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Decision-making by children

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Abstract In this paper, we examine the determinants of decision-making power by children and young adolescents. Moving beyond previous economic models that treat children as goods consumed by adults, we develop a noncooperative model of parental control of child behavior and child resistance. Using child reports of decision-making and psychological and cognitive measures from the NLSY79 Child Supplement, we examine the determinants of shared and sole decision-making based on indices created from seven domains of child activity. We find that the determinants of sole decision-making by the child and shared decision-making with parents are quite distinct: sharing decisions appears to be a form of parental investment in child development rather than a simple stage in the transfer of authority. In addition, we find that indicators of child capabilities and preferences affect reports of decision-making authority in ways that suggest child demand for autonomy as well as parental discretion in determining these outcomes.

Keywords Children · Parents · Investment · Decisions

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1 Introduction

Economic models of the family treat children either as "goods" in the consumption vector of their parents or as agents with autonomous preferences who are capable of full economic independence. In a developmental trajectory between the infant and the near-adult we know that there are children who have well-defined preferences, who are developing communications and formal reasoning skills, who are capable of productive work and independent action, and who still rely on their parents for guidance and support, but economic theory does not accommodate them easily. During late childhood and early adolescence, children acquire a level of autonomy about their own activities and spending at rates that vary depending on their own traits and abilities, the preferences and resources of their parents, and their environment. As children begin to make choices about how to allocate their time between homework and television, and about how and when to spend their money, they become economic agents engaged in constrained optimization. We know very little about the process by which children acquire this agency; this paper provides a first look at child decision-making autonomy from an economic perspective.

The balance that is struck between parental authority and child independence in choices about children's own activities is potentially important for developmental outcomes. Parental restrictions can curtail risky behavior and promote investments in child human capital, but children develop self-confidence by taking independent actions and judgment by experiencing their own mistakes. A gradual transfer of decision power from parents to children is believed by child development experts to be better for children than either premature independence or prolonged subservience (Dornbusch et al. 1987; Steinberg et al. 1991).

In this paper we develop an economic model of parent–child interaction and test its implications. Our simple non-cooperative bargaining model has a parent choosing a level of behavioral control in the face of limited resources and child demand for autonomy. Using the 1979 National Longitudinal Survey of Youth Child data (NLSY-C), we examine the determinants of a child's agency within the household based on children's reports of who makes decisions about their own activities, such as spending money and watching TV. We find that the determinants of sole decision-making by the child and shared decision-making with parents are quite distinct: sharing decisions appears to be a form of parental investment in child development rather than a simple stage in the transfer of authority. In addition, we find that indicators of child capabilities and preferences affect reports of decision-making authority in ways that suggest child demand for autonomy as well as parental discretion in determining these outcomes.

2 Children and decision-making

In this paper, we are interested in how much control a parent exerts over the behavior of older children and young teenagers, and the extent to which this level of control is determined by the parent's assessment of the child's capability versus the child's own demand for independence. Empirically, we use measures developed by developmental and social psychologists to capture decision-making about domains in children's lives, such as how late a child can stay out or how the child spends his or her money. For very young children, these decisions are either irrelevant or are completely controlled by parents, but a child's say increases with age. Prior research establishes that children's involvement in decisions (either deciding with parents or deciding on their own) increases over ages nine to 13 (Yee and Flanagan 1985), while decision autonomy (deciding without parental input) increases over ages 12–17 (Dornbusch et al. 1985).

This transfer of authority corresponds with the child's development of skills associated with sound decision-making. The formal reasoning skills needed to generate and weigh alternatives develop rapidly from age eight or nine to age 15 or 16 (Keating 1990). Recent experimental studies have evaluated the development of children's abilities to make rational economic decisions. Harbaugh et al. (2001) find that the choices of children as young as 11 seldom violate the generalized axiom of revealed preference, though Harbaugh et al. (2002) find that the ability to appropriately weight high-probability and low-probability events develops more slowly.

Adult-centric models have dominated academic analysis of child development. Developmental psychologists traditionally consider decision-making about children's lives and the transfer of decision power from parents to children to be parts of the set of activities that comprise "parenting." The transition from parent control to child control is referred to as "autonomy granting" or "independence giving" (Bulcroft et al. 1996; Bumpus et al. 2001), reflecting a normative assumption that parents initially hold the right and power to make decisions and that they transfer it to children via a parent-controlled process. In related work (Romich et al. 2008), we suggest that a more interactive conceptualization of decision-sharing is warranted. Part of the motivation for rethinking these models comes from a recent focus among developmentalists on child agency. For example, consider monitoring, the set of actions traditionally associated with parents tracking and supervising children. Monitoring is typically operationalized through questions about whether parents know their children's friends and whereabouts, and greater parent knowledge about these topics is interpreted as successful monitoring. However, in an important study of sources of information, Kerr and Stattin (2000) find that that parent knowledge of children's activities is due more often to children's spontaneous disclosure than parental inquiry. The assumption that parents track their children masks the shared reality that, in many families, adults and children keep each other informed. This interpretation fits with transactional models of child development, in which children both shape and are shaped by their environments (Sameroff 1994, 2000; Magnusson and Stattin 1998; Maccoby 2000).

Applied to decision-making, this line of thinking suggests that children's decision-making power may reflect child demands, as well as adult preferences, and that child autonomy may be usefully modeled using the tools of game theory. The developmental process by which children become independent decision-makers has not been studied extensively by economists, although economic models have the advantage of being able to generate clear testable hypotheses and often consider factors—such as financial resources—not always fully considered in other disciplines.

In most economic models of parenting, adults allocate time and goods to the household production of child services or child "quality" and receive direct utility from their children and their children's attributes. Children may or may not have preferences that appear in the objective function of altruistic parents, but they do not make effective decisions—the allocation of goods and time within the household is determined by parents. Analytically, the absence of child agency is accommodated either by an assumption of direct parental control of the child's behavior, or by the neutralizing effect of parental transfers.

Child behavior makes its first significant appearance in the economics literature in Becker's "altruist" model (1974, 1991). In this model, the family consists of purely selfish, rational "kids" and an altruistic "parent" who cares about the well-being of the kids as well as his/her own. If the altruistic parent makes transfers to all the kids, then Becker's "rotten kid" theorem asserts that the selfish kids will be induced to act in an efficient and unselfish manner. This occurs because the parent will adjust transfers in such a way that acting so as to maximize total family income will be in each child's own self-interest. The family can then be thought of as a single decision-making unit, with the objective of maximizing a single utility function—the altruist's. Indirect parental control via transfers produces an elegant model of the unitary family, but would seem to be more appropriate for older dependents (in some of the examples presented by Becker and later commentators, the "rotten kid" is the wife) than to younger children.

An alternative parental control mechanism is introduced by Burton et al. (2002), who apply a non-cooperative model to the interactions of parents and younger children (age 6–11 in their empirical analysis). They set up a principal-agent model in which the child chooses a level of costly "good behavior" in response to the parenting strategy of an altruistic parent. This parenting strategy consists of a level of praise or censure that is a function of the child's good behavior, so that child outcomes and parent behavior are simultaneously determined. Empirically, they do find evidence of such simultaneity.

As children grow into teenagers, they must be modeled not only as individuals with their own preferences, but also as agents who are capable of influencing family outcomes. Economic models supporting an empirical analysis of interactions between parents and teenagers or young adults (McElroy 1985; Hao et al. 2007; or Kooreman 2004) tend to be based on non-cooperative game theory, although economic models of marital bargaining are generally cooperative. Cooperative game theory ensures that outcomes are Pareto efficient by assuming that the players can make binding, costlessly enforceable agreements, while in noncooperative games efficient outcomes are possible but not necessary. Browning et al. 1994 motivate their assumption of Pareto efficiency in marriage with the claim that the marital environment possesses characteristics that promote efficient outcomes in repeated noncooperative games: a long-term relationship, relatively good information, and a stable bargaining environment. In the parent–child context, the bargaining environment is constantly changing as the child matures, and effective information exchange may be hampered by the still-developing cognitive and communicative abilities of children.[1] We find some evidence of shared decision-making by parents and children that may signal cooperative negotiation, but it is relatively rare in our sample. Thus, we follow in the noncooperative tradition of the economics literature on parenting and model parental control of a child's behavior and the child's choice of a costly level of resistance as a non-cooperative game.

