children's behavior and social lives."[8] Filling in this gap, this paper develops a new theory about the intra-familial interaction between parents and adolescent children, and provides empirical evidence in support of the theory. As detailed in the next section, we believe the paper has explored a new branch in the economics literature, complementary to both the Rotten Kid's Theorem (Becker 1974, 1991) and the classic theory of unitary decision within a family (Becker 1964).

Consider an altruistic parent and a selfish teenage child in a two-stage game. In the first stage, the adolescent decides whether to engage in risky behaviors. In the second stage, the parent decides whether to punish such behaviors by withholding resources to the child. As Bergstrom (1989) points out, this game may not reach a desirable outcome (i.e. no risky behaviors) as the Rotten Kid Theorem predicts, if the parent's utility function is non-transferable. In that case, the parent cares about the child so much that he could not withhold the transfers from an ill-behaving child. The child foresees the parent's inability to commit punishment and therefore undertakes the risky behavior more than the parent would have her choose. Such equilibrium implies that the parent has little control over adolescent behaviors.

This paper is more optimistic about parental control. We argue that a parent with non-transferable utility is able to exploit children's uncertainty about parental preferences and resume controls on some of his adolescent children. Specifically, we model parent-adolescent actions as a repeated game. Each round of the game has the same two stage structure as described above, characterizing the parent's interaction with one of his children who has reached adolescence. Each child plays the game once by birth order whereas the parent plays through all the rounds. Initially, children are uncertain of parental preferences being transferable or non-transferable, but

[8] American Bar Association (1996), p. 5-7.

younger children learn from older siblings' experience. Drawing on the reputation model of Milgrom and Roberts (1982) and Kreps and Wilson (1982), we show that parents have incentives to penalize older children for their risky behaviors in order to dissuade the younger ones from the same risky behavior.

This reputation model yields two empirical implications. First, parents should be more willing to punish their first-borne children who engage in risky behaviors in order to influence the actions of their later-born children, if they have more than one child. Second, to the extent that such reputations can be credibly established, the first-born children are less likely to engage in risky behaviors as teens. In essence, the reputation model implies that risk-taking on the part of their adolescent offspring and parental responses to such behaviors vary systematically by birth order.

Using the National Longitudinal Survey of Youth, 1979 Cohort (NLSY79), we analyze the outcomes of two types of risky behaviors among adolescents—teenage childbearing, and high school dropping out. Both behaviors appear to have long-term negative consequences. Teenage mothers are less successful in the labor and marriage markets[9] and are more likely to expose their children to poverty later in life than women who do not have teen births.[10] Similarly, most children who drop out of school for at least a year do not end up ever receiving a regular high school diploma and, as Cameron and Heckman (1993) find, high school dropouts have significantly lower earnings than do those who complete high school.[11]

[9] While the evidence on the long-term consequences of teenage childbearing are controversial—see Hotz, McElroy and Sanders (2004) for example—such women do experience reductions in earnings and marriages prospects early in their adult lives.

[10] While giving up births for adoption might mitigate some of these adverse consequences, most teen mothers do not do so. Between 1989 and 1995, for example, less than 1% of all babies born to never-married women in the U.S were relinquished for adoption. See Chandra, et al. (1999).

[11] Some high school dropouts do end up obtaining a GED, but as Cameron and Heckman (1993) also find, such certificates are not equivalent to receipt of high school diplomas in terms of lifetime earnings or employment.

Consistent with the reputation model, we find that respondents who have committed teenage childbearing or high school dropout as teenagers receive fewer parental transfers after age 18 when there are still siblings younger than age 18. Moreover, focusing on respondents from the same families, we find that older siblings are less likely than younger ones 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.

Alternatively, low-income parents may have fewer resources to transfer to older children if they need to support a large number of children under age 18. Older children, in expectation of the resource dilution, are less likely to engage in risky behavior. This alternative explanation yields the same predictions as our reputation model. We empirically test both and find that the reputation model is far more powerful than the resource dilution story in explaining the empirical data.

The remainder of the paper is organized as follows. Section 2 reviews multi-disciplinary literature on risky behavior and positions our reputation model in the economic literature of intra-familial interactions. Section 3 characterizes the repeated two-stage game of a parent and his adolescent children, and spells out each player's equilibrium strategy. Section 4 outlines the empirical implications, specifies the econometrics model, and discusses a range of issues that may compromise our ability to test the implications. Section 5 describes the data. Section 6 presents the empirical estimates and examines alternative explanations. The last section offers concluding remarks.

2. Literature Review

Teenage risky behaviors have attracted attention from a number of 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 strand, researchers 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[12]; others examine parental control within the family.

