Chapter 6
Subjective Rationality, Parenting Styles, and Investments in Children

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Abstract I argue that a model in which parents act with subjective rationality is consistent with the evidence on parenting styles, investments, and child development described by Kalil (Chap. 5). By rationality, I mean that investment in children and parenting style choices can be explained by a model of optimization under constraints. By subjective, I mean that parents rely on their own assessments about the constraints in order to make choices. Data that motivate these assumptions and confirm the implications of the model are presented. The model generates new insights about policies to foster the development of children's human capital.

Introduction

A large empirical literature that establishes the importance of parenting styles and familial investments in the determination of a child's human capital is summarized by Kalil in the first part of Chap. 5. In the second part of the chapter, Kalil asks if the environment that children experience at home can be improved through parenting education programs. With few exceptions—namely the Nurse-Family Partnership (Olds et al. 2002) and the Jamaican Nutrition and Cognitive Stimulation Program (Gertler et al. 2013)—such interventions have a poor track record in improving child developmental outcomes. The poor track record most likely results from high attrition rates, and the fact that many parents who do not drop out fail to adhere to the program prescriptions. In the last part of her chapter, Kalil suggests that the high attrition and low adherence rates may be due to the design of the interventions which does not take into account behavioral constraints faced by parents that lead them to choose less effective parenting styles and low levels of investments in children.

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The traditional approach in economics is to explain differences in investments through differences in costs or benefits (e.g., Becker and Tomes 1986). However, it is important to recognize that, from the point of view of the parents, early investments in the human capital of children have uncertain benefits that are only realized many years after the investment decisions have been made. Indeed, new research shows that disadvantaged parents may underestimate the returns to investment in children (Cunha et al. 2013). Interventions that improve parental beliefs about the returns to investment generate changes in investments and improvements in child developmental outcomes (e.g., Suskind and Leffel 2013; Fitzsimons et al. 2012).

In this chapter, I articulate a "subjective rationality" model of choice of parenting styles and investments in children. By rationality, I mean that parents have a clear objective that they want to optimize. By subjective, I mean that parents lack the information they need and instead rely on personal assessments in order to make choices. In the next section, I briefly summarize a rich body of evidence from the fields of anthropology, sociology, and psychology that supports the assumptions of subjective rationality around which I build the model.

Why Subjective Rationality?

A large literature in anthropology, sociology, and psychology presents evidence that parents are subjectively rational in their choice of parenting styles and investments in children. That is, parents choose a parenting style that is optimal given their subjective assessment of the constraints under which they operate.

A major insight by anthropologists is that it is possible to learn a lot about a people's culture by studying the way that parents rear their children.[1] Consider, for example, the San, a group of very mobile hunters and gatherers who inhabit the Kalahari Desert in Africa. San parents believe that motor skills, such as sitting, standing, and walking, must be taught, and children should be encouraged to practice these skills (Konner 1977). As a result, San parents invest time and effort in making sure that their babies develop appropriate motor skills early on. As a consequence of this training, San children perform better in motor-coordination tests because their physical development is more advanced than their Western peers (Konner 1973). A possible interpretation of this finding is that San children are genetically predisposed to learn motor skills from an early age. However, experimental evidence shows that it is possible to accelerate motor development in typical Western children by providing them with a regimen of physical exercises similar to the ones San children are exposed to from an early age (Zelazo et al. 1972).

In contrast, consider the Ache Indians who live in Paraguayan forests in which children can fall prey to jaguars, poisonous snakes, or other dangers. In such an

[1] A helpful survey of the literature I present in the next two paragraphs is provided by Small (1999).

environment, early mobility could endanger a child's survival. Indeed, Ache parents act to postpone motor development: Their babies ride in slings early on and are carried piggyback by fathers at later ages. Research shows that Ache children walk over a year later when compared to the San children (Kaplan and Dove 1987; Hill and Hurtado 1996).

Since the early twentieth century, sociologists have been interested in how parents of different socioeconomic status (SES) raise their children. In the USA, Lynd and Lynd (1929, 1937) observed that working-class mothers ranked "strict obedience" as their most important goal more frequently than higher-SES mothers did. Their findings have been replicated in more recent studies and in other contexts as well (e.g., Alwin 1984; Harwood 1992; Luster et al. 1989; Pearlin and Kohn 1966; Tudge et al. 2000; Wright and Wright 1976). The data on language interaction partially support this view (Hart and Risley 1995). Low-SES parents tend to use more directives in their speech, while high-SES parents are more likely to use reasoning. Kohn (1963) argues that the stronger preferences toward socioemotional skills by lower-SES mothers reflect those mothers' forecasts for their children choosing occupations in which obedience and conformity have relatively higher returns.