3 A model of parent control and child resistance

This section sets up a simple model of non-cooperative interaction between parents (assumed to have unitary preferences) and a single child. The utility function of parents is $U^P(y, z, q)$: they care about their own consumption of private goods, y, their child's level of "good" behavior, z, and their child's future quality, q. The child cares about the family resources available to him, which can depend on the level of family conflict over his behavior and on his own autonomy, defined as the discrepancy between desired and parentally-controlled behavior.

Parental resources, Y, are assumed to be exogenous and parents must decide how to divide these resources between their own consumption—including pleasant leisure-time interactions with their child—and costly control of their child's behavior, which generates both current and future benefits but reduces the child's autonomy. Child discipline is costly because it requires either parental time for intensive monitoring, direction on contested decisions, and possibly negotiation, or the purchase of parental substitutes to provide supervision. The child, in turn, decides on a level of resistance that counters parental control at the cost of reducing family harmony and thus child resources. Note that we do not assume parents to be altruistic in the sense that they care only about their child's utility or subjective wellbeing rather than his characteristics or behavior.[2] The child cares only about current, and not future, outcomes.

We model the interaction between a parent and child as a non-cooperative Nash game: the parent chooses how much autonomy to give the child (or, equivalently, how much control to exert) as a function of the child's resistance; the child chooses how much resistance to offer as a function of the parent's control.

3.1 Parent control

We begin, for expositional simplicity, with a special case of the model in which parents do not take into account the effects of their current discipline on the child's

[1] Critics of the altruist model also raise the possibility of strategic behavior by children that can limit parental control and cause the rotten kid theorem to fail (Bergstrom 1989; Bruce and Waldman 1990), but these criticisms apply to marital bargaining as well.

[2] Pollak (1988) argues that there is likely to be a divergence between what children want and what parents want for their children, and calls preferences of the sort we assume "paternalistic preferences." Our theory does not require that parents' preferences are more—or less—likely to be developmentally appropriate than children's preferences. In some cases, parents' expectations may be in fact harmful to children's development, as in the case of children with excess household responsibilities or children held to unattainable academic or athletic standards.

future quality. The parent has a utility function $U^P = \alpha_1 \ln(y) + \alpha_2 \ln(z) = \alpha_1 \ln(Y - \delta c - \gamma r) + \alpha_2 \ln(z^* + c - r)$. Parental utility is increasing in private consumption y, which is equal to full income Y net of the cost of the chosen quantity of child control c (with per unit cost δ) and the cost of child's resistance r (with per unit cost γ). The cost of control represents the time and other resources required to ensure that the child behaves in accordance with the parents' wishes (e.g. dresses "appropriately", studies hard for exams, or completes assigned chores). The cost of child resistance includes the psychic and other costs to the parents of disobedience and defiance. We assume that the parent is able to choose a positive level of control, but takes as exogenous the child's chosen level of resistance.

The utility of the parent is also increasing in the current amount of compliant behavior, which depends upon the amount of "good" behavior the child would engage in without any control, z^*, the level of parent control, and the amount of child resistance. Choosing the amount of control c to maximize utility, we obtain the parent's reaction function:

$$c(r) = \frac{\alpha_2 Y - \alpha_1 \delta z^* + (\alpha_1 \delta - \alpha_2 \gamma) r}{\delta(\alpha_1 + \alpha_2)}.$$

For a given level of r, control will be increasing in Y and decreasing in z^*. The slope of the parent's control function in r, c space is indeterminate; child resistance both increases the expected return to control by reducing z and increases the cost by draining parental resources. If we assume that $\alpha_1 \delta - \alpha_2 \gamma > 0$, then parents will react to increasing child resistance r by imposing a higher level of control c.

3.2 Child resistance

The utility of the child, $U^K(Y^K, z - z^*)$, is increasing in the child's net resources and decreasing in the deviation between actual behavior and the child's "natural" level of good behavior, $z - z^*$. The child can reduce the disutility from control by engaging in resistance r at a unit cost of θ, so that $U^K = \beta_1 \ln(Y^K - \theta r) - \beta_2 \ln(c - r)$ for $c > 0$ and $r \geq 0$. Resistance reduces the child's resources Y^K by imposing costs on parents or reducing family harmony.[3] At one extreme, the child can run away from home and avoid the control of the parent completely by relinquishing all family resources. At the other extreme, he can neglect some chores and experience mild, but unpleasant, parental annoyance or reproach.

Choosing the amount of resistance r to maximize child utility, we obtain the child's reaction function:

$$r(c) = \frac{\beta_2 Y^K - \theta \beta_1 c}{\theta(\beta_2 - \beta_1)}.$$

The slope depends on the utility parameters—if $\beta_2 - \beta_1 > 0$, i.e., if child places greater weight on autonomy, relative to resources, the child's resistance will be

[3] We think of Y^K as a function of parent's resources as well as the family environment, but making this dependence explicit has no effect on the results that follow. In Becker's altruist model, manipulation of the child's resources through transfers provides an alternative representation of parenting.

increasing in available family resources Y^K as well as decreasing in parent control c and in resistance costs θ.

3.3 Equilibrium

In this model, an equilibrium is a combination of positive control c and non-negative resistance r that is consistent with the two reaction functions. The linearity of our model ensures that the equilibrium is unique, and the parameter restrictions noted in Sects. 3.1 and 3.2 (which guarantee that parental control is increasing in child resistance and child resistance is decreasing in control) are sufficient, but not necessary, to ensure a stable equilibrium.[4] Since in the data we observe indicators of parent control but not child resistance, we focus on the solution for the former:

$$c = \frac{\alpha_2\theta(\beta_2 - \beta_1)Y + (\alpha_1\delta - \alpha_2\gamma)\beta_2 Y^K - \theta(\beta_2 - \beta_1)\alpha_1\delta z^*}{\theta(\beta_2\alpha_1\delta + (\beta_2 - \beta_1)\alpha_2\delta - \gamma\beta_1\alpha_2)} \tag{1}$$

Several comparative statics results follow. The parent controls more when either the resources of the parent Y or the child Y^K increase ($\partial c/\partial Y > 0$ and $\partial c/\partial Y^K > 0$), and controls less when the child-preferred level of approved behavior is higher ($\partial c/\partial z^* < 0$). The child's relative preference for autonomy β_2 can either increase or decrease equilibrium parental control, but it is simple to show that $\frac{\partial c}{\partial Y \partial \beta_2} > 0$, so a parent with more resources Y is more likely to increase control of an autonomy-seeking child, while a parent with fewer resources Y reduces it.[5]

3.4 Parental control as an investment

Re-introducing child quality into the parents' utility function yields a much richer model, but we present only the broad outlines of it here to provide a framework for interpreting some of the empirical results that indicate parental investment motives. Future child quality may depend on both current levels of good behavior (avoiding an injury or an early pregnancy, for example), and on the level (and potentially the method) of parental control, so that $q = q(z, c)$. In controlling the child's risky behavior, parents must weigh the benefits to their own current comfort and their child's future health against the cost of the foregone judgment and good sense the child would have acquired by making his own decisions (and his own mistakes). This reasoning suggests that parental control may vary across decision domains, since some child actions may have more serious implications for their future quality or wellbeing than others, or across extra-family environments, since children in certain neighborhoods or social groups may be exposed to more potentially risky behaviors.

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[4] If the child resistance function is positively sloped, and steeper than the parental control function, then the equilibrium is unstable, and may result in ever-increasing levels of c and r.

[5] A possible extension of this model would allow parental control to be produced with inputs of parental time and money. In this case, the effect of Y on control would be ambiguous, since higher-resource parents would also have a higher price of time.

A concern for future child quality may also influence methods of control in ways that are not incorporated in the simple model above. Many children report that both they and a parent are the main decision-makers in some domains. One interpretation of this response is that discussion or negotiation is going on regarding how much television the child watches, or what he wears, and this type of parent–child interaction is not well-represented by a continuous measure of discipline or control. Negotiation or shared decision-making will be costly in terms of parental time and patience, and in addition to effecting parental control over the child's behavior, it may have developmental implications—contributing to the child's judgment or verbal skills. In general, the demand for child quality will be increasing in parental resources, and we can expect well-endowed parents to choose costly control levels and mechanisms that make positive contributions to child development.