The study on parent control can be further classified into two branches: psychologists and sociologists stipulate that parents foster children's internalization of social values through modeling, reinforcing and punishing (Baumrind 1978; McLanahan 1985)[13], while economists focus on utilizing economic incentives to mitigate the interest conflict between parents and children. Here we focus on the economics literature. Since the reputation model boils down to birth-order effects in the empirical tests, we draw special attention to the implication of birth-order effects in the existing theories.

Economists hold two views of familial decisions: some take the family as an efficient unit maximizing the whole family's welfare and pay little attention to the conflict of interests within

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[12] Some economists have focused on the responsiveness of adolescent risky behaviors to market-based and public policy incentives, such as prices, taxes, regulations and other governmental and public efforts to curb such behaviors. See Gruber (2001), Chaloupka and Grossman (1996), and Evans and Huang (1997) on the effects of taxes and other policies on youth smoking; Dee and Evans (2001) on the effects of speed limits and safety belt laws on teen traffic safety; Levine (2001) on the effects of costs of becoming pregnant on the sexual activity and contraceptive practices of teens; Cook and Moore (2001) on the effects of excise taxes on teenage drinking; Card and Lemieux (2001) on the effects of tuition costs and labor market conditions on the dropout and enrollment trends for youth in the U.S.

[13] 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).

family members (Becker 1964). Such unitary model is useful explaining many familial decisions, but it contradicts the fact that parents disapprove teenage risky behaviors. Apparently, parents and their adolescent children have conflicting preferences towards risky behaviors, and such conflict is not completely solved within family.[14]

The concern of intra-familial conflicts motivates the second view of familial decisions. In a seminal work, Gary Becker considered a two-stage game between an altruistic parent and a selfish child (Becker 1974, 1991). In the first stage, the child decides whether to take an action. In the second stage, the parent decides whether to punish such action by withholding resources to the child. Becker argued that the parent could use financial transfers to induce the child to take an action that maximizes the total well being of the family, even though the parent cannot directly control the child's behavior. This is known as the Rotten Kid's Theorem.

Subsequent works question the validity of the Rotten Kid Theorem.[15] For example, Bergstrom (1989) proves that the Rotten Kid Theorem requires the preferences of family members fall within the class of transferable utility. Under transferable utility, the parent can always withhold enough resources from a wrongdoing child so that the withheld resources fully compensate the discomfort resulting from the child's misbehavior. We label such parent "unforgiving." If the utility is non-transferable, the parent may care about the child's welfare so much that he could not stand seeing the child suffer from the withheld resources. Such parent would help the wrongdoing child ex post, even though he fully realizes the adverse long-run consequences of the misbehavior and would like the child to avoid it ex ante. We name this type of parent "forgiving." Since the forgiving parent cannot make a credible commitment to punish

[14] Economists also develop a collective model in which the family is assumed to reach parent-efficient outcomes (Chiappori 1988, 1992). Obviously, the collective model is subject to the same criticism in our context.
[15] See Lindbeck and Weibull (1988), Bruce and Waldman (1990), Bergstrom (1989), and the Foreword to the enlarged edition of Becker's *Treatise on the Family*.

an ill-behaving child, the adolescent child would undertake risky behaviors more than the parent desires.

The distinction of forgiving and unforgiving parents is better exhibited in a game theoretic framework. Consider Case 1 in Figure 1 where the parent is unforgiving so that his payoff is –1 if he withholds transfer from the teenage child who engages in a risky behavior and –2 if he accommodates the misbehaving child. Knowing that the parent is unforgiving and always punishes risk-taking behavior, the adolescent child will choose not to engage in such behavior because the utility of "risky action, parent punishes" is lower than that of "no risky action, parent supports." As a result, the final equilibrium—"no risky action, parent supports"—is Pareto optimal. Now consider case 2 with a forgiving parent. After the child engages in a risky behavior, the parent is more willing to accommodate the child (earning utility 0.5) than to punish her (earning utility –1). Knowing that the forgiving parent will always acquiesce, the child will misbehave, given that she obtains utility 2 for engaging in "risky action" and 1 for "no risky action." In this case, the adolescent manipulates the forgiving parent to accept a sub-optimal equilibrium—"risky action, parent acquiesce"—although the parent would prefer "no risky action" ex ante. Note that, no matter the parent is forgiving or unforgiving, Becker's model applies to every child in the same family thus implying no birth-order effects.

One possible extension is to subject Becker's model to financial constraints. Assuming transferable utility (i.e. unforgiving parents), Weinberg (2001) argued that parents' ability to control children behavior via pecuniary incentives is limited at low incomes, leading to increased reliance on non-pecuniary mechanisms such as corporal punishment. The financial constraint may give rise to a birth-order effect. Specifically, older children may have access to fewer resources than later-born children in the same family, because they have to share the resources with younger siblings. If this is true, the Weinberg model implies that low-income parents have more resources per capita to construct pecuniary incentives for the younger children and therefore younger children should behave better than their older siblings.