There is evidence that parents differ in their information about the process of child development. For example, a large literature in child development shows that the lower the parents' SES, the lower their expectation about cognitive development (e.g., Epstein 1979; Hess et al. 1980; Ninio 1988; Ninio and Rinott 1988; Mansbach and Greenbaum 1999). More educated mothers embrace important information sooner than less educated ones. The smoking habits of educated and uneducated pregnant women were tracked before and after the release of the 1964 Surgeon General's Report on Smoking and Health (Aizer and Stroud 2010). Before the release of the report, educated and uneducated pregnant women smoked at roughly the same rates. After the report, the smoking habits of educated women decreased immediately, and suddenly, a ten-percentage-point gap in smoking arose between educated and uneducated pregnant women.

Differences in parental information about the importance of the language environment that children experience may explain the finding of the path-breaking study by Hart and Risley (1995). These authors documented that the children of welfare parents heard about 600 words per hour, while the children of professional parents heard almost twice as many words in the same amount of time. Not surprisingly, the children of professional parents exhibited superior language development throughout the period of the study. Results by Hart and Risley were recently reproduced by Rowe (2008), whose aim was to understand why some parents spoke so little to their children. According to Rowe's data, poor and uneducated women were simply unaware that it was important to talk to their babies. This is persuasive evidence that parents may not know the importance of investments and parenting styles in fostering their child's human capital development.

In essence, the evidence briefly summarized above supports the assumption that parents are rational: In settings where early mobility is desired, parents act to accelerate motor development, and the opposite happens when early mobility is a

disadvantage for survival. Parental expectations about the child's future occupations partly determine the types of skills that parents choose to foster in their children. At the same time, not all parents have up-to-date information about the process by which the child's human capital accumulation can be fostered. Parents make rational choices based on subjective assessments of the constraints they face. In the next section, I develop a model of parenting styles and investments in children in which parents are subjectively rational.

The Model

The model has few components. First, a child's human capital is determined by the interaction between inputs that parents directly determine (which I call investments) and inputs that parents have little control over (which I call institutions). Investments, for example, consist of the amount and the quality of interaction between parent and child. Institutions are represented, for example, by the quality of the schools in the neighborhood where the family resides.

Second, a parenting style is a way to combine investments with institutions. Inspired by the research by Lareau (2003), I assume that parents can choose between two types of parenting styles. The "concerted cultivation" parenting style is one in which the parent actively engages with institutions for the benefit of her child's human capital development. In contrast, the "natural growth" parenting style is the one in which parents take a more passive role. For each of these parenting styles, there is an equation that specifies how investments and institutions are combined to produce the child's human capital. This equation is called the technology of human capital formation.

Third, the parent chooses investments and a parenting style that will maximize the parent's preferences subject to three constraints: (1) the budget constraint; (2) the technology of human capital formation; and (3) the parental information constraint. In what follows, I provide a mathematical description of the model.

Parenting Styles and Investments

Let $\boldsymbol{h}_i$ denote the child's human capital. Let x_i denote investment in the child's human capital. Let e_i denote the institutions that affect the child's human capital but are not directly controlled by the parents.

I distinguish investments from parenting styles. A parenting style p_i is a technology of human capital formation. One technology, which I refer to as concerted cultivation, is very efficient in combining institutions and investments into the child's human capital. The other, which I call natural growth, is less efficient in doing so.

$$h_i = \begin{cases} e_i^{\alpha} x_i^{\beta} & \text{if} \quad p_i = \text{Concerted Cultivation} \\ e_i^{\gamma} x_i^{\delta} & \text{if} \quad p_i = \text{Natural Growth} \end{cases} \tag{6.1}$$

Before I proceed, it is useful to describe the meaning of the parameters in Eq. (6.1). The parameters β and δ determine the responsiveness of human capital to investments under concerted cultivation and natural growth, respectively. The interpretation of these parameters is straightforward. Suppose that the parent increases investments x_i by 100 % (say, from 1 to 2 h/day). Then, $\boldsymbol{h}_i$ will increase by β percent if the parent chooses the concerted cultivation approach and δ percent if the parent chooses natural growth. Similar interpretations apply to the parameters α and γ.