3.5 Implications of the model

In our empirical analysis, we interpret reported decision-making autonomy by children as a reflection of the equilibrium level of control chosen by the parents, taking into account the expected resistance of the child. Allowing for heterogeneity among both parents and children, Eq. 1 can be re-written as

$$c_i = c(Y(x_i^r), z^*(x_i^c, a_i), \delta(x_i^c, a_i), \beta_2(x_i^d, a_i)) \tag{2}$$

We expect the level of parental control in family i to be increasing (and child autonomy to be decreasing) in indicators of parental resources x_i^r, and decreasing (increasing) in the child's level of good behavior without parental interference, z_i^*. z_i^* is a function of x_i^c, a vector of characteristics (or capabilities) that include cognitive skills, maturity, and self-control, and of age a_i. These capabilities may also affect the parent's cost of control, δ_i, and this cost will also increase as the child matures. The value that the child places on autonomy relative to family resources is reflected in β_{2i}, a function of age and preference shifters x_i^d.

3.5.1 Parental resources

Wealthier and more able parents will be better able to bear the enforcement costs of parental control, and may also have a greater demand for future child quality, so child autonomy should be negatively related to measures of parental wealth and human capital.[6] Wealthy parents are also more likely to increase, rather than decrease, control of autonomy-seeking children. Family size and structure may also influence parental control. Single mothers tend to be relatively poor in both time and money, and so may exert less influence over child behavior either through control or negotiation. More children will place a heavier burden on parental resources, but there are also likely to be externalities across siblings in the parental control regime that are not captured in the model above. It may be cheaper to extend one control regime than another to several children, or particularly costly to employ multiple methods with siblings of different ages and abilities.

[6] Unless the price of parental time is an important component of the cost of control.

3.5.2 Child age

Child age will affect both the costs and benefits of parental control. The child's ability to earn her own money, to care for herself and evade parental control, and to make meaningful contributions to household public goods will increase with age. For these reasons, we might expect the costs of monitoring and enforcing parental directives to increase as a child gets older, acquiring greater mobility and independent control over resources. It is also likely that, as children mature, their reasoning abilities improve and their preferences become more similar to the paternalistic preferences of their parents—reducing conflict and the expected returns to costly monitoring by parents. Thus as children age, we can expect them to make more of their own decisions about how to spend their time and to control larger amounts of money, both through parental allowances and other transfers, and through market work.

3.5.3 Child characteristics

In general, we expect a child's physical maturity and intellectual ability to increase child autonomy by both reducing the expected benefits and increasing the costs of parental control. High cognitive abilities may improve the child's autonomous decision-making, reduce the costs of parent-child negotiation, but also increase their ability to evade or subvert parental control. Tall children may be stronger and more difficult to control physically by parents, or they may be more likely to be employed and have higher independent income (Pabilonia 2001). A tall child's access to extra-familial resources should reduce parental leverage. Finally, personality characteristics that increase the child's demand for autonomy will, *ceteris paribus*, increase their level of resistance to parental authority and their effects on parental control will depend on parental resources.

4 Data and measures

The data we use are from the ongoing National Longitudinal Survey of Youth 1979 (NLSY) and the associated Children survey (NLSY-C). The NLSY tracks a nationally representative sample of men and women who were age 14–21 in 1979 (Center for Human Resource Research 2000). Beginning in 1986, data has been gathered about the children of the women in the 1979 cohort. Children stay in this sample as long as they are age 14 or younger on December 31 of the sampling year; thereafter they are administered a different, "young adult" interview. Our analysis uses a pooled sample constructed from the universe of children aged 10–14 in the 1994, 1996, 1998 and 2000 waves. Eliminating observations with wave-specific child or parent non-response on the key dependent and independent variables gives a sample of 6327 child-years.

The NLSY-C is not a nationally-representative sample of 10–14 year olds in the 1994–2000 period (Chase-Lansdale et al. 1991). Rather, it is a sample of children born to women in their early years of fertility, ages 17–32. First-born children and children of young mothers are over-represented relative to their population prevalence, and immigrant children and children born to very recent immigrants are underrepresented since all sample mothers resided in US households in 1979. However, the NLSY over-sampled black, Hispanic, and economically disadvantaged white youth, making it particularly informative for these groups. No appropriate weighting scheme is available for pooled time series analyses (Olsen 2001), so all estimations are presented on unweighted data.

Table 1 contains basic descriptive statistics. The NLSY Children provides a rich set of child characteristics that could affect the child's demand for decision-making autonomy or his or her parents' willingness to provide it. We begin with basic demographics, including the child's gender, race and ethnicity (two dummy variables, with non-black non-Hispanic omitted), age, and birth order. We also include physical attributes of the child that may be correlated with developmental

Table 1 Sample statistics

	Full sample (N = 6327)		
	Min	Max	Mean (SD)
Child demographics			
Girl	0	1	.50 (.50)
Age in years	10	14	11.78 (1.31)
Black	0	1	.32 (.47)
Hispanic	0	1	.22 (.41)
First child	0	1	.43 (.49)
Child capabilities			
Height in inches[a]	44	78	60.78 (4.42)
Low birth weight[b]	0	1	.04 (.20)
PIAT—mathematics (ages 6–8)	65	135	99.77 (11.52)
PIAT—reading recognition (age 6–8)	65	135	102.95 (11.93)
Impulsivity index	−2	2	.00 (.69)
Parent resources			
Mother's education			
<High school	0	1	.13 (.34)
Some college	0	1	.28 (.45)
College+	0	1	.13 (.33)
Father present	0	1	.52 (.50)
Stepfather present	0	1	.17 (.37)
Income ($10000)	0	97	4.60 (6.24)
# Brothers	0	7	.88 (.90)
# Sisters	0	7	.88 (.92)
Parent preferences			
Frequently goes to church (≥once per week)	0	1	.38 (.49)
Never goes to church	0	1	.14 (.34)

[a] 46 obs. with z-score of absolute value >5 are dropped

[b] 333 missing observations

outcomes, or that may affect her ability or incentive to act independently such as height and low birthweight (below 5 lb 8 oz). Height is measured as a z-score standardized by month of age and gender using U.S. data (see Appendix).

The NLSY-C includes several useful cognitive and psychosocial measures that we use as proxies for child capability and preferences. One measure of the child's decision-making capability is early academic proficiency—we include a widely used developmental measure, the Peabody Individual Achievement (PIAT) tests for math and reading recognition. PIAT tests were administered at ages 6–8 and scores are standardized by age and gender. To capture one dimension of the child's demand for autonomy, we use a set of four questions that explore the child's impulsivity, a proxy for demand for risk-taking behavior. Each child is asked to strongly agree/agree/disagree/strongly disagree with the statements "I enjoy taking risks", "I enjoy new and exciting experiences, even if they are a little frightening or unusual", "I think that planning takes the fun out of things" and "Life with no danger in it would be too dull for me." These items are based on questions derived by Buss and Plomin (1975). The numeric values of responses (1–4) are combined, equally-weighted, into a single index standardized by age and gender.[7]

The main NLSY files include characteristics of the child's mother and household composition. The number of brothers and sisters is based on children currently in the household, and will include step-siblings. The mother's highest grade completed (three dummy variables, high school only omitted) and her frequency of attendance at religious services (measured in 1979) are also included. The presence of the child's father or stepfather in the household and household income are additional indicators of total household resources. The year of observation is included in all models to capture trends in children decision-making over time and any otherwise unobserved effects of the over-representation of children born to young mothers in earlier waves.

Table 2 summarizes reported decision-making by the children in our sample. We use a series of questions originally used in the National Health Examination Survey (Dornbusch et al. 1985) and included in the NLSY Child Self-Administered Supplement.[8] Children are asked "Who usually makes the decisions about…," about each of seven topics: buying your clothes? how to spend your money? which friend to go out with? how late you can stay out? how much allowance you get? how much TV you can watch? your religious training? For each domain, respondents could give multiple responses from the list of responsent self, mother, father, stepfather, friends or someone else.[9] Indices were created for sole decision-making

[7] An additional statement "I often get in a jam because I do things without thinking" was excluded because Cronbach's alpha indicated its correlation with other items in the index is not high.

[8] The CSAS is a self-report booklet filled out by children over age 10 (10–14 beginning in 1994) that collects information on a wide variety of topics, including parent–child interactions, attitudes towards school, peer interactions, and substance abuse. The content was expanded between 1988 and 1994, but remained reasonably constant between 1994 and 2000.