The implication of birth-order effects would be reversed if we impose financial constraints on forgiving parents. In a family facing resource dilution, parents may be equally forgiving for every child's risk-taking behavior but they are tied up in resources to help out the older children. In equilibrium, older children expect the resource shortage ex ante and therefore are less likely to engage in risky behaviors. This birth-order effect is similar to that from the reputation model. However, the logic only applies to the low-income families, because rich families, by definition, have enough resources to help each wrongdoing children regardless of birth order.

Instead of imposing financial constraints, this paper extends the Becker model in two new dimensions. First, rather than focusing on the one-parent-one-child interaction, we set up a dynamic intra-familial model where one parent and multiple children engage in a repetition of the Becker's game. Each child plays the two-stage game once by birth order whereas the parent plays through all rounds. Second, we relax the assumption of perfect information. Becker's model assumes that the child knows whether the parent is forgiving or unforgiving. If every player's preference is publicly known, by backward deduction, the dynamic model implies the same static outcome every round. However, if the children are uncertain about the parent's type (forgiving or unforgiving), a forgiving parent may utilize the information asymmetry to improve his control over adolescent children.

Given the once-for-all nature of some risk-taking actions and the inherent problems of parents providing credible signals about their net preferences over such actions, children are likely to be uncertain as to exactly how their parents feel about such behaviors and exactly how they will respond to them. Over time, younger children can learn that from the experience of older siblings, which entails a reputation concern on the parent's side. 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. Such birth-order effects are conditional on the occurrence of adolescent risky behaviors, and may appear in all families with multiple children. These predictions allow us to distinguish the reputation model from the existing theories mentioned above.

To summarize, this paper intends to make two contributions to the literature. In the context of adolescent risky behaviors, the existing economic theories posit the family's role in two extremes. At one extreme, a family solves all the intra-familial conflicts (via the unitary model or the Rotten Kid's Theorem). At the other extreme, a forgiving parent is subject to the manipulation of his adolescent children and has no control over adolescent behaviors. These two extremes imply either no need for social policies regarding adolescent risky behaviors or a complete reliance on the social policy in curbing risky behaviors. In contrast, the reputation model allows a middle ground between the two extremes by examining the condition under which the parent has the ability to control adolescent children. Our work and hopefully future research along the same line would help policymakers better understand the role of parents and therefore design better social policies that complement parental efforts in curbing risk-taking behaviors among adolescents. This is our main contribution to the literature.

Our second contribution relates to the birth-order effects. A number of sociologists and psychologists document birth-order effects, but they do not specify the underlying mechanism. Not only do we provide a framework for a new kind of birth-order effects, we also articulate the mechanism through which adolescent behavior and parental response give rise to such birth-order effects. We hope our work will deepen the understanding about the impact of birth orders.

3. The Reputation Model

Consider a family of one parent and N children. The whole game consists of N rounds, each involving the parent and one child at adolescence by birth order. Each round is a standard Becker's model: in the first stage, an adolescent child decides whether to engage in some risky behavior. After observing the adolescent's choice, the parent decides whether to provide or withhold financial transfers to the child. The case of most interest is when the parent and the children do not agree about the utility of the adolescent behavior.

More precisely, in each round of the game, the child is selfish and maximizes his/her utility $U_c(c_c, b)$ over own behavior b and own consumption c_c. The behavior takes two values: $b = 1$ if the child engages in the risky behavior, $b = 0$ if no risky behavior. The parent is altruistic and has two personalities: as a consumer, the parent derives utility $U_p(c_p, b)$ from his own consumption c_p and the child's behavior b; as a social planner, the parent cares about the family's welfare $W_p(U_p(c_p, b), U_c(c_c, b))$. In each round of the game, the parent has an exogenously given income I_p to support his own consumption and that of the child via financial transfers t. For simplicity, we assume that the adolescent has no income and totally depends on parental transfer to support consumption. Thus the utility functions can be rewritten as $U_c(t, b)$ and $W_p(U_p(I_p - t, b), U_c(t, b))$. For simplicity, we assume the transfer takes two values: $t = 1$ if the parent gives financial transfer to the child, $t = 0$ if the parent withholds the transfer. We also assume, from the planner-parent's standpoint, that both the consumer-parent's utility and the child's utility are normal goods and that W_p has nice concavity to guarantee a unique solution to this game.