In this model, parenting styles are technologies of skill formation. As illustrated by Lareau (2003), parents who follow the concerted cultivation approach are present in their child's education: They make sure that the child is doing homework, and they exert a major monitoring effort in order to do so; they also make sure that the teachers and school principals understand and work around any limitations the child has; they actively search for information about the best teachers in the school, and they do not hesitate to contact the school if they believe their child is not receiving the necessary attention. In the context of Eq. (6.1), these observations imply that $\alpha > \gamma$

The research by Kalil et al. (2012) shows that high-SES parents not only spend more time with their children, but they are also more likely to dedicate time to activities that best suit their children's developmental needs. In other words, the high-SES parents—the ones that, according to Lareau (2003), are more prone to adopt a concerted cultivation approach—invest in skills when these skills undergo sensitive periods of development. Thus, a mathematical interpretation of the findings by Kalil et al. (2012) is that $\beta > \delta$.

Preferences, Budget Constraint

The parent's utility function has three arguments. First, the parent cares about the goods and services that satisfy the basic needs of the family (e.g., housing, food, and heating). I refer to such expenditures as household consumption, and they are represented by c_i. Second, the parent cares about the child's human capital $\boldsymbol{h}_i$. Third, the parent cares about the parenting style. In particular, following Kalil's (Chap. 5) suggestion, there is a behavioral cost of adopting the concerted cultivation parenting style. For simplicity, I denote by η_i this utility cost and I assume that it is normally distributed with mean μ_η and variance σ_η^2. The utility function is as follows:

$$U(c_i, h_i, p_i) = \ln c_i + \theta_i \ln h_i - \eta_i 1(p_i = \text{Concerted Cultivation}) \tag{6.2}$$

The parameter θ_i describes how the parent values the child's human capital relative to current household consumption. Heterogeneity in θ_i arises because of differences in altruism toward the child or in future discounting. Clearly, parents who are more altruistic and/or have lower discount rates value the child's human capital more and, thus, are more likely to choose parenting styles and investments that produce high stocks of the child's human capital.

Let y_i and π denote, respectively, the parent's income and the relative price of the investment in the child's human capital. The budget constraint is as follows:

$$c_i + \pi x_i = y_i. \tag{6.3}$$

Parent's Information Set

At the time that the parent is choosing investments and parenting style, I assume that the parent knows his valuation of the child's human capital θ_i, the behavioral cost η_i, the price of investment π, and the income y_i.

In this model, the benefits of investments and parenting styles are determined by the parameters α, β, γ and δ. If we observe investments, institutions, parenting styles, and the child's human capital, it is possible (although challenging) to estimate the values of these parameters (e.g., Cunha et al. 2010). In the model I propose in this chapter, I assume that parents do not know the estimated value of these parameters. Instead, I assume that parents have their own subjective expectations about the value of these parameters. I denote by $\mu_{\alpha,i}$, $\mu_{\beta,i}$, $\mu_{\gamma,i}$, and $\mu_{\delta,i}$, respectively, parent i's subjective expectation of α, β, γ and δ. Note that the parent's subjective expectations can be different from the value of the parameters estimated by social scientists.

Thus, parent i's information set is represented by $\Omega_i = (\mu_{\alpha,i}, \mu_{\beta,i}, \mu_{\gamma,i}, \mu_{\delta,i}, \theta_i, \eta_i, y_i, \pi)$. The parent's problem is to choose a parenting style p_i and to decide how to allocate income y_i between consumption c_i and investment x_i to maximize the parent's expected utility conditional on the information set Ω_i. In what follows, I describe the solution of this problem.

Solution of the Model

To solve the model, I break up the problem in two stages. In the first stage, the parent chooses a parenting style. In the second stage, the parent chooses the investment conditional on the parenting style chosen in the first stage. Once the problem is broken up in this fashion, I solve the problem by backward induction. That is, I start by deriving the optimal investment for each parenting style. Then, I derive the optimal parenting style in the first stage.