[9] Very few children listed friends and others as participants in these decisions (less than 2%). We include reports that friends make the decision as the child's own decision, and include stepfather and "someone else" with parents. In the 2002 wave of this survey, the options for reported decision-makers become much more detailed. Children are able to report grandparents, stepmothers, and other adult relatives as possible decision-makers, and we find that these groups make up the majority of the "someone else" category.

(the child reports self or friends but not a parent as the decision-maker), shared decision-making (the child reports self and parent as usual decision-makers), and parent-only decisions.

The first panel of Table 2 reports the proportion of the sampled children who report that they, and they alone, are the usual decision-maker in each domain. On average, children claim to have sole authority in 2 of the 7 areas, and this is most common in areas that concern the expenditure of the child's own time and money—spending, friends, and TV. In each of these three domains, 40–50% of the sample report that they are the sole decision-maker. Substantially fewer children make their own decisions about clothing and religion—areas in which parents may wish to assert their own values or community norms. Only about 2% of 10–14 year-olds make sole decisions about curfew time or the size of their allowance. Since the latter involves a direct claim on parental resources and the former has important implications for child safety, this is perhaps not surprising.

An index of total decisions is created by adding together the responses for all domains except allowance and curfew (since assertions of sole decision-making in these areas are both rare and rather suspect). We also calculate two sub-indices, one for clothes, spending, and friends that we term "personal" and one that sums responses about TV and religious education that is called "human capital" because behavior in these domains may affect the child's knowledge and attitudes.[10] The responses of boys and girls are very similar, though boys report more independent decision-making in the human capital domains. Mother's education has little impact on the personal decisions, but more-educated mothers are more restrictive about TV and religion.

The second panel of Table 2 reports shared decisions in which the child reports both him- or herself and a parent as "usual" decision-makers. Though the survey provides no direct information about how, in practical terms, both the child and parent can both be "usual" decision-makers in a particular domain, it seems reasonable to infer that some discussion or negotiation is taking place in most cases. We therefore interpret this response as shared or joint decision-making. Parents apparently reserve sole authority over allowances and curfew for children in this age group—less than 10% of the sample report shared decisions in these domains. Clothing is the most common area of shared decision-making; the interests of parents in the cost and appropriateness of their child's attire are apparently weighed against the child's legitimate interest in fashion and conformity. Shared decisions in the other four domains are reported by about 15–20% of the sample. A distribution of responses shows that the modal response is to report shared decisions in zero categories: parents who cede partial authority to children, or discuss decisions with them, tend to do so in multiple domains. The third panel summarizes reports of

[10] One might ask whether reported decision-making is actually related to behavior. Other evidence from the survey suggests that it is. In the NLSY-C survey, children are asked, "Within the last month, have you and your parent(s) gone to church or religious services together?" and "How much time do you spend watching television on typical weekday/Saturday/Sunday?" We regress the answers to these two questions on the corresponding decision dummies (own, shared and parent). We find that children who make their own decisions about television watch more television, and watch less when their parents make or share the decision. Likewise, the children are less likely to have gone to church last month when they make their own decision on religion, and more likely when their parents make or share the decision.

Table 2 Decision patterns

	Full sample	Child gender		Mother's education	
		Girls	Boys	≤High school	≥Some college
Sole decisions					
1 Allowance[a]	2%	2%	3%	3%	1%
2 Clothes	28	29	27	28	28
3 Spending	50	50	51	50	51
4 Friends	53	52	54	52	54
5 Curfew	2	2	3	3	2
6 Television	42	44	41	45	38
7 Religion	23	24	22	26	19
Total decisions = 2 + 3 + 4 + 6 + 7	1.97	1.93	2.07	2.01	1.92
Personal decisions = 2 + 3 + 4	1.31	1.30	1.34	1.30	1.34
Human capital decisions = 6 + 7	0.66	0.62	0.73	0.71	0.58
Shared decisions					
1 Allowance	6	7	5	5	7
2 Clothes	33	39	28	31	37
3 Spending	23	25	20	21	25
4 Friends	18	21	15	16	20
5 Curfew	10	11	9	9	12
6 Television	15	15	14	13	17
7 Religion	17	20	14	14	21
Total decisions = 1 + 2 + 3 + 4 + 5 + 6 + 7	1.23	1.32	1.02	1.11	1.40
Parent decisions					
1 Allowance	91	91	92	92	91
2 Clothes	39	32	45	41	34
3 Spending	27	25	29	29	24
4 Friends	30	28	31	32	26
5 Curfew	88	88	88	89	86
6 Television	43	41	45	42	45
7 Religion	60	56	64	60	60
Total decisions = 1 + 2 + 3 + 4 + 5 + 6 + 7	3.75	3.59	3.92	3.83	3.65
Personal decisions = 2 + 3 + 4	0.95	0.85	1.05	1.02	0.85
Human capital decisions = 6 + 7	1.03	0.97	1.09	1.02	1.05

[a] No allowance is treated as parent decision

parent-only decision-making. These patterns reflect the residual of the responses in the first two panels.

Figure 1 plots the age trajectory of the mean number of domains in which boys and girls report themselves as sole decision-makers, or as sharing decisions with parents. Sole decision-making authority increases steadily between the ages of 10 and 14, and the average response is essentially identical for girls and boys at each age. Shared

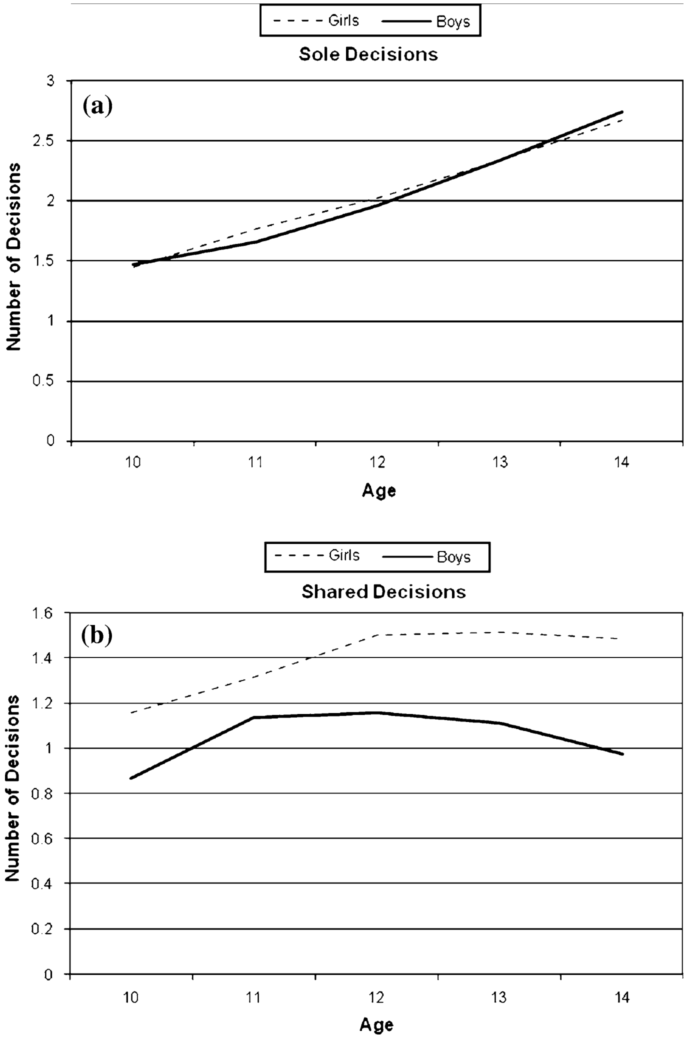

Fig. 1 Mean number of domains in which children participate in decisions, by child age—boys and girls

decisions rise until about age 12, and are stable or declining after that. Girls are much more likely than boys to report sharing decisions with parents at all ages.