The parent may be one of the two types: forgiving or unforgiving. At the beginning of the dynamic game, children do not know the parent's type.[16] We label a child as the k th child if she has $k-1$ younger siblings. By this notation, the first born is Child N, and the last-born is Child 1. While uncertain about the parent's preferences, the first-born starts with a prior belief that the parent is forgiving with probability π_N. We do not specify exactly how these priors are formed, although it is reasonable to presume that they are influenced by the past interactions of children with their parent and from observing the parent-adolescent interactions in other families in one's neighborhood or extended family or social class. As the game moves on, Child k observes all the actions of older siblings and may update this belief to π_k when she enters adolescence.

Given the uncertainty, Child k chooses her action based on π_k and the expected parental response to her action. Since the parent plays throughout the whole game, he chooses a sequence of financial transfers so as to maximize the discounted sum of utility from all of his children, i.e.,

$$\sum_{k=1}^{N} \delta^{N-k} W_p(t_k, b_k),$$

where δ is the publicly known discount factor. The parent's choice of financial transfer in round k is conditional on Child k's behavior and the updated belief π_k. A perfect Bayesian equilibrium exists if at any point of the game, (i) a player's strategy prescribe optimal actions

[16] Examining the consequences of other forms of uncertainty in parent-children interactions is also of potential interest. For example, it is possible that parents are uncertain about their children's true preferences over risky actions. Another interesting source of uncertainty is the possibility that parents are unable to directly observe whether their children engage in risky behaviors, e.g., whether they smoke, drink alcohol, or use drugs. Allowing for the latter type of uncertainty is a focus of our future work on parental responses to adolescent risk taking.

from that point on given her opponents' strategy and the relevant belief, and (ii) the belief is consistent with the strategies being played.[17]

Following Kreps and Wilson (1982)[18], we define a sequence of belief thresholds $\{\overline{\pi}_k\}$, where

$$\overline{\pi}_1 = \frac{U_c(t=1, b=0) - U_c(t=0, b=1)}{U_c(t=1, b=1) - U_c(t=0, b=1)}$$

and

$$\overline{\pi}_k = 1 - (1 - \overline{\pi}_1)^k .$$

The numerator in the first expression represents the maximum cost for a child engaging in the risky behavior, while the denominator denotes the benefits of taking the risky action and obtaining parental support. Therefore, $\overline{\pi}_1$ represents the "cost-benefit" ratio that makes a child indifferent between engaging in the risky behavior in the static Becker's model. If the youngest child believes her parents' preferences are more lenient than $\overline{\pi}_1$, she will engage in the risky behavior because the "benefits" of this action overweigh the "costs." As one moves up the birth order from the youngest to the oldest, there is more reputation gain for a forgiving parent to punish the risky behavior. As a result, for Child k to optimally choose the risky action, she must believe that her parent is forgiving with a probability as high as $\overline{\pi}_k$. Apparently, $\overline{\pi}_k$ increases with *k*.

Assuming that the parent is sufficiently patient, the perfect Bayesian equilibrium for the N-child family can be described in three regimes.

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[17] Mas-Colell, Whinston and Green (1995), page 283-285.

[18] The setting is a strict translation from the original model in Kreps and Wilson (1982), which specified and proved the perfect Bayesian equilibrium. The model is robust if we assume the parent's type to be continuous from complete forgivingness to complete unforgiving ness. See the working paper version of this paper for this extension, and Milgrom and Roberts (1982) for the same extension of the original Kreps and Wilson model.

Suppose the prior of the first-born child, π_N, falls between $\overline{\pi}_{k*}$ and $\overline{\pi}_{k*+1}$. Regime 1 consists of all children older than Child $k*$. In Regime 1, the reputation gain is so great that the parent, with probability one, will punish all children that engage in a risky behavior. Given this punishment policy, all children in Regime 1 avoid the risky behavior. Since no risky behavior occurs in Regime 1, the children's belief about their parent's type remains equal to π_N. Obviously, the more likely the children believe the parent to be unforgiving (i.e. the smaller the π_N), the more children fall into Regime 1, and therefore the more children the parent can successfully deter from adolescent risky behaviors.

Starting from Child k*, the gain from reputation reduces to a level that entails the parent to adopt a randomized strategy. In particular, the parent chooses to punish the k th child ($k < k*$) with probability

$$p_k = \frac{1-\pi_k}{\pi_k} \cdot \frac{\overline{\pi}_{k-1}}{1-\overline{\pi}_{k-1}}.$$

Let $n*$ represent the first round in which the parent acquiesces to the child's engagement in the risky behavior (by definition $n* < k*$). For Child $n*$, the parent reveals his type to be "forgiving." Define the interval $n* \le k \le k*$ as Regime 2 and $k < n*$ as Regime 3. In Regime 2, although the parent employs a randomized punishment strategy, the actually observed transfers are all $t = 0$ to any ill-behaving child. Mimicking the parent's strategy, the k th child in Regime 2 follows a randomized strategy, trying to avoid the risky behavior with probability greater than or equal to $1-\overline{\pi}_k$. Finally in Regime 3, the parent's type is no longer uncertain and the equilibrium reduces to the static game equilibrium, i.e., "Risky Action, Parents Acquiesce" outcome, $\forall k < n*$.