So, starting from the second stage, it is possible to show that optimal investments for a parent who chooses concerted cultivation (CC) in the first stage are given by:

$$x_i^{\mathrm{CC}} = \left(\frac{\theta_i \mu_{\beta,i}}{1 + \theta_i \mu_{\beta,i}}\right)\frac{y_i}{\pi} \quad \text{if } p_i = \text{Concerted Cultivation} \tag{6.4a}$$

Alternatively, if the parent chooses the natural growth (NG) approach in the first stage, then the optimal investments in the second stage are given by:

$$x_i^{\mathrm{NG}} = \left(\frac{\theta_i \mu_{\delta,i}}{1 + \theta_i \mu_{\delta,i}}\right)\frac{y_i}{\pi} \quad \text{if } p_i = \text{Natural Growth} \tag{6.4b}$$

The empirical literature shows that high-SES parents tend to invest more in their children. According to Eqs. (6.4a) and (6.4b), this can happen for different reasons. First, high-SES parents have higher income. Second, if we compare parents who have chosen the same parenting style, the gap between high- and low-SES parents could be explained by differences in expectations about the parameters β and δ. Third, the gaps in investments could also be explained by differences in parenting styles if the expectations about β of the high-SES parents who choose the concerted cultivation approach are higher than the expectations about δ of the low-SES parents who choose the natural growth approach.

As I show below, the parents who choose the concerted cultivation approach are a selected sample of parents. In particular, they tend to have higher income and access to higher-quality institutions. Under the assumption that $\eta_i \sim N\left(\mu_\eta, \sigma_\eta^2\right)$, the probability that parent i chooses concerted concerted cultivation which I denote by $\Pr(p_i = \mathrm{CC}|\Omega_i)$, is:

$$\Pr(p_i = \mathrm{CC}|\Omega_i) = \Phi\left(\frac{k_i - \mu_\eta + \theta_i\left(\mu_{\beta,i} - \mu_{\delta,i}\right)\ln\left(\frac{y_i}{\pi}\right) + \theta_i\left(\mu_{\alpha,i} - \mu_{\gamma,i}\right)\ln e_i}{\sigma_\eta}\right) \tag{6.4c}$$

The model states that the following four factors determine the choice of parenting observed in the data. The first factor is the behavioral cost associated with the concerted cultivation parenting style. The model implies that the higher the behavioral cost, which is denoted by μ_η, the less likely that parents are going to choose concerted cultivation. It is this implication of the model that Kalil (Chap. 5) suggests may have large influences on how parents behave. It is important to implement empirical research that verifies the model's implication.

The second factor that affects the choice of parenting style is family resources. In the empirical literature, the higher the parental income, the more likely that the parent chooses the concerted cultivation approach. A sufficient condition for the model to generate this implication is that $\mu_{\beta,i} > \mu_{\delta,i}$. In this case, the relationship

between family resources and parenting style arises because investments are an increasing function of family income. The higher the parental income is, the higher the difference between the child's human capital under concerted cultivation and natural growth. In other words, the higher the family income, the higher the benefit of choosing the concerted cultivation parenting style.

The third factor that determines the choice of parenting style is the quality of the institutions. The findings by Lareau (2003) show that middle-class parents have access to institutions with higher quality and are also more likely to take a more active role in their child's school activities. These actions are indicative of parents who choose the concerted cultivation parenting style. A sufficient condition for the model to generate this prediction is that $\left(\mu_{\alpha,i} > \mu_{\gamma,i}\right) > 0$. Under this condition, the implication that parenting styles are affected by the quality of institutions is similar to the relationship between parenting style and income. When the quality of the institutions is higher, the benefit of choosing concerted cultivation over natural growth is larger.

Interestingly, there is evidence that low-SES parents respond to exogenous changes in the quality of the institutions. Bergman (2013) studied whether changes in the frequency and mode of communication to parents could change parental involvement in the child's education. In order to do so, Bergman randomly assigned parents to a treatment or control group. Parents in the control group received the default amount of information the school provided. Parents in the treatment group received not only the default information but also text messages about their child's missing assignments, grades, and upcoming exams. As Bergman (2013) shows, this experiment changed parental relationships with the school. Parents in the treatment group were 85 % more likely to initiate contact with the school than parents in the control group. Parents in the treatment group also increased their attendance at conferences with teachers. These are actions usually taken by parents who follow the concerted cultivation approach. The children of parents in the treatment group were more likely to submit their work on time, to improve their work habits, and to cooperate in school. Consequently, there was improvement in the child's human capital formation: The students of parents in the treatment group had higher GPA scores and higher scores on state standardized tests.