5 Empirical model and results

This section presents an empirical model of the relationship between child, mother and family characteristics and child decision-making. The dependent variables are the number of domains in which the child reports that he is able to make decisions on his own ("sole"), decisions with his parents ("shared"), or in which his parents are the sole decision-makers ("parent"). These count variables take values between 0 and 7 (shared and parent) or between 0 and 5 (sole) for the full set of decisions and values between 0 and 3 or 0 and 2 for the personal and human capital decisions, respectively. We assume that the observed values of the decision indices are determined by the latent variable, parental control, as represented in Eq. 2. Let the child's propensity to make her own decisions, for example, be negatively related to the level of parental control. From Eq. 2, the child's decision-making authority is:

$$y_i^* = \bar{C} - c_i = y(x_i^r, x_i^c, x_i^d, a_i, \varepsilon_i) = y(\mathbf{x}_i, \varepsilon_i) \tag{3}$$

where $\bar{C}$ is the maximum level of parental control.[11] The difference between the maximum possible level of control and the control exerted on the ith child is a function of parental resources, x^r; child characteristics related to behavior, x^c, and desire for autonomy x^d; age a; and unobserved characteristics of parent and child ε_i. The linear model $y_i^* = \mathbf{x}_i'\boldsymbol{\beta} + \varepsilon_i$, where ε_{ij} has a logistic distribution conditional on $\mathbf{x}_i$, can be estimated as an ordered logit. The observed discrete value of the decision index y_{ij} depends on the latent variable y_{ij}^* in the following manner:

$$\begin{aligned} y_i &= 0 \quad \text{if } y_i^* \le 0 \\ y_i &= 1 \quad \text{if } 0 < y_i^* \le \mu_1 \\ &\cdots \\ y_i &= K \quad \text{if } \mu_{K-1} < y_i^* \end{aligned}$$

The sole decision index varies between the values 0 and K as the latent control variable passes the thresholds μ_1, μ_2,..., μ_{K-1}. For simplicity, we present similar results for shared and parent decision-making, but our focus is on sole decision-making by the child as a measure of autonomy. Cross-section results for all decisions and for personal and human capital decisions are presented first. Since unobserved characteristics of the parents may be correlated with some of our explanatory variables, we also estimate fixed-effects ordered logit models, using variation in the characteristics of children with the same mother.

5.1 Sole, shared, and parent decision-making, cross-section results

Table 3 presents our main cross-section results for the full sample of all child observations from the 1994 to 2000 waves. We report odds ratios and p-values based on robust standard errors. The proportional odds ratios from an ordered logit model give the effects of a one unit change in the independent variable on the odds that the decision index takes on a value greater than k versus k or less, for all k.

As seen in the descriptive results, age is an important determinant of child autonomy—a child's ability to make sole decisions affecting her use of time and allocation of resources grows rapidly from ages 10 to 14. The likelihood of exerting independent decision power in more domains increases by approximately half

[11] An alternative interpretation of y would allow reported child decision-making to be a function of both c and r. If the number of child-controlled decision domains, for example, depends on $c - r$, all of the comparative statics results in Sect. 3 follow, except for the effect of Y^K, which will be ambiguous.

Table 3 Cross-section results for total decisions (ordered logit: odds ratio (*p*-value))

All ages			
	Sole decisions Total (N = 5817)	Shared decisions Total (N = 5740)	Parent decisions Total (N = 5740)
Child demographics			
Girl	1.010 (.857)	**1.524 (.000)**	**.701 (.000)**
Age			
10	**.516 (.000)**	**.632 (.000)**	**2.777 (.000)**
11	**.699 (.000)**	**.856 (.040)**	**1.594 (.000)**
13	**1.504 (.000)**	.988 (.875)	**.684 (.000)**
14	**2.477 (.000)**	.959 (.639)	**.462 (.000)**
Black	**.771 (.000)**	**.668 (.000)**	**1.791 (.000)**
Hispanic	**.863 (.057)**	**.704 (.000)**	**1.610 (.000)**
First child	**.890 (.030)**	**1.166 (.008)**	.969 (.563)
Child capabilities			
Height	**1.057 (.014)**	1.004 (.867)	**.960 (.078)**
Low birth weight	**.751 (.040)**	.957 (.771)	**1.412 (.029)**
PIAT—mathematics	**1.145 (.000)**	**1.175 (.000)**	**.765 (.000)**
PIAT—reading recognition	.987 (.707)	**1.174 (.000)**	**.897 (.002)**
Impulsivity	**1.410 (.000)**	**.899 (.005)**	**.805 (.000)**
Parent resources			
Mother's education			
<High school	1.011 (.907)	**.795 (.027)**	**1.177 (.081)**
Some college	1.008 (.903)	1.065 (.350)	.986 (.830)
College+	**.765 (.004)**	**1.380 (.001)**	.985 (.869)
Father present	**.798 (.001)**	**1.278 (.000)**	1.010 (.880)
Stepfather present	1.009 (.916)	1.126 (.173)	.926 (.327)
Income ($10000)	.995 (.200)	1.001 (.733)	1.002 (.734)
# Brothers	.954 (.139)	.984 (.657)	1.054 (.105)
# Sisters	.971 (.362)	.965 (.286)	**1.055 (.075)**
Parent preferences			
Frequently goes to church	.939 (.313)	.908 (.125)	**1.149 (.022)**
Never goes to church	**1.340 (.001)**	**.864 (.082)**	.898 (.173)

Notes: (1) Dummies for missing birth weight, PIAT scores and impulsivity are not reported. (2) Standard errors are calculated by the robust estimator, with clusters on mothers

between ages 12 and 13 and more than doubles between 12 and 14. The age trajectory for shared decision-making is very different: child–parent decision-making rises from ages 10 to 12, but not thereafter. It is also notable that girls are much more likely than boys to report shared decision-making with parents, though the gender dummy on sole decision-making is small and insignificant. This may indicate that it is easier for parents to negotiate and discuss decisions with girls, who on average have superior verbal skills at these ages. However, it is also possible that this is a reporting effect—that girls understand and represent decision-making differently than boys. Such a reporting effect is consistent with the psychology of gender finding that collectivity is more salient than autonomy to girls (Gilligan 1982).

Another striking result is the large negative effect of minority race and ethnicity: both black and Hispanic children are much less likely than non-black, non-Hispanic children to report having a say in decisions—either solely or with their parents. This high level of parental authority is consistent with developmental research on parenting styles in African-American families (Steinberg et al. 1991). These racial and ethnic differences persist throughout the models reported in this paper.

Several indicators of parental resources, including time and human capital, are negatively associated with sole decision-making by children and positively associated with shared decision-making. Children with college-educated mothers and with fathers present in the household are less likely to make sole decisions and more likely to make shared decisions (though stepfathers have no significant effect). Household income and number of siblings have little impact on child decision-making conditional on other parental resources measures. Of other parental characteristics, mother's attendance at religious services is strongly associated with strict control over child behavior: frequent attendance increases parent-only decisions and no attendance increases the frequency of child decisions.

The child's own characteristics have some surprising and interesting effects on reported independence. Indicators of child capability, both physical and cognitive, tend to reduce parental control. Tall children are more likely to make sole decisions,[12] and low-birthweight children are less likely to do so. High math scores at ages 6–8 increase both sole and shared decision-making by older children, while reading scores have a significant positive effect only on shared decisions. These results suggest that achievement scores are associated with lower costs of parent–child negotiation, but only math scores are associated with greater decision-making authority. In a cross-sectional analysis, however, the correlation between shared decision-making and achievement scores may be driven by early parent investments, which both increase child achievement scores and prompt parent-child discussion or negotiation.

The impulsivity index has a strong positive association with sole decisions—and a negative association with both shared and parent-only decisions. Since this index reflects reported enjoyment of risky, novel, or dangerous activities and an aversion to planning, it seems unlikely that parents would willingly grant more independence, all else equal, to children with a high score. Either this index captures attitudes or personality traits that increase a child's demand for autonomy, or greater decision-making authority increases a child's risk-tolerance, or risk attitudes are correlated with some unobserved aspect of child capability.[13] We examine the possibility of an impulsivity-capability correlation in Sect. 5.3.

[12] Separate analyses for boys and girls shows that the height effect is particularly strong for girls.

[13] In related work (Romich et al. 2008), we examine decision-making by a sample of 12 and 13 year olds in the NLSY-C in the context of developmental psychology and include child helpful and problem behaviors as regressors. We show that a mother-reported behavioral problems index is not significantly related to decision autonomy, but that children who regularly do chores have less autonomy while children who spend time with siblings report more shared decision-making.

The general patterns here are quite distinct. Shared decisions, which we might associate with cooperative decisions since they are likely to involve some negotiation, or at least discussion, between parent and child, are associated with higher parental education and resources, high achievement test scores, and female children. These results are consistent with an interpretation of shared decision-making as an element of parental investment in child development, facilitated by the child's verbal skills. The determinants of independent child decisions are quite different. The prevalence of independent decision-making grows strongly with the child's age, but the other predictors are suggestive of limited parental resources—single mothers and less parental education. Black and Hispanic children have less decision power on both measures. The greater independence of tall children, children with high test scores and children who enjoy risky and novel activities suggest that both the capabilities and the demands of the children themselves have an impact on parenting regimes.