The three-regime equilibrium only holds when the parent is patient enough[19]. Kreps and Wilson (1982) showed that as δ becomes sufficiently small, only Regime 3 exists in the equilibrium. In that case, the forgiving parent lacks an incentive to establish a reputation for punishing the risky behavior of any child, since the discounted benefits of obtaining greater conformity by younger children in the future is always exceeded by the costs of punishing older children. In the empirical analysis presented below, we propose a way of detecting the impacts of such discounting of future payoffs by parents.

4. Testable Implications and Econometric Specifications

4.1 Testing the Reputation model

It is tempting to test the reputation model in its full structure: specify the prior belief π_N as a function of parent, family and neighborhood characteristics; model each player's choice set; solve for the optimal choice out of the choice set; and update the belief by the Bayes' rule given all the behaviors undertaken by the older siblings and all the parental responses to these behaviors.

In reality, the structural model is difficult to implement because we do not observe the *complete* behavior-transfer history within a family. This generates two technical difficulties: first, it is hard to construct the prior belief. Although the NLSY79 contains the full fertility history of the family, we do not know what happened to older children not included in the

[19] 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, which 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.

sample. In the structural model, these children's past behaviors and the parent's response to these behaviors shall enter the prior belief. Second, parents in the real world may respond to adolescent behaviors in many ways and throughout many periods. For instance, parents may carry out non-financial punishment before age 18 (since they have legal responsibilities to financially support children before age 18) and financial punishment after age 18. Unfortunately, NLSY79 does not contain information about non-financial punishment, which hinders our ability to estimate the belief update upon *all* the parental responses.

Given these difficulties, we test the reputation model in a reduced form. Specifically, we take the financial transfers that parents give to children after age 18 as *one* type of parental response to the children's adolescent behavior. Since the timing of these financial transfers is not immediately after the occurrence of the adolescent behavior, we cannot estimate how these transfers feed back to younger children in terms of belief update. Rather, we use these transfers to capture the way in which parental responses differ by birth order.

The reputation model predicts that, in regime 1, the parent punishes every risk-taking children with probability one; in regime 2, although the parent will punish risky behaviors with a probability less than one, the actual outcomes are all punishment until the first parental accommodation triggers regime 3; in regime 3, the parent reveals himself being forgiving and therefore never punishes the children for undertaking risky behaviors. This suggests that forgiving parents, in face of children's uncertain about parents' preference types, are more likely to punish older children for engaging in risky behaviors because the benefits of punishment increases with the number of younger siblings remaining under age 18 at the point of decision. Moreover, if the reputation benefit depreciates over time, the discounted benefits would be lower if there is a greater age gap between the child at question and the next younger sibling at risk.

Based on these predictions, we consider the following specification:

$$T_{ijt}^* = \alpha_{ij} + \alpha_1 B_{ij} + \alpha_2 NYG_{ijt} + \alpha_3 AGAP_{ijt} + \alpha_4 B_{ij} NYG_{ijt} + \alpha_5 B_{ij} AGAP_{ijt} + f(z_{ijt}^c, z_{ijt}^p) + e_{ijt}$$

$$T_{ijt} = 1 \text{ if } T_{ijt}^* \geq 0$$

$$0 \text{ if } T_{ijt}^* < 0,$$

where

B_{ij} =1 if child i in family j has engaged in a risky action during teen age,

T_{ijt} =1 if parent j provides financial transfers to child i at time t (after i reaches age 18)

T_{ijt}^* = index function of T_{ijt}

NYG_{ijt} = number of younger siblings under age 18 at time t

$AGAP_{ijt}$ = the age gap between the respondent and the next younger sibling that is under age 18 at time t

$f(z_{ijt}^c, z_{ijt}^p)$ = a flexible function of child characteristics z_{ijt}^c and parent characteristics z_{ijt}^p.

The reputation model implies that $\alpha_4 < 0$ and $\alpha_5 > 0$. At issue is the endogeniety of B_{ij}. Child i's adolescent risky behavior depends on the belief she had about the parent type when she came to adolescence, which in turn depends on the characteristics of child i and family j at that time. Due to the dynamic nature of the game, parental transfer depends on that belief as well, generating an endogeneity problem. Although it is difficult to specify the belief update in a full structural model, this problem can be easily solved by including a child-specific fixed effect α_{ij}.