The fourth factor in the choice of parenting style is the expectation that parents have about the benefits of concerted cultivation (measured by $\mu_{\alpha,i}$ and $\mu_{\beta,i}$) versus natural growth (measured by $\mu_{\gamma,i}$ and $\mu_{\delta,i}$). In particular, the larger the differences $\mu_{\beta,i} - \mu_{\delta,i}$ or $\mu_{\alpha,i} - \mu_{\gamma,i}$, the more likely it is that parents will adopt the concerted cultivation style. As described above, Rowe (2008) shows that low-SES parents may talk little to their children because they are unaware of the role of child-directed speech for the child's language development. A small-scale intervention to improve parental knowledge about the importance of talking to young children was conducted by Suskind and Leffel (2013). The intervention, known as the Thirty Million Words Project, is based on three components. The first component is communicating to parents the scientific evidence on how the early language

environment experienced by children affects children's brain development. The second component is providing parents with suggestions on how to easily and very cheaply improve the language environment at home. The third component is supplying parents with information about the quality of the language environment at their home and encouraging them to reach for higher levels of hourly word counts and daily conversational turns. As a result of the intervention, the parents in the treatment group increased the amount of conversation turns per hour by around 50 % and the children's language development (measured in number of vocalizations per hour) also increased by 50 %.

In the context of poor countries, researchers often equate parental investments to feeding practices that young children experience on a day-to-day basis. Indeed, this is an important topic of study because it is known that early malnourishment has detrimental consequences for longer-term outcomes such as schooling, adult health, and productivity (Glewwe et al. 2001; Maluccio et al. 2009). Consider, for example, Malawi, an African country where 48 % of children younger than five are stunted and 22 % of them are underweight. It is very likely that poor feeding practices are partly responsible for these extreme indicators. For example, over half of all infants below 6 months of age are given food and/or unsterilized water (Malawi Demographic and Health Survey 2004), which is contrary to World Health Organization (WHO) recommendations.

The question of whether the provision of information about the impact of these poor feeding practices on child development leads Malawi parents to become more careful with the food they give their children was examined by Fitzsimons et al. (2012). In the context of the model above, this is essentially informing parents about values of β and δ. A randomized counseling intervention was used to impart information and advice on infant feeding to mothers of young children. Counseling visits not only encouraged exclusive breastfeeding up to the age of 6 months, but also provided information about weaning, locally available nutritious foods, the importance of a varied diet (particularly, the inclusion of protein and micronutrient-rich foods such as eggs) and instructions on how to prepare foods so as to conserve nutrients and ease digestion. Three years after the beginning of the intervention, it was found that mothers in treated localities exhibited superior knowledge about infant feeding best practices. Children in treatment localities experienced a more varied diet, richer in protein. By age 3 years, the children in the treatment group were 20 % of a standard deviation (for age) taller than the children in the control group.

The findings from the Thirty Million Words Project (Suskind and Leffel 2013) and the nutrition counseling intervention by Fitzsimons et al. (2012) are persuasive evidence that beliefs have a causal effect on child development. In contrast, the home visitation programs summarized by Kalil (Chap. 5) have poor performance in increasing investments in children. Kalil's suggestion is that there are high behavioral costs of adopting the parenting practices promoted by the home visitation programs in the USA. Another possible interpretation, suggested by the findings from the studies discussed above, is that the interventions did not succeed because they failed to change parental beliefs. An important design in the Thirty

Million Words Project is that the parent was provided feedback about the child's vocalizations in response to an increase in parental child-directed speech. The feedback may have been key to changing parents' beliefs about the importance of the home language environment for the child's language development. In the Malawi experiment, Fitzsimmons et al. (2012) showed that the intervention generated interest in child nutrition within the village, beyond just households directly affected, making child health- and nutrition-related issues more salient in these communities. This finding suggests that parents not only updated their beliefs, but they also communicated their updated beliefs to other parents who were not directly treated.

Conclusion

In this chapter, I have presented a model in which parents are subjectively rational. Although parents act to maximize a well-defined objective function, they lack information about the constraints that link parenting style and investments to child development. Following Kalil's (Chap. 5) suggestion, parents are also subject to behavioral costs. Such a model is consistent with the empirical literature that links parenting styles, investments in children, and child development. Empirical implications of the model have been validated in recent experiments that provide parents with important information to foster child development. These findings provide useful guidance for the design of new policies that can close the human capital gap that opens up long before children reach school.

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