5.2 Personal and human capital decisions, cross-section results

Table 4 reports ordered logit estimates for child reports of sole or parent-only decisions in two subsets of the decision domains: personal and human capital decisions.[14] Personal decisions—choosing friends, clothing and purchases—are expressions of the child's own personality and tastes, though parents may have strong opinions concerning the appropriateness of that self-expression. Human capital decisions—TV watching and religious education—affect the information that the child receives and may influence the development of values and tastes. TV watching also has a significant effect on time use, and may interfere with other activities that will contribute to useful skills, such as homework and sports.

There are some notable differences between the aggregate decision indices and these subindices in the effects of basic demographic variables. Minority children are significantly less likely to make sole personal decisions but there is no significant effect of "black" or "Hispanic" on human capital decisions. It is also clear from the parent-only results that minority parents are relatively more restrictive of personal than human capital decisions, compared to non-black, non-Hispanic parents. Greater parental authority concerning the child's choice of friends could be interpreted as protectiveness, but estimates with individual decision domains shows that the minority effect on child independence extends to spending and clothing as well.[15]

Girls are more likely to report sole decision-making than boys in human capital domains (including both TV watching and religion), but not in personal decisions. When we disaggregate personal decisions, we find the expected results that these young adolescent girls make more independent decisions about clothing than boys, but we cannot say whether these gender differences emerge from parental perceptions about the costs of child autonomy (because boys may be more likely to disagree with parental judgment about clothes) or from differences in the

[14] The results for shared decisions are not reported to simplify the presentation.

[15] We speculate that this general restrictiveness may reflect minority parents' concerns about spending choices that could lead to financial difficulties or clothing choices that might attract unwanted attention from authorities or predatory older adults.

Table 4 Cross-section results for personal and human capital decisions (ordered logit: odds ratio (p-value))

All ages				
	Sole decisions		Parent decisions	
	Personal (N = 6072)	Human capital (N = 5883)	Personal (N = 6072)	Human capital (N = 5883)
Child demographics				
Girl	.954 (.370)	**1.115 (.057)**	**.674 (.000)**	**.737 (.000)**
Age				
10	**.537 (.000)**	**.583 (.000)**	**2.640 (.000)**	**2.235 (.000)**
11	**.712 (.000)**	**.747 (.000)**	**1.516 (.000)**	**1.516 (.000)**
13	**1.336 (.000)**	**1.534 (.000)**	**.687 (.000)**	**.703 (.000)**
14	**2.083 (.000)**	**2.337 (.000)**	**.440 (.000)**	**.527 (.000)**
Black	**.725 (.000)**	1.000 (.997)	**2.125 (.000)**	**1.301 (.000)**
Hispanic	**.865 (.054)**	.927 (.370)	**1.766 (.000)**	**1.298 (.001)**
First child	.937 (.223)	**.842 (.003)**	.915 (.117)	1.087 (.148)
Child capabilities				
Height	1.033 (.144)	**1.070 (.007)**	**.962 (.096)**	.966 (.144)
Low birth weight	**.770 (.053)**	.867 (.322)	**1.354 (.037)**	1.173 (.279)
PIAT mathematics	**1.178 (.000)**	1.053 (.172)	**.732 (.000)**	**.858 (.000)**
PIAT reading recognition	.983 (.630)	1.004 (.927)	**.849 (.000)**	.955 (.199)
Impulsivity	**1.277 (.000)**	**1.483 (.000)**	**.867 (.000)**	**.767 (.000)**
Parent resources				
Mother's education				
<High school	.912 (.296)	1.131 (.242)	**1.286 (.004)**	.972 (.771)
Some college	1.075 (.290)	**.868 (.046)**	.931 (.303)	1.048 (.488)
College+	.954 (.612)	**.558 (.000)**	**.838 (.063)**	**1.239 (.024)**
Father present	**.818 (.002)**	**.838 (.014)**	1.052 (.440)	1.030 (.661)
Stepfather present	.977 (.761)	1.044 (.625)	1.019 (.813)	.885 (.146)
Income ($10000)	1.002 (.616)	**.983 (.037)**	.995 (.350)	1.010 (.124)
# Brothers	.969 (.363)	**.934 (.039)**	1.014 (.681)	**1.096 (.006)**
# Sisters	.975 (.465)	.960 (.234)	1.029 (.392)	**1.065 (.045)**
Parent preferences				
Frequently goes to church	.950 (.403)	.926 (.249)	1.100 (.124)	**1.157 (.019)**
Never goes to church	**1.192 (.045)**	**1.379 (.001)**	.969 (.716)	**.818 (.016)**

Notes: (1) Dummies for missing birth weight, PIAT scores and impulsivity are not reported. (2) Standard errors are calculated by the robust estimator, with clusters on mothers

intensity of child demands (girls may invest more effort in developing fashion sense in preparation for an appearance-oriented dating market).[16]

[16] We thank the editor for suggesting this interpretation.

Parental resources continue to have consistently positive effects on shared decision-making in the personal and human capital domains (not shown), but the sole decision-making results reveal some differences across categories. Mothers with more education are significantly more restrictive about human capital decisions, but reserve less parental authority in their children's personal decisions. Children's human capital decisions are also more restricted in high-income households. Since the role of parental resources in facilitating enforcement should be consistent across categories, it seems likely that this pattern reflects differences in the perceived investment component of child actions in these different domains—parents with more resources wish to control children's behavior in areas where they believe those actions might have long-term effects, such as TV and religion, but allow children to make their own current, and possibly inconsequential, choices about what to wear and buy. Another possible explanation is that high-resource parents are able to control the environment within which their children shop and choose friends in ways that reduce risk without direct behavioral control, while low-income parents are not.

The presence of fathers dramatically reduces independent child decision-making in both personal and human capital decisions—most notably, reducing the authority of both boys and girls regarding religious education. Siblings increase parental authority in human capital decisions. It seems likely that the need for coordination in activities such as church attendance and TV watching results in parents in large families setting firm rules rather than engaging in individual discussions with their children.

Child height (standardized by age and gender) increases child-only decisions in the human capital domain and reduces parental authority in the personal domain. Additional analyses (not shown) show that this effect is particularly strong for girls, suggesting that taller girls may appear more mature to parents.[17]

High math scores at ages 6–8 are associated with fewer parent-only decisions in both the personal and human capital domains, and more sole decision-making in the personal category. The impulsivity index continues to have very strong effects on both domains—increasing child-only decisions and reducing parent-only decisions. In general, the child characteristics have fairly consistent effects across the personal and human capital domains, while measures of parental resources have differential effects that are consistent with an investment interpretation of parental control.

These cross-section results are descriptive; we do not, in particular, want to ignore the possible endogeneity of variables such as child's impulsivity, cognitive performance, father's presence, or mother's employment with respect to other determinants of the child's participation in decision-making. For example, single motherhood may be correlated with maternal characteristics that would affect her relationship with her child (even if she were married). In the next section, we report on family-fixed-effects models that attempt to deal with this endogeneity directly by comparing the decision-making of children with different characteristics but the same mother.

[17] An alternative measure of physical maturity for girls, time since menarche, has no significant effect on child decisions.

5.3 Family fixed-effects results

Table 5 presents ordered logit models of the sole, shared, and parent-only decision indices with family fixed-effects. The estimation procedure is described in the appendix. To the extent that unobserved characteristics of the mother relevant to child decision-making are correlated with the independent variables, bias in the coefficients of the cross-section model will be reduced by this within-family structure. The fixed-effects models use only information from families in which there is variation in the value of the decision indices between siblings, so the sample sizes vary between regressions. Also, since there are few observations in the extreme categories (e.g. few children make all decisions on their own), we have combined values above 3 for sole and shared decisions, and above 5 for parent decisions, into a single category.

Since the process generating child autonomy appears to be different near the beginning and end of our age range, we compare siblings at similar ages. Table 5 uses observations for siblings when they are both age 10 or 11. We also control for the age of each child at the time of interview in months. We cannot estimate the impact of parental resources in this model—although there are some changes in family structure between the survey waves that capture siblings at the same age, the responses to these changes are likely to reflect transitional disruption to family routines, as well as equilibrium effects. To allow parental responses to sibling differences to vary by resource level, however, we estimate fixed-effects models separately for families in which the mothers had high (some college or more) or low (high school or less) education levels.