To see this, recall that we examine parental transfers after the child reaches age 18. At that point, the child's adolescent behavior is predetermined and never changes over time. For the same reason, the belief preceding the adolescent behavior and whatever personal or family preferences that drive the behavior at the child's teen age are also predetermined. These predetermined factors are fully absorbed in the child-specific fixed effect α_{ij}, helping solve the endogeneity problem of B_{ij}. Though we cannot estimate the coefficient of B_{ij} separately from the individual fixed effects, it does not hamper our ability to examine the interaction terms of $B_{ij}\ NYG_{ijt}$ and $B_{ij}\ AGAP_{ijt}$ and to test the reputation model. More specifically, with individual fixed effects, we test whether parents transfer more to the same ill-behaving adult child as more and more younger children grow older than age 18.

The reputation model also produces a strong birth-order effect in children's adolescent behavior. Since the parent's incentive of building a reputation of "being tough" is stronger for the older children, older children foreseeing such reputation incentives should behave better than the younger children. Similarly, the closer is the age gap, the stronger is the reputation effect and therefore the stronger is the incentive for the children to avoid the risky behaviors. This implies:

$$B_{ij}* = \beta_j + \beta_1 NYG_{ijt} + \beta_2 AGAP_{ijt} + f(z_{ij}^c, z_{ij}^p) + e_{ijt}$$

$$B_{ij} = 1 \text{ if } B_{ij}* \geq 0$$

$$0 \text{ if } B_{ij}* < 0,$$

where $B_{ij}*$ is the index function of B_{ij}. The reputation model predicts that $\beta_1 < 0$ and $\beta_2 > 0$.

Note that the prediction of older children behaving better than the younger children derives from the three-regime feature of the dynamic equilibrium. Given the initial belief π_N, children in regime 1 never engage in risky behavior, children in regime 2 undertake the risky behavior with a probability positive but less than one, and children in regime 3 knows the parent is forgiving and engage in the risky behavior with certainty. An empirical test of this prediction does not need to specify the children's belief at each decision point, as long as the children under study are subject to the same initial belief π_N.

We control for π_N by family fixed effects β_j. In fact, β_j not only absorbs the initial belief π_N of family j but also account for whatever family and neighborhood characteristics that may affect the formation of π_N. We would like to draw attention to two of such factors. First, β_j includes all the fertility preference of family j if family j had completed all the childbirths before the first wave of NLSY79. This is true for most observations, and ruling out the few families whose number of children has changed during the years of NLSY79 does not affect any conclusion of this study. Second, some older children of family j may fall out of the interview frame of NLSY79. These children's adolescent behaviors and parental response to these behaviors help define the prior belief for the first child included in the NLSY79. All these information are predetermined, thus fully absorbed in the family fixed effect β_j.

While the use of fixed-effects estimators deals with all of the sources of bias that could arise in the given specifications, they may not be robust to certain generalizations of the reputation model. For example, parents may alter their preferences concerning their children engaging in risky behaviors, as they learn the consequences of such risky behaviors from the experiences with their older children. Similarly, due to imperfect financial markets, parents' and adult children's disposable incomes may follow a life-cycle pattern rather than remain constant as the reputation model assumes. Under either of these generalizations, our estimates of reputation effects might 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. For example, we include parental age in both equations in order to proxy for the influence of time-varying factors determining parental income and/or the evolution of parental tastes. We also include child's age and other time-varying child-specific characteristics in our specifications. Section 6 specifies a complete list of these variables.

4.2 Alternative explanations

The reputation model is not the only source of birth-order effects. Birth-order effects may arise if resources per capita vary systematically by birth order. For example, a typical life-cycle earning profile suggests that parents may earn more when their younger children reach teenage. Even if the family's disposable income is constant over time (say smoothed by borrowing and lending in a perfect financial market), parents have responsibility to support their children under age 18. As the children grow up, the resource that is available per child under age 18 will increase over time. Either way, parents may have more resources to transfer to younger children than to older children, if the children are compared at the same age. We refer to both scenarios as resource dilution.

What does resource dilution mean for children's risky behavior and parental transfers? It depends on the pattern of the parent-child interaction. By the unitary model, parents can always persuade the children to undertake behaviors that are of the best interests for the family. This implies no birth-order effect in the children's behavior, although parental transfers may differ by birth order for the reasons stated above.[20] This is clearly different from the birth-order effects of children behaviors predicted by the reputation model.

Becker's model of parent-child conflict does not imply birth-order effects either, unless we impose financial constraints. As described in Section 2, imposing financial constraints on the Becker's model may lead to two types of birth-order effects. In a world of transferable utilities (i.e. the parent is unforgiving and this is publicly known), the parent has more resources for younger children and therefore is less constrained in designing an optimal incentive for the younger children to behave as the parent desires. In our context, this implies that younger children behave better than the older children, which is opposite to the prediction from the reputation model. Alternatively, in a world of non-transferable utilities (i.e the parent is forgiving and this is publicly known), parents may be equally forgiving for every child's risk-taking behavior but they are tied up in resources to help out the older children. In equilibrium, older children expect the resource shortage ex ante and therefore are less likely to engage in risky behaviors.