In the full sample for children aged 10 or 11, child height-for-age is now positively correlated with shared, rather than sole, decision-making. So, although families with tall children permit them to make more independent decisions, height does not have the same effect within families. First-born children are more likely than their siblings to report that both they and their parents make decisions in a particular domain. The PIAT reading recognition score (at ages 6–8) has, as it did in the cross-section, a strong positive effect on shared decision-making, and the math score significantly increases child-only decisions (but not shared decisions).

The significant negative effects of the impulsivity index on parental decision-making in this fixed-effect model provide much stronger evidence that a child's own preferences affect reported levels of autonomy. Within a family, more impulsive children report that fewer decisions are being made by their parents.[18] Children who score high on this index would not appear to be children whose parents judge that they are more capable of making their own decisions, but rather children who value independent (and risky) behavior. As such, they suggest that children themselves play an active role in determining the rate at which they develop independence in allocating their own time and resources.

High- and low-education mothers respond differently to child characteristics at ages 10 or 11. Mothers with some college education or a college degree are more

[18] An interpretation of these results as simply a reporting effect is made less plausible by the sensitivity of the impulsivity coefficient to mother's education, as reported below.

Table 5 Family fixed-effects results for ages 10 and 11 (ordered logit: odds ratio (*p*-value))

	Sole decisions (N = 1315, G = 584)	Shared decisions (N = 966, G = 425)	Parent decisions (N = 1400, G = 626)
Girl	1.105 (.569)	1.067 (.713)	.885 (.466)
Age in months	**1.027 (.024)**	**1.026 (.038)**	**.951 (.000)**
Height	.896 (.234)	**1.212 (.049)**	.949 (.544)
Low birth weight	.470 (.157)	1.600 (.308)	.701 (.460)
First child	.812 (.218)	**1.496 (.016)**	.842 (.278)
PIAT—mathematics	**1.316 (.037)**	.815 (.140)	.919 (.507)
PIAT—reading recognition	.859 (.289)	**1.440 (.009)**	.829 (.161)
Impulsivity	1.224 (.154)	1.021 (.881)	**.797 (.090)**
High education	Sole decisions (N = 593, G=264)	Shared decisions (N = 419, G = 213)	Parent decisions (N = 629, G = 283)
Girl	1.127 (.654)	1.395 (.210)	.873 (.598)
Age in months	1.028 (.142)	1.029 (.114)	**.940 (.001)**
Height	1.055 (.721)	1.243 (.147)	.865 (.293)
Low birth weight	.819 (.834)	1.263 (.733)	.308 (.194)
First child	**.630 (.071)**	**2.220 (.002)**	.784 (.305)
PIAT—mathematics	1.445 (.127)	**.676 (.090)**	1.058 (.798)
PIAT—reading recognition	**.617 (.055)**	**1.964 (.004)**	.788 (.274)
Impulsivity	1.108 (.659)	1.355 (.193)	.748 (.194)

Table 5 continued

Low education	Sole decisions (N = 722, G = 320)	Shared decisions (N = 487, G = 212)	Parent decisions (N = 771, G = 343)
Girl	1.192 (.489)	.785 (.350)	.922 (.736)
Age in months	1.023 (.161)	1.023 (.226)	**.958 (.012)**
Height	**.793 (.067)**	**1.297 (.068)**	1.001 (.993)
Low birth weight	.383 (.188)	1.231 (.757)	1.379 (.625)
First child	1.004 (.988)	1.055 (.829)	.944 (.805)
PIAT—mathematics	1.294 (.126)	.928 (.686)	.837 (.287)
PIAT—reading recognition	1.036 (.854)	1.155 (.451)	.833 (.331)
Impulsivity	**1.386 (.099)**	.804 (.264)	.864 (.406)

Notes: (1) Dummies for missing birth weight and impulsivity not reported. (2) See the Appendix for details on the estimation procedure

Table 6 Age 16 outcomes: ages 10 and 11 characteristics (probit coefficient (p-value))

	Used marijuana (N = 757)	Had sex (N = 730)
Child characteristics		
Girl	**−.214 (.061)**	**−.325 (.004)**
Black	**−.299 (.040)**	**.545 (.000)**
Hispanic	−.048 (.759)	.213 (.174)
Height	.060 (.243)	.059 (.242)
Low birth weight	.398 (.145)	−.369 (.235)
First child	**−.265 (.038)**	−.207 (.101)
PIAT—mathematics	.128 (.109)	**.186 (.019)**
PIAT—reading recognition	−.024 (.755)	**−.148 (.050)**
Impulsivity	**.156 (.065)**	**.183 (.031)**
Mother and household characteristics		
Mother's education		
<High school	.007 (.972)	**.522 (.004)**
Some college	**.246 (.060)**	**.222 (.089)**
College+	.010 (.960)	−.063 (.746)
Father present	**−.529 (.000)**	**−.350 (.007)**
Stepfather present	−.157 (.342)	.070 (.666)
Income ($10000)	−.004 (.579)	.002 (.701)
Mom working	.069 (.597)	.033 (.797)
# Brothers	−.047 (.536)	.082 (.254)
# Sisters	−.052 (.430)	.002 (.973)
Frequently goes to church	−.017 (.889)	−.166 (.177)
Never goes to church	−.010 (.955)	.178 (.273)

Notes: (1) Dummies for missing birth weight, PIAT scores and impulsivity not reported. (2) Based on child's report at age 16. (3) For time-varying variables, the average of age 10 and 11 observations is used. (4) Model also includes Behavior Problem Index subscales measured at ages 4–6

likely to share decisions with first children compared to later siblings. They also share decisions with children who have a higher PIAT reading score—this is a very robust result that implies ease of negotiation with verbally-skilled children—but share fewer decisions with children with higher math ability. There are fewer significant effects for the children of less-educated mothers but child impulsivity, which has no significant effect in the high education sample, has a large positive effect on child independence in the low education sample. Mothers with less education cede more sole decision-making authority to more impulsive children, while more educated mothers do not. If anything, more educated mothers appear to react to impulsivity through increasing parental involvement in shared decision-making, but this is not statistically significant.[19] Overall, the difference between more and less educated mothers in the decision patterns of impulsive

[19] These results are robust in alternative specifications, such as a fixed-effect count model, and in many cases are stronger. For example, the positive effect of impulsivity on shared decisions in the high-education sample is strongly significant in a fixed-effect Poisson model.

children is consistent with our predicted effects of parental resources on child discipline.

There are very few significant coefficients in the family fixed-effects results for decision making by 13 or 14 year-old siblings (results not shown). In part this is due to a smaller sample size resulting from right censoring of younger sample members. Girls and first children report more shared decisions, while impulsivity decreases shared decision-making at this age. High PIAT math scores, however, still seem to increase autonomy for these young teens.

It is possible that some of the child attributes, including the impulsivity index, are correlated with unobserved child characteristics that make them more capable of responsible decision-making, and so we also examine the relationship between child characteristics at age 10 and 11 and some later outcomes available in the NLSY-C. This exploration confirms that impulsivity is predictive of subsequent risky behavior. Using the young adult survey completed at age 16, we construct indicators for whether the child ever used marijuana or had sex by the survey date. Table 6 reports Probit models for these outcomes. Most of the results are not surprising—girls are less likely to report using marijuana or having sex by age 16, the presence of fathers is associated with lower levels of both activities. Black teenagers are more likely to have sex and less likely to use marijuana. The impulsivity index from age 10 or 11, however, has a strong positive relationship with both outcomes, suggesting that this measure is, in fact, related to some determinants of risky behavior.[20] Rather oddly, the PIAT math score is positively related to teen sex, while the PIAT reading score has a significant negative coefficient.

6 Conclusion

This paper extends current economic models of parents and children to examine the increasing autonomy of children and young teens. We identify two driving forces within this transitional period: parents' willingness to cede authority and children's own demand for autonomy. We posit that parents' demand for child control is increasing in parents' resources and the value parents assign to children's "good" behavior, and decreasing in parents' assessment of children's capabilities for choosing the desired behavior. In the case of rebellious children, higher costs of responding to child resistance (i.e., the strength of the child's preferences or the child's ability to enforce said preferences) decrease the expected level of discipline. Parents may attempt to influence child behavior via discussion or negotiation rather than unilateral decree; such shared decision processes are costly but are likely to serve as investments in children's future decision-making.

Descriptive analyses show that children's self-reported participation in decisions concerning their own spending and activities increases sharply between ages 10 and 14. This is particularly true of reports that the child is the sole decision-maker in a particular domain; reports of shared decision-making tend to rise between ages 10 and 12, but then fall or remain stable from 12 to 14 as independent decision-making rises.

[20] It may also reflect the reduced parental control that children who score high on this instrument receive.

Shared decision-making is relatively rare, with the median child reporting none at all, and a mean value of one domain out of seven. Two notable patterns in our results are the dramatically lower participation in decision-making by minority children, and the greater involvement of girls in shared decision-making with the parents. The minority effects are consistent across activity domains and child gender and deserve further study.

Our cross-sectional results are consistent with several predictions of the model. Higher parental resources, including higher maternal education and the presence of a father in the household, are associated with less sole decision-making by children and more shared decision-making. Higher resource parents are also more likely to exert control in human capital domains than they are in possibly less consequential domains such as spending and clothing. More sole decision-making is observed for children who may have superior decision-making capabilities (measured by higher math achievement scores), greater demand for autonomy (measured by higher expressed preferences for risk and novel experiences), or greater ability to exert control over external resources (measured height). The effects of child characteristics are relatively consistent across the personal and human capital domains.

The importance of child characteristics and parental resources in determining child decision-making receives further support from within-family fixed-effects estimates. The positive effect of child-reported impulsivity on child autonomy, for example, is very robust within families and over time, and the effect of math achievement is also consistently positive. The impact of child capabilities and preferences on decision-making authority in a wide range of activities suggests that the child is an active agent in the choice of a parenting regime. Our prediction that parents with high and low resources respond differently to child assertion is also supported by the fixed-effect results.

Initially, we had expected a child's development as an economic agent to be a continuum, beginning with complete parental authority, followed by consultation and negotiation, and finally the achievement of authority to make independent decisions. However, our results are not consistent with this picture in the sense that the child and family characteristics that predict sole decision-making by children are very different from those that predict shared decision-making. Rather, independent decisions by children in some domains appear to arise when parental resources (for monitoring or negotiation) are limited, or when the perceived costs of a deviation between child- and parent-preferred actions are small. Shared decision-making, on the other hand, seems to represent an investment in children by parents with greater resources and human capital.

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Appendix

Height

The reference table from the Centers for Disease Control and Prevention, Department of Health and Human Services[21] is used. It was released in 2000, based on children in the United States. A group is defined for each age-in-month and each gender (so there are $59 \times 2 = 118$ groups). For each group, three parameters (the median (M), the generalized coefficient of variation (S), and the power in the Box-Cox transformation (L)) are obtained from the table. With these parameters the z-score is calculated, as suggested by the Centers, for each child of height X as: $Z = \frac{(X/M)^L - 1}{L*S}$, $L \neq 0$. We drop 46 observations with a z-score of absolute value more than 5.

Fixed-effects ordered logit model

Our three dependent variables (own, shared, and parent decisions) are all discrete dependent variables y_{ij} that can take K possible values 0, 1,…, $K - 1$. Since the number of decisions made is an ordinal measure of autonomy, we use the ordered logit model for estimation. Computational problems arise when we incorporate fixed effects in the model. This appendix describes a simple two-step procedure of estimating the fixed-effects ordered logit model first proposed by Das and van Soest (1999). See also Ejrnaes and Portner (2004) and Greene (2008).

We have a discrete dependent variable y_{ij} that can take $K + 1$ possible values. We do not assume cardinality (i.e., the difference between $y_{ij} = 1$ and $y_{ij} = 2$ is different from the difference between $y_{ij} = 2$ and $y_{ij} = 3$).

Consider the following model for a latent variable y^*_{ij} for child j in family i, $i = 1,\ldots, I$ and $j = 1,\ldots, J$:

$$y^*_{ij} = \alpha_i + \mathbf{x}'_{ij}\boldsymbol{\beta} + \varepsilon_{ij},\ \varepsilon_{ij} \text{ has a logistic distribution conditional on } \mathbf{X}_i \text{ and } \alpha_i$$

The observed choice y_{ij} depends on the latent variable

$$\begin{aligned} y_{ij} &= 0 \quad \text{if } y^*_{ij} \leq 0 \\ y_{ij} &= 1 \quad \text{if } 0 < y^*_{ij} \leq \mu_1 \\ &\ldots \\ y_{ij} &= K \quad \text{if } \mu_{K-1} < y^*_{ij} \end{aligned}$$

Now derive the probability of observing a choice of $y_{ij} = k$:

[21] The reference table can be found at http://www.cdc.gov/nchs/data/nhanes/growthcharts/statage.txt.

$$\begin{aligned}
\Pr\left(y_{ij} = k|\mathbf{X}_i, \alpha_i\right) &= \Pr\left(y_{ij}^* < \mu_k\right) - \Pr\left(y_{ij}^* < \mu_{k-1}\right) \\
&= \Pr\left(\varepsilon_{ij} < \mu_k - \alpha_i - \mathbf{x}_{ij}'\boldsymbol{\beta}\right) - \Pr\left(\varepsilon_{ij} < \mu_{k-1} - \alpha_i - \mathbf{x}_{ij}'\boldsymbol{\beta}\right) \\
&= \Lambda\left(\mu_k - \alpha_i - \mathbf{x}_{ij}'\boldsymbol{\beta}\right) - \Lambda\left(\mu_{k-1} - \alpha_i - \mathbf{x}_{ij}'\boldsymbol{\beta}\right)
\end{aligned}$$

where $\Lambda(\cdot)$ is the logistic CDF. Now we split the estimation problem into many small ones by defining a binary variable:

$$s_{ij}^k = 1 \text{ if } y_{ij} > k, \quad k = 0, \ldots, K-1$$

From this definition comes the following result:

$$\Pr\left(s_{ij}^k = 1|\alpha_i, \mathbf{X}_i\right) = \Lambda\left(-\mu_k + \alpha_i + \mathbf{x}_{ij}'\boldsymbol{\beta}\right) = \Lambda\left(\theta_i + \mathbf{x}_{ij}'\boldsymbol{\beta}\right) \tag{4}$$

We lump the cutoff point μ_k, which is the same for all individuals, into the fixed family effects α_i and have a new family fixed effects θ_i. Obviously, we can fit Eq. 4 with the Chamberlain-type conditional fixed effects logit model (Chamberlain 1980). In total there are K such models, and from them we obtain K different sets of estimates for $\boldsymbol{\beta}$, call it $\boldsymbol{\delta} = \left(\boldsymbol{\beta}^{(0)}, \boldsymbol{\beta}^{(1)}, \ldots, \boldsymbol{\beta}^{(K-1)}\right)$.

The next step is to combine the K different sets of estimates. We use a minimum distance estimator with the following objection function:

$$(\boldsymbol{\delta} - \imath_K \otimes \boldsymbol{\beta}^*)'\mathbf{W}(\boldsymbol{\delta} - \imath_K \otimes \boldsymbol{\beta}^*)$$

where $\imath_K$ is a K vector of ones.

Our choice of the weighting matrix $\mathbf{W}$ makes use of the inverse of the covariance matrices from the K logit models:

$$\mathbf{W} = \begin{pmatrix} \mathrm{var}\left(\boldsymbol{\beta}^{(0)}\right) & \cdots & \cdots & 0 \\ \vdots & \mathrm{var}\left(\boldsymbol{\beta}^{(1)}\right) & & \\ \vdots & & \ddots & \vdots \\ 0 & & \cdots & \mathrm{var}\left(\boldsymbol{\beta}^{(K-1)}\right) \end{pmatrix}^{-1}$$

Intuitively, we put less weight on regressions that are less precisely estimated. The covariance matrix of the minimum distance estimator $\boldsymbol{\beta}$* is given by

$$\mathrm{var}(\boldsymbol{\beta}^*) = \left[(\imath_K \otimes \mathrm{I})'\mathbf{W}(\imath_K \otimes \mathrm{I})\right]^{-1}(\imath_K \otimes \mathrm{I})'\mathbf{W}(\imath_K \otimes \mathrm{I})\left[(\imath_K \otimes \mathrm{I})'\mathbf{W}(\imath_K \otimes \mathrm{I})\right]^{-1}.$$

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