The birth-order effects implied by the second scenario under the non-transferable utility assumption are similar to those from the reputation model with two distinctions. First, unless the adolescent risky behavior generates a greater demand for financial transfers at the adult age, the birth-order effects implied by resource dilution should apply to both ill-behaving and well-behaving children. In contrast, parental punishment out of reputation concerns only applies to the children that have engaged in some risky behaviors in adolescence. The second distinction lies in difference between low- and high-income families. Under the resource dilution argument, the birth-order effects should only exist when the financial constraints are sometimes binding. In

[20] Another possibility is that parents prefer the younger children to behave worse than the older children, which we think is unlikely to hold in reality.

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 no birth-order effects for high-income families. In contrast, under the reputation model, the punishment of risky behavior should be sensitive to birth order for all levels of family income. In fact, high-income parents (who are most likely well educated) may have stronger preferences against teen risky behaviors, either because they are more concerned about losing face with an ill-behaving child or because they place higher value on education. If so, children from the high-income family would hold a stronger prior belief that their parents are unforgiving. In the reputation model, a strong prior implies that high-income parents have stronger incentives to maintain the reputation of "being tough." In short, a comparison of high-income and low-income families should draw a clear distinction between the two competing explanations.

5. 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. As noted above, our transfer analysis is able to take advantage of the full sample of NLSY79,[21] 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 behavior 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.[22]

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.

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

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[21] For a complete description of this survey, see Bureau of Labor Statistics (2001).
[22] 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.

between the respondent and the next younger sibling (sister) at risk in the behavior equation. To incorporate the timing of transfers, in the transfer equation, $AGAP$ is defined as the number of years since the study year to the year of the next younger sibling growing up to age 18. To distinguish low-income and high-income families, we define the third variable, $HIGHINC$, in 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.[23] By definition, NYG and $AGAP$ are time varying but $HIGHINC$ is time-invariant.

Besides the three key variables, 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.

6. Results

[23] 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.

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 explanation of resource diluting, we report two sets of summary statistics, one for all families and the other for high-income families only. Section 6.2 presents multivariate analyses for parents' transfer decisions and children's behavior decisions, both allowing formal econometric tests for the two potential explanations.

6.1 Summary of Key Variables

6.1.1 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 transfer 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 resource dilution argument, 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 explanation of resource diluting.

6.1.2 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 resource dilution argument.

6.2 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 alternative explanations.

6.2.1 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 resource dilution 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 $B \cdot BYG$, 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 resource dilution argument 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 resource dilution argument 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 resource dilution 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.

6.2.2 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 resource dilution argument by adding in an interaction of the number of siblings (sisters) under age 18 and the binary indicator of high-income families ($NYG \cdot HIGHINC$). A similar birth order effect may arise from the resource dilution 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 resource dilution story.

7. Conclusion

This paper introduces a new perspective to understand intra-familial interaction and its impact on teenage risky behaviors. Drawing on a literature from industrial organization, we layout 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 age 18. At least in the context of high school dropout and teenage childbearing, we find support for both implications. We also consider an alternative resource dilution 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.

To be sure, there are a variety of other factors that influence the risk-taking behaviors of adolescents. As noted in the Introduction, there is evidence that community, school and public policies may have important impacts on teenage behaviors as well. In complement, our analysis suggests that parents alone, as the main authority of adolescents, may have some ability to control at least some adolescents' risky behaviors.

Understanding the role of parents may help policymakers in two aspects: first, it may help identify the circumstances under which parents are less able to discipline teenagers thus helping policymakers design social policies to remedy the parents' failure. Reputation model suggests that, *within the same family*, forgiving parents may have less control on later-born children. Reputation model also provides a potential link between declining family size over time[24] and more spoiled children today than generations ago[25].

In the second aspect, our study may help formulate social policies that *strengthen* the parental control over adolescents. For example, the reputation model suggests that a stronger prior of parents being unforgiving give parents more incentives to maintain the reputation of "being tough." Specifically, a family with stronger prior will classify more children in Regime 1 where parents punish wrongdoing with probability one. The expectation of parental punishment will deter adolescent children from risky behaviors. If social policies such as school education and community efforts can reinforce the prior belief (of parents being unforgiving), these policies may help parents discipline their adolescent children.

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[24] Family size has dropped significantly over the last 20 to 40 years. Today, the typical woman in the U.S. is expected to have 2.03 children over her lifetime. In 1970, the corresponding figure was 2.5 children and in 1960 it was 3.6 children. Source: Period-specific total fertility rate estimates taken from selected issues of National Vital Statistics Reports, Center for Health Statistics, U.S. Center of Disease Control and Prevention.

[25] An article in the 08/06/2001 issue of Time magazine entitled, "Who's in Charge Here?" reported that 80 percent of American adults think that today's children are more spoiled than kids of 10 or 15 years ago were.[25] The article goes on to lament that today's youth are the most indulged generation in recent history: "Go to the mall or a concert or a restaurant and you can find them in the wild, the kids who have never been told no, whose sense of power and entitlement leaves onlookers breathless, the sand-kicking, foot-stomping, arm-twisting wheedling, whining despots whose parents presumably deserve the monsters they, after all, have created."

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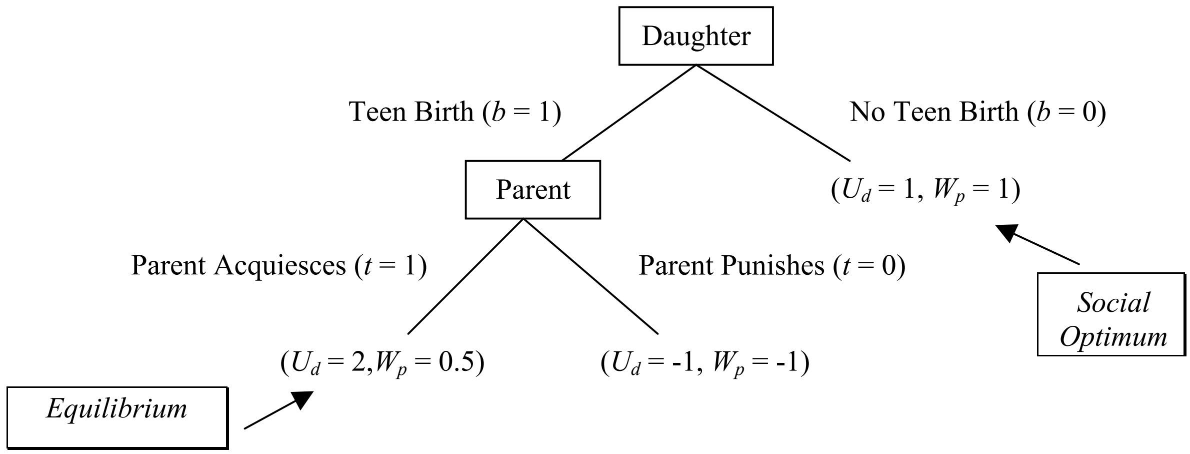
Figure 1: Decision Tree for Parents' and Daughter's Decisions – an Example of Teen Birth

Case A: Forgiving Parents



Case B: Unforgiving Parents

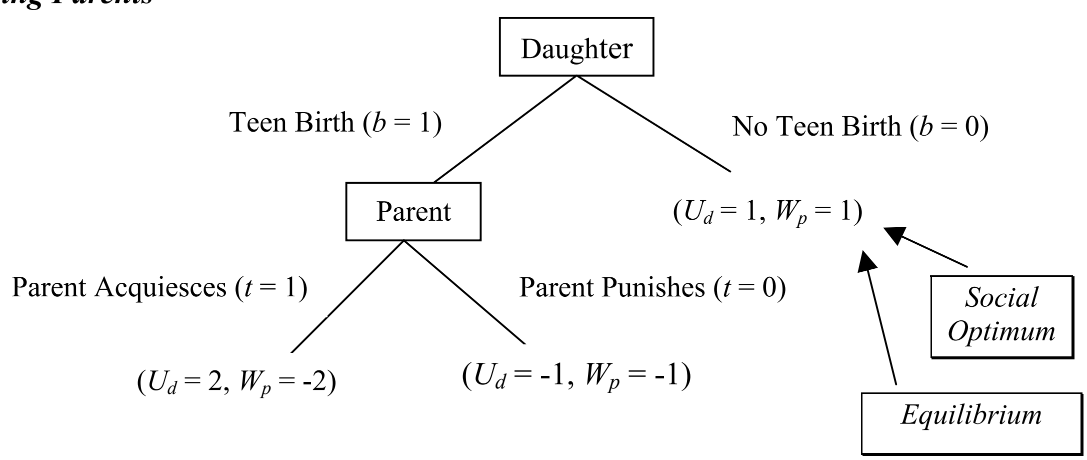


Table 1. Parental Transfers by Offspring's Risky Behaviors, Number of Younger Sibling (Daughters) under Age 18, and per Capita Income in the Family

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) *(NYG * HIGHINC)*			-.0037
			(.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) *(NYG * HIGHINC)*			-.0395
			(.0386)